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Navigating the Shifts in the Next Generation Science Standards

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How do we get from **here** to **there**?

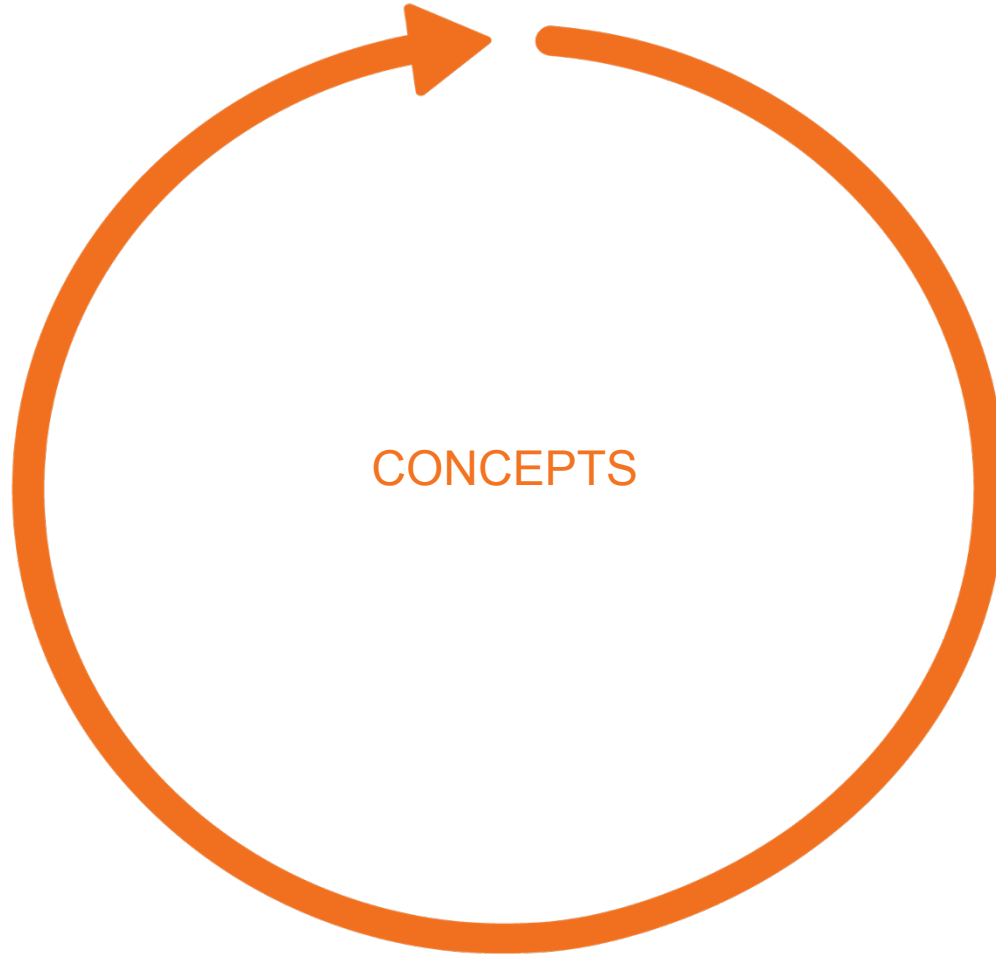
Plan for Today

Where we've been

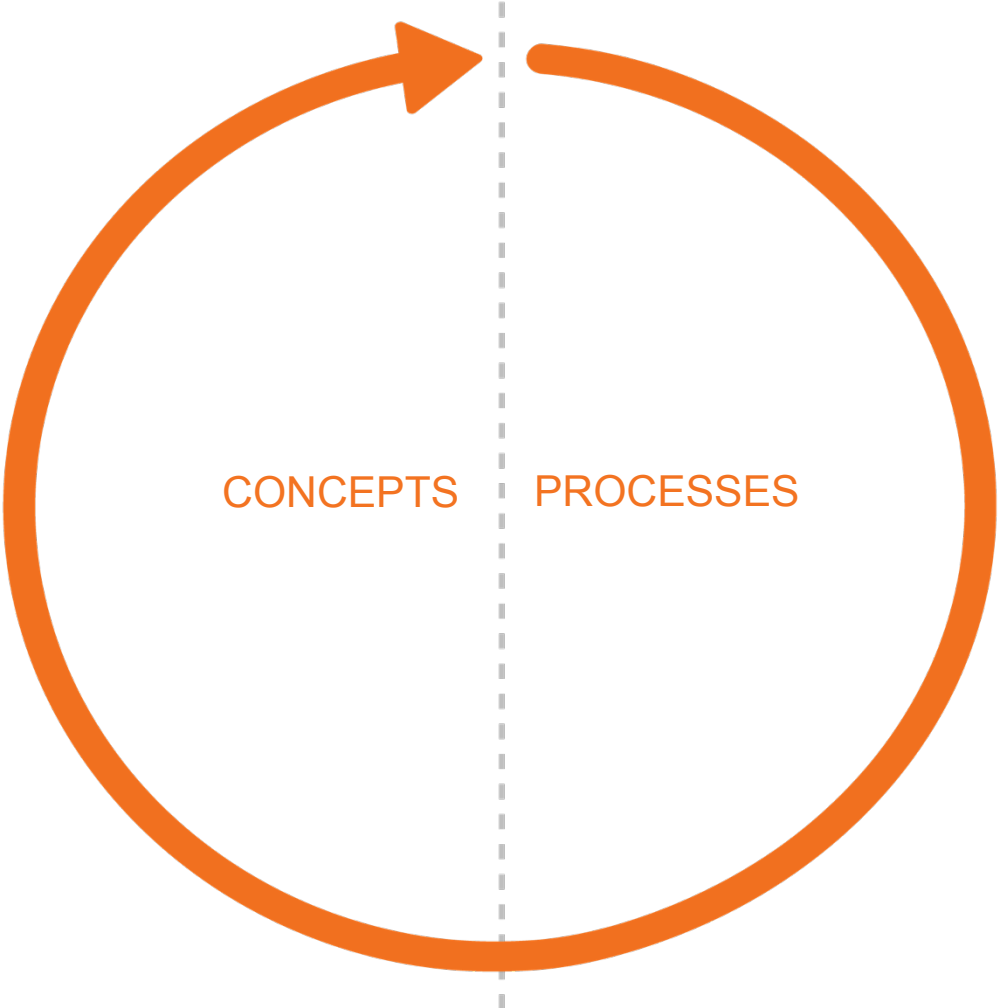
Vision of the Next Generation Science Standards

Shifts

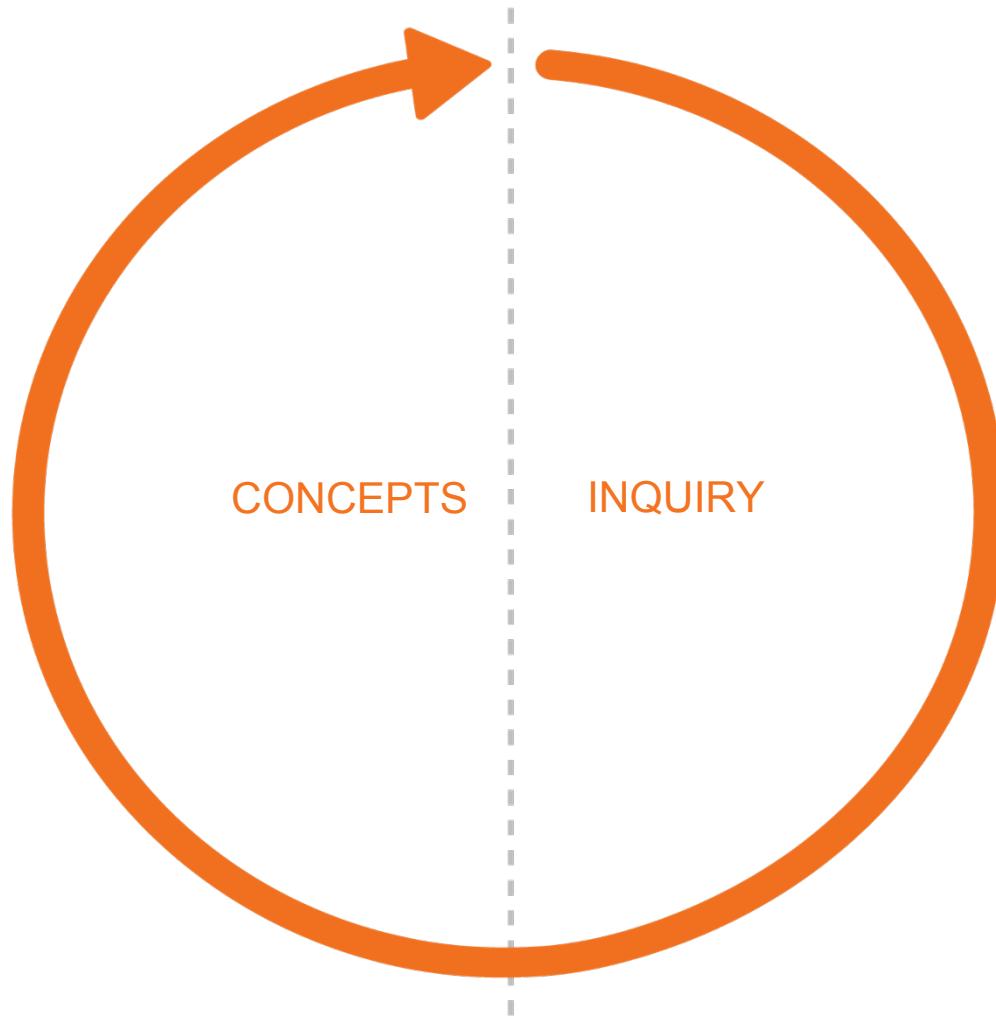
In the beginning



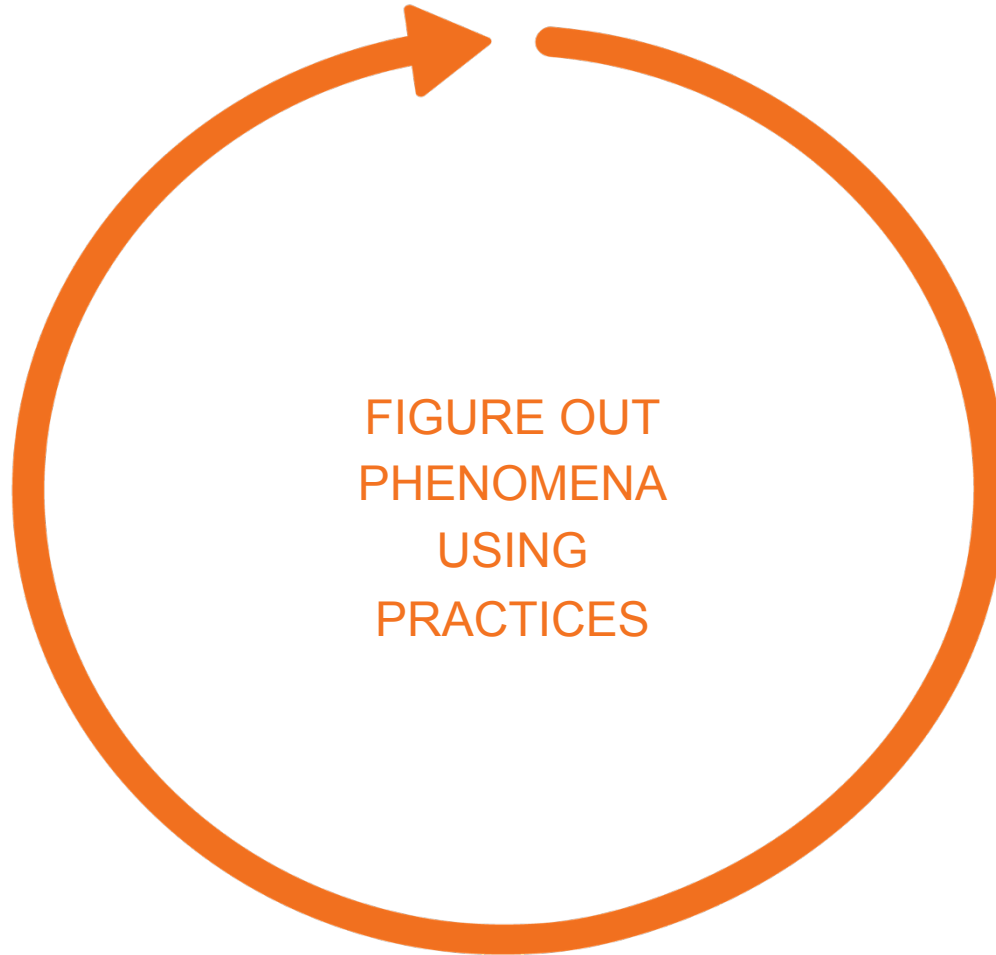
1965



1990's



2010



Getting from here to there

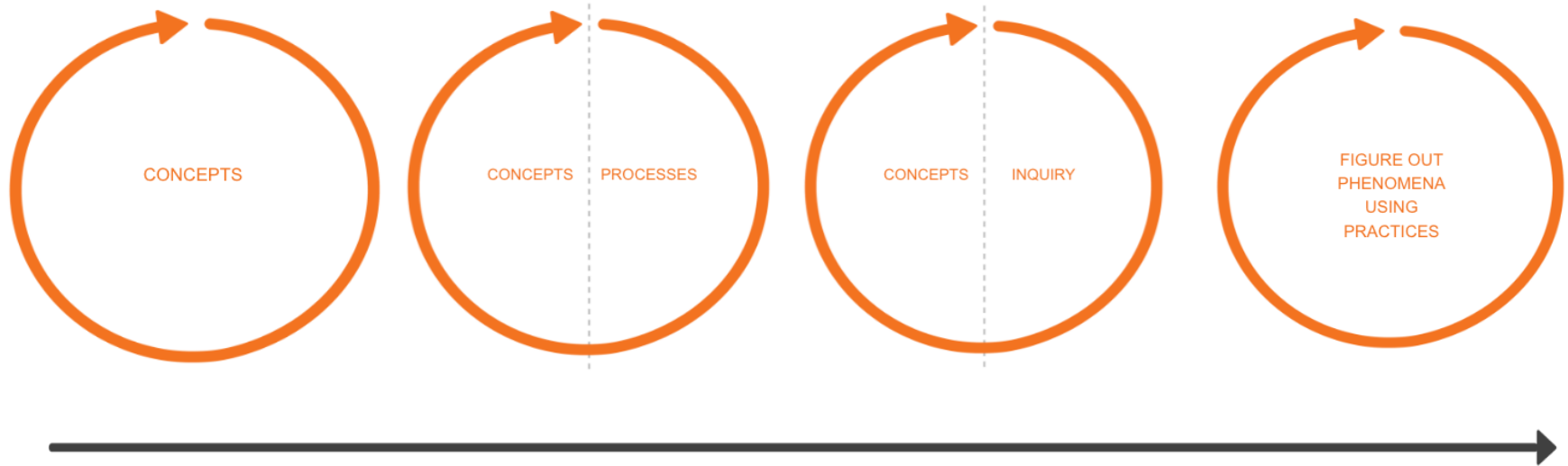


Figure out scientific phenomena
using science practices

topics



phenomena

all about
sea turtles



how do sea turtles
defend themselves
from sharks?

electric
circuits



why is Ergstown
experiencing frequent
blackouts?

light waves
and matter



why does Australia
have an elevated
skin cancer rate?

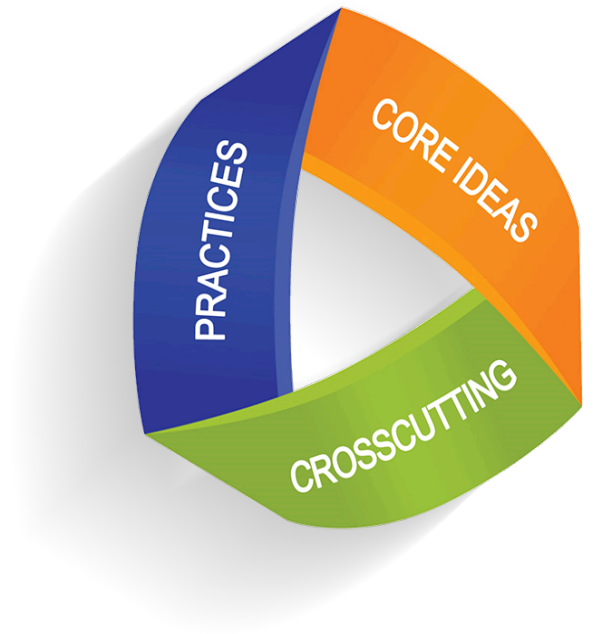
Phenomenon

Why is there variation
in the traits of a spider's silk?



Disciplinary Core Ideas

Fewer, deeper



What **disciplinary core idea**
do I want students to figure
out?

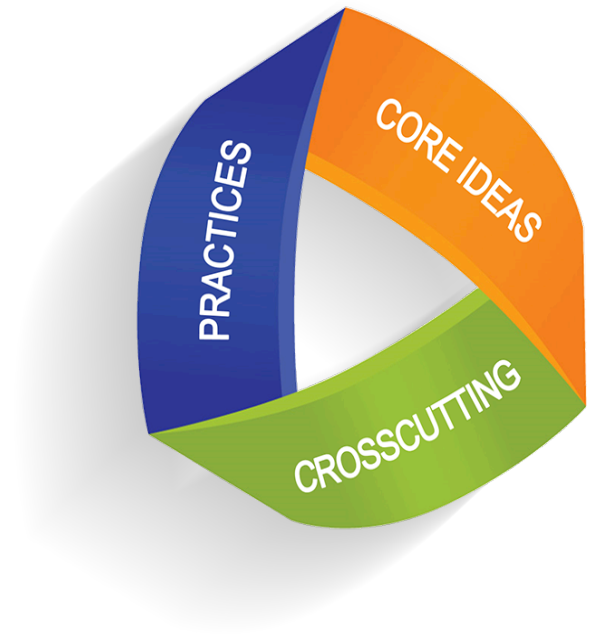


Figure out scientific phenomena
using **science practices**

Science and Engineering Practices

1. Asking questions and defining problems
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 and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

NGSS Science and Engineering Practices

1. Asking questions (and defining problems)
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 (and designing solutions)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Inquire like a scientist.

Convergence

Inquire like a scientist.

Think like a scientist.

Quantify like a scientist.

Read like a scientist.

Talk like a scientist.

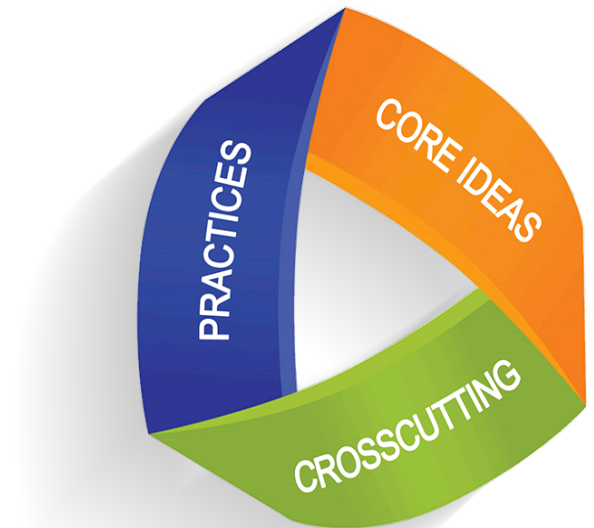
Write like a scientist.

Critique like a scientist.

Argue like a scientist.

What **disciplinary core idea**
do I want students to figure
out?

What **science and engineering
practice** will they use to figure
it out?



3-dimensional approach

Not this:

Students learn about **information transfer**.


 DISCIPLINARY CORE IDEA

3-dimensional approach

Not this either:




Students design and compare multiple solutions
to transfer information.

 DISCIPLINARY CORE IDEA

 SCIENCE AND ENGINEERING
PRACTICE

This!

Students design and compare multiple solutions to transfer information and describe how patterns are used.

-  DISCIPLINARY CORE IDEA
-  SCIENCE AND ENGINEERING PRACTICE
-  CROSSCUTTING CONCEPT

Crosscutting Concepts

Patterns

Cause and Effect

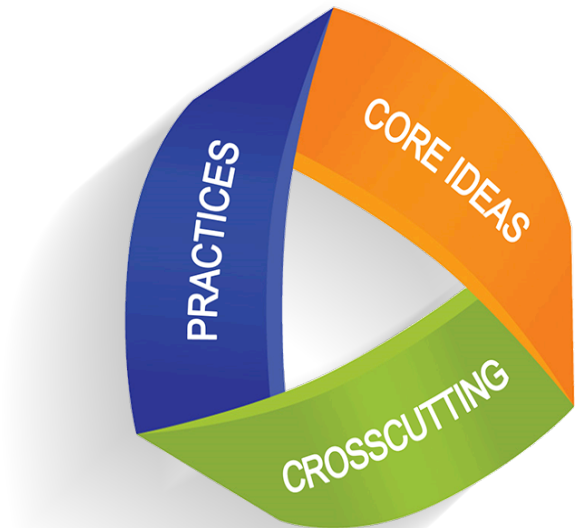
Scale, Proportion, and Quantity

Systems and System Models

Energy and Matter

Structure and Function

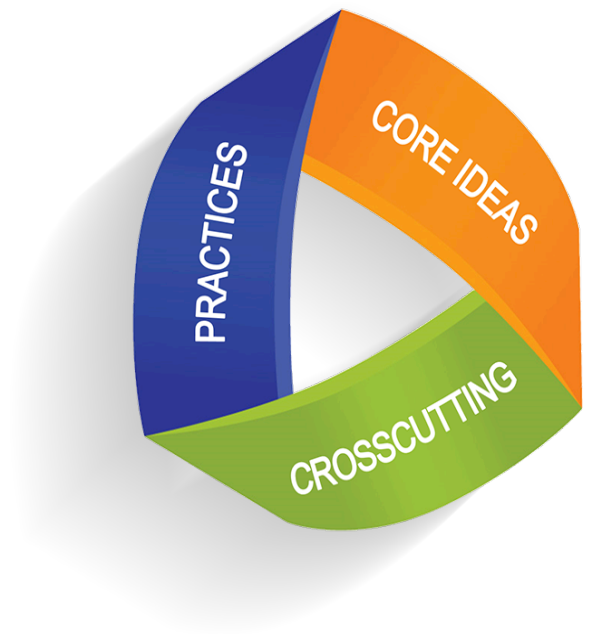
Stability and Change



What **disciplinary core idea** do I want students to figure out?

What **science and engineering practice** will they use to figure it out?

What **crosscutting concept** will help them connect what they learn to other ideas in science?



From a typical Middle School Curriculum on Inheritance

Not this:

- > Students are told how inheritance works.
- > Students make gumdrop and toothpick models of DNA.

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From a typical Middle School Curriculum on Inheritance

Not this either:

- > Students are told how inheritance works.
- > Students apply what they learn about the rules of inheritance to complete Punnett squares.

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From the *Amplify Science* Traits and Reproduction unit for Middle School

This!

Why do the Darwin's bark spider offspring have different gene combinations even though they have the same parents?

- > Students conduct experiments using a spider-breeding computer model that allows them to observe the resultant spider offspring and examine their genes, in order to figure out how the rules of inheritance work.

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Instructional Sequence on Weather
From a typical Middle School Weather Unit

Not this...

- Students learn the names of clouds.
- Students learn about the main types of storms.

Instructional Sequence on Weather
From a typical Middle School Weather Unit

Not even this...

- Students learn the names of clouds.
- Students learn about the main types of storms.
- They figure out where the main types of storms occur across the planet

Instructional Sequence on Weather
From Amplify Science Middle School Unit
Weather Patterns: Severe Storms in Galetown

This!!

- Students use a model to investigate the factors of sunlight, water vapor, and wind in order to figure out why some storms are more powerful than others.

Shift to an NGSS approach

from learning about



to figuring out

Instructional Sequence on Butterflies
From a typical Kindergarten Life Science curriculum

Not this...

- Students listen to a read aloud about monarch butterflies.
- Then they complete a cut-and-paste sequencing of the stages of a monarch's life cycle.

Instructional Sequence on Butterflies
From a typical Kindergarten Life Science curriculum

Not this either...

- Students compare a monarch life cycle to their own experience and knowledge of humans growing and changing
- Students write cause-and-effect statements about how food helps living things grow.

Instructional Sequence on Butterflies
From Amplify Science Kindergarten unit
Needs of Plants and Animals:
Milkweed for Monarchs

This!!

Why are there no more monarch caterpillars in Mariposa Grove after the field was turned into the community garden?

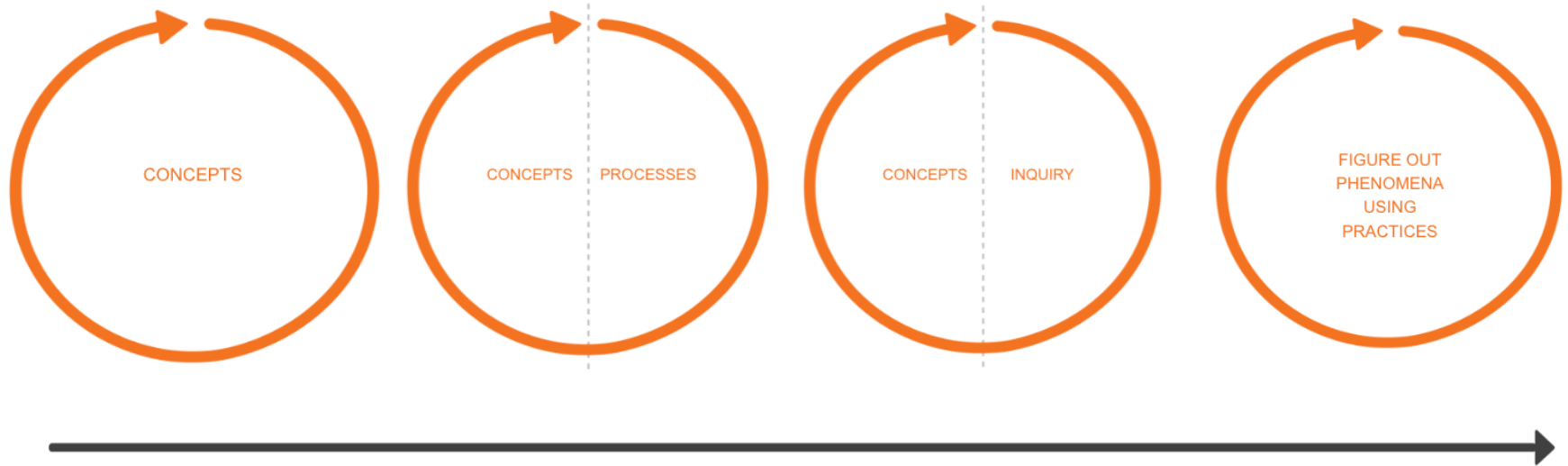
- Students investigate what monarch caterpillars need to live, and analyze photos of the plants that were in the field before and are in the garden now.
- They use that evidence to explain why the monarch caterpillars no longer live in the garden
- Students then make a new plan for a garden that provides for the needs of monarch caterpillars in addition to vegetables for humans.

A curriculum should allow students to figure out

Even when they are in kindergarten

Even when it might be faster to tell students.

Getting from here to there



Reflections and Q&A

Thank you for your participation!

Please feel free to contact me:

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