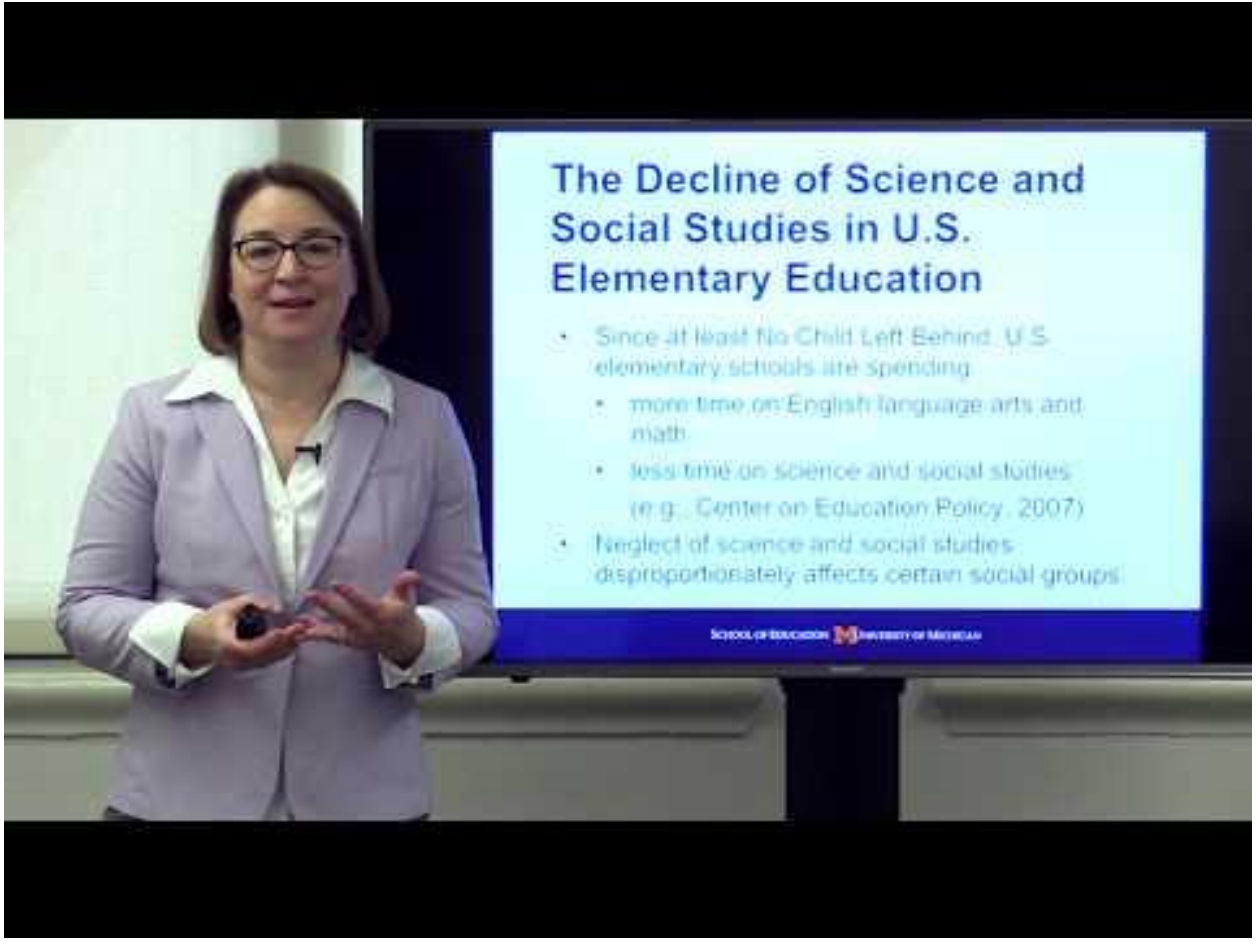
Teach Science? I don't have time for that!

Kristen McKinney
Director of Science
Department of Elementary and Secondary Education

Objectives:

1. Learn literacy skills and practices through a science lens.
2. Understand how to effectively teach GOOD science practice in the elementary classroom.

Speaking Up for Science (and Social Studies)



WHY is K-2 science important?

Grade Level	Physical Science				Life Science				Earth and Space Science		
	PS1 Matter and its Interactions	PS2 Motion & Stability: Forces & Interactions	PS3 Energy	PS4 Waves and Their Applications	LS1 From Molecules to Organisms: Structure & Processes	LS2 Ecosytems: Interactions, Energy, & Dynamics	LS3 Heredity: Inheritance and Variation of Traits	LS4 Biological Evolution, Unity & Diversity	ESS1 Earth's Place in the Universe	ESS2 Earth's Systems	ESS3 Earth & Human Activity
K	X	X	X		X				X	X	X
1			X	X	X		X		X	X	
2	X	X		X		X			X	X	
3	X	X			X		X			X	X
4		X	X	X	X				X	X	X
5	X	X	X	X	X	X			X	X	X
6-8	X	X	X	X	X	X		X	X	X	X
9-12	X	X	X	X	X	X	X	X	X	X	X

LS1 Progression Example

K-2	3-5	6-8	9-12
All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K.LS1.C.1)	Plants acquire their material for growth chiefly from air and water. (5.LS1.C.1)	Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (6-8.LS1.C.1)	The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (9-12.LS1.C.1) The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (9-12.LS1.C.3) As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (9-12.LS1.C.2) (9-12.LS1.C.3) As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another and release energy to the surrounding environment and to maintain body temperature. Cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. (9-12.LS1.C.3)

CCC's in the ABC's

Crosscutting Concepts and Trade Books

What is a tradebook?

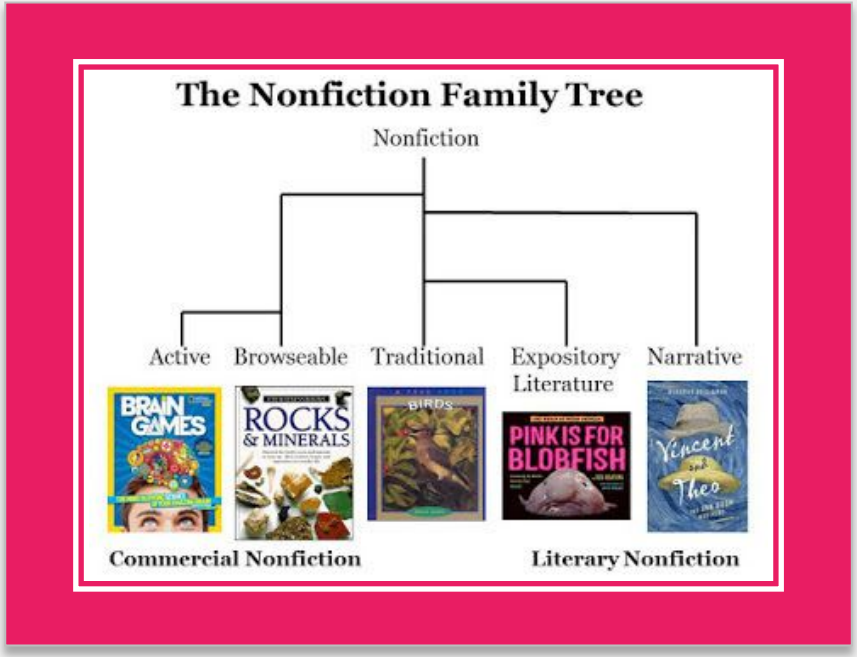
Trade book is defined as a book that is to be sold to the public through booksellers.

Identifying Great Trade Books

- NSTA
- Outstanding Science Trade Books
- Best STEM Books

Types of Nonfiction Books

- Commercial Nonfiction
- Literary Nonfiction




Browsable
1,000 FACTS ABOUT THE WHITE HOUSE
Active
STITCH CAMP
Traditional
Beyoncé Sisson
WATER
Expository Literature
Narrative
Vincent and Theo
Commercial Nonfiction
Literary Nonfiction

What are some familiar ways to use trade books?

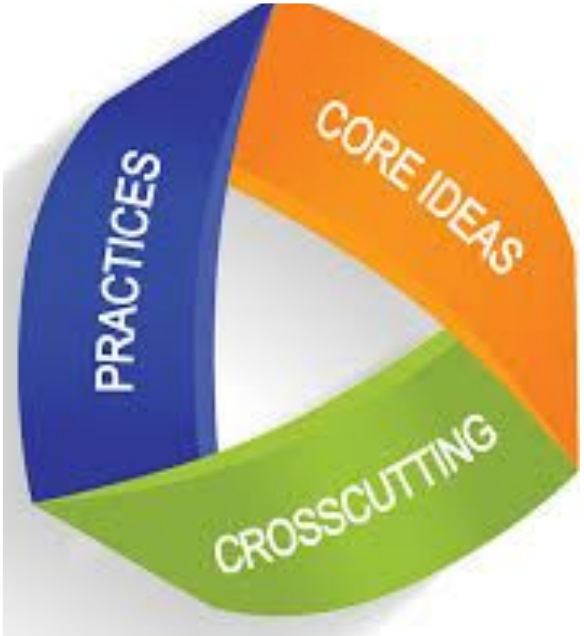
CLAIM

Reading science trade books is the perfect way for students to build literacy skills while learning science content.

Ways to look at trade books through a Science lens

Science Content	Science and Engineering Practices
Crosscutting Concepts	STEM like Thinking

3 Dimensional Science Teaching



Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas. – Framework p. 233

Evidence

Cross Cutting Concepts - review

- ➔ Patterns
- ➔ Cause and Effect
- ➔ Scale, Proportion, and Quantity
- ➔ Systems & System Models
- ➔ Energy & Matter
- ➔ Stability & Change
- ➔ Structure & Function

Crosscutting Concepts

Structure and Function

Structure

The structure of an object is related to its shape. For example, lets look at the structure and function of a bike tire.

_____ – the thing that is being studied
- bike

_____ – the part or piece of a system
- tire

_____ – the shape, what it is made of
- A bike tire is made of rubber wheels that have an air tube inside.

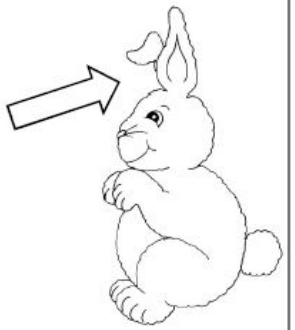
_____ – the specific job that it designed to do
- The bike tire helps the bike to roll.

The structure supports the function because the round shape help the tires to roll. The air inside of the tire helps to maintain its shape.

Structures that help support a function are found in the natural world and in the things that humans build, like bike tires.

System: Bunny
Component: Bunny Ears

Describe the structure of the bunny's ears?



What is the function of the bunny's ears?

How does the structure support the function?

Crosscutting Concepts

Structure and Function

Structure

The structure of an object is related to its shape. For example, lets look at the structure and function of a bike tire.

System – the thing that is being studied
- bike

Component- the part or piece of a system
- tire

Structure – the shape, what it is made of
- A bike tire is made of rubber wheels that have an air tube inside.

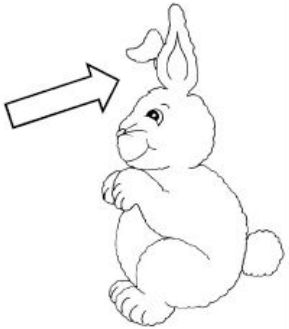
Function – the specific job that it designed to do
- The bike tire helps the bike to roll.

The structure supports the function because the round shape help the tires to roll. The air inside of the tire helps to maintain its shape.

Structures that help support a function are found in the natural world and in the things that humans build, like bike tires.

System: Bunny
Component: Bunny Ears

Describe the structure of the bunny's ears? The bunny's ears are soft, flexible and large.



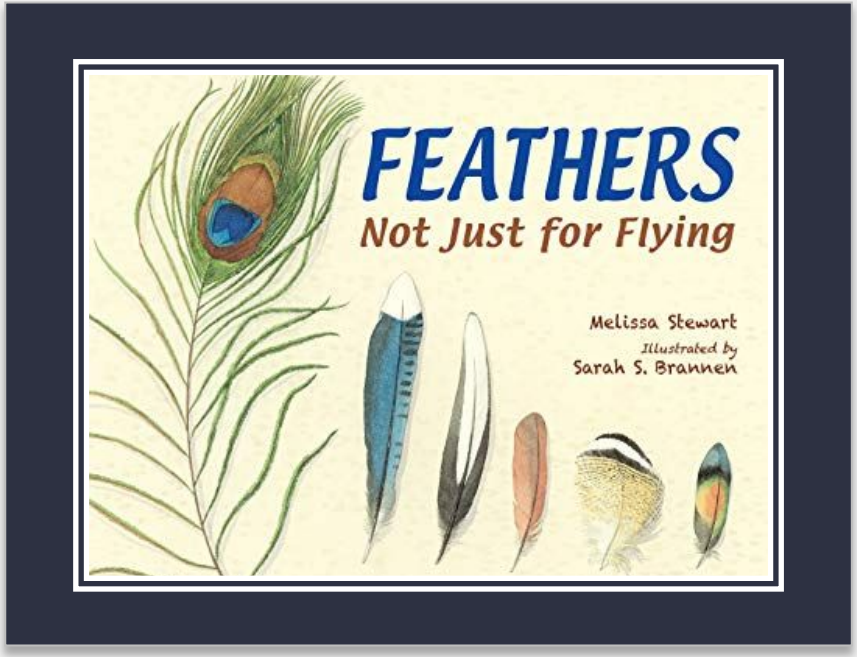
What is the function of the bunny's ears? The bunny's ears help a bunny to hear.

How does the structure support the function? The large ears help the bunny to hear sounds that are far away. The ears are flexible which helps to move them toward in the direction of a sound so that the bunny can hear better.

The answers that are provided are sample answers. Discuss with your class to come up with your own answers.

Structure & Function

Feathers Not Just for Flying



Crosscutting Concepts

Structure and Function

System:

Components	Structure	Function	How does the structure support the function?

How is this “science”?

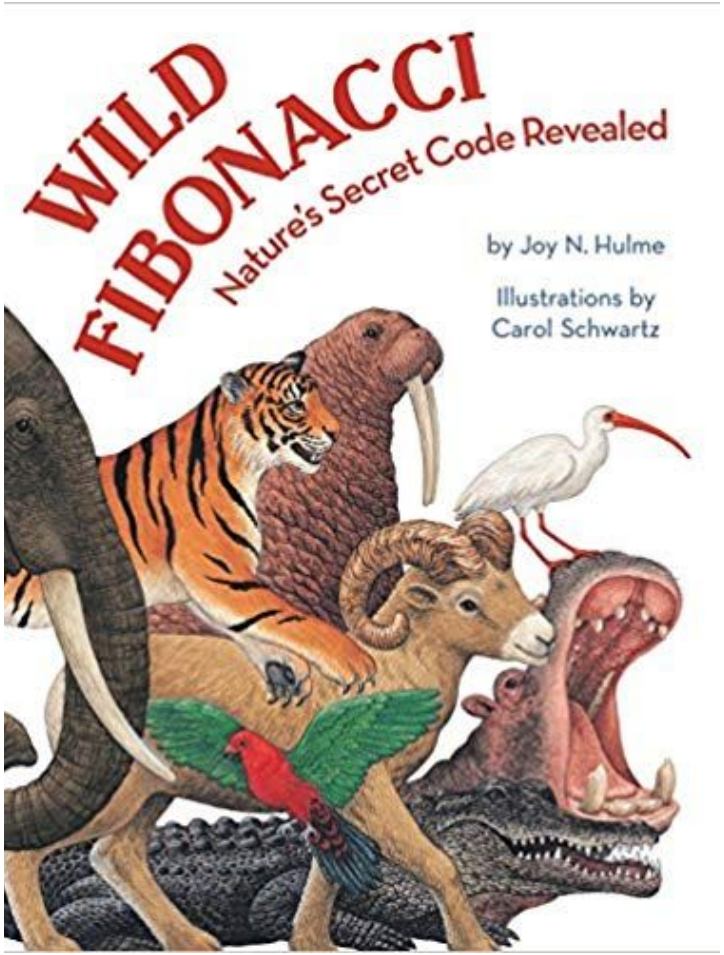
Crosscutting concept: Structure and Function

Science and Engineering Practice: Developing and Using Models

Disciplinary Core Idea: Variation of Traits [Different organisms vary in how they look and function because they have different inherited information AND the environment affects the traits that an organism develops.]

Patterns

Wild Fibonacci: Nature’s Secret Code

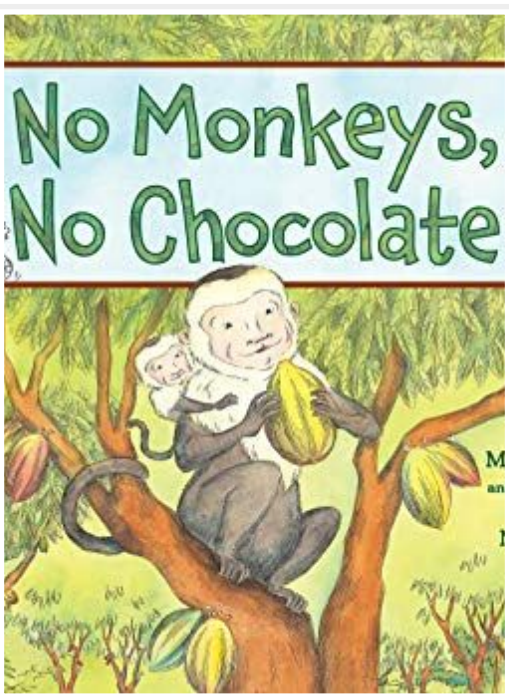


Patterns

Adi’s Perfect Patterns and Loops

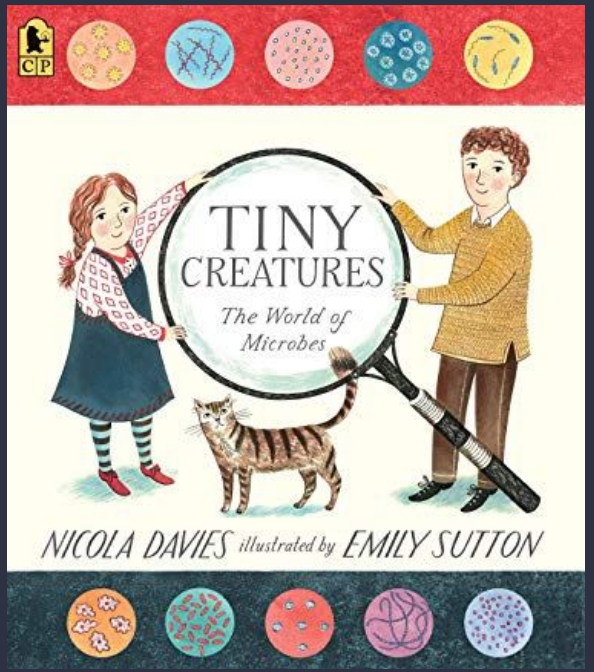
Cause & Effect

No Monkeys No Chocolate



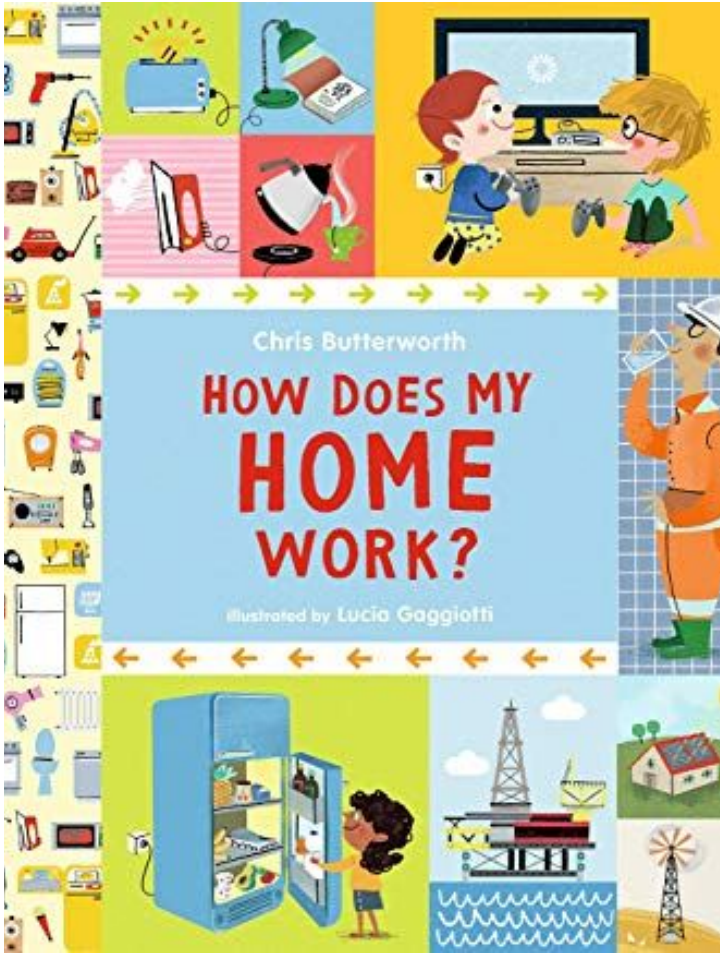
Scale, Proportion, and Quantity

Tiny Creatures: The World of Microbes



Systems & System Models

How Does My Home Work?

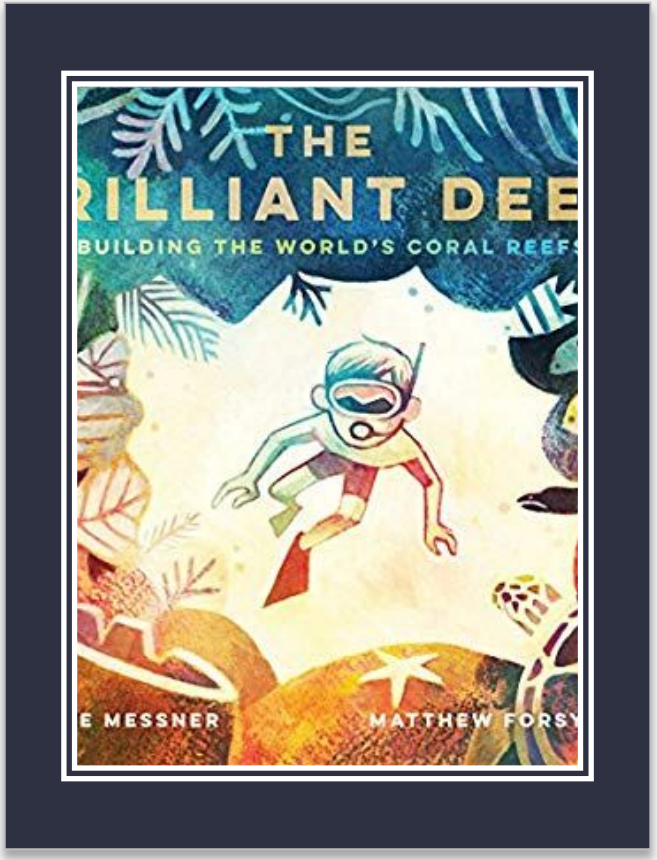


Systems & System Models

From Acorn to Oak Tree

Energy & Matter

The Brilliant Deep

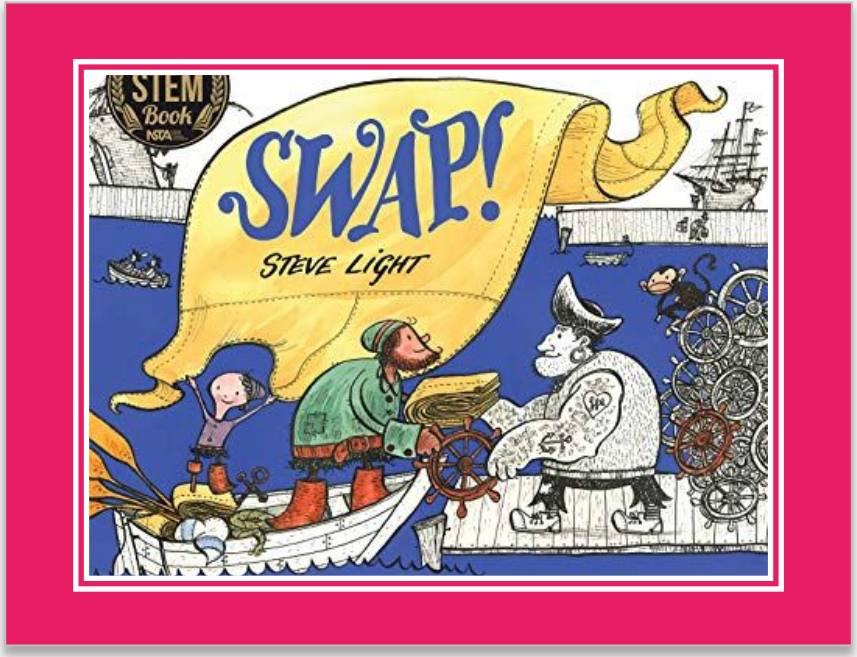


Stability & Change

The Coral Kingdom

STEM Books

Invite STEM-like thinking!



Models Innovation

Illustrates Authentic Problems

Invites divergent and convergent thinking

Divergent Thinking

Spontaneous

Non-linear

Free-flowing

Convergent Thinking

Contemplated

Linear

Single-answer

Shows progressive change or improvement

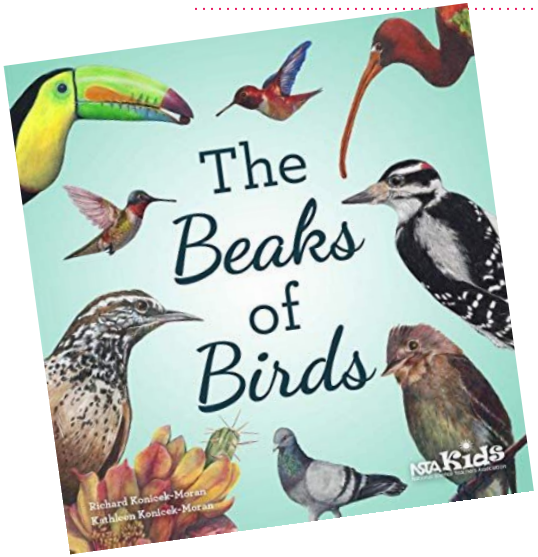
Assimilates new or more efficient ideas

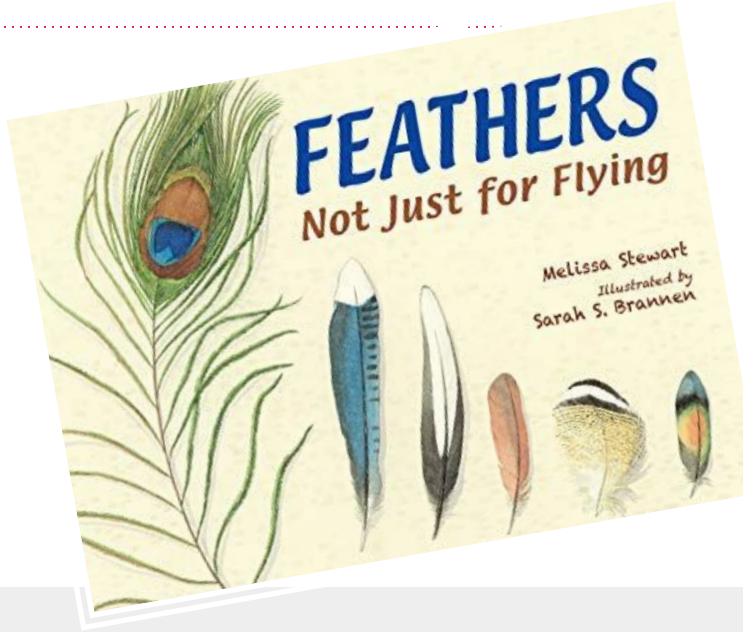
Explores multiple solutions

When can we use scientific literacy OUTSIDE the science classroom?

Reasoning

Non-fiction books can be used in a plethora of ways





Let's examine some books!

Resources on DESE's website

- ➔ Student Learning Outcomes K-5
- ➔ Course Bundling (Scope and Sequence)
- ➔ Implementation Plan
- ➔ PD on your Plan
- ➔ Performance Level Descriptors K-2 and 3-5
- ➔ Item Specifications: K, 1, 2, 3, 4, 5

Student Learning Outcomes

K-5 MLS Science Student Learning Outcomes (SLOs)

Grade K	
K.PS1.A.1	I can describe observations of size, shape, color, or mass of objects.
K.PS2.A.1	I can investigate how different strengths or different directions of pushes or pulls affect an object's motion.
K.PS2.A.2	I can use data to describe how the motion of an object has changed.
K.PS3.A.1	I can use data to describe how sunlight affects Earth's surface.
K.PS3.B.1	I can develop a model to describe a structure that will reduce the warming effect of sunlight on an area.
K.LS1.C.1	I can make observations to describe patterns between the needs of plants and animals.
K.ESS1.B.1	I can use observations to describe the amount of light available during each season.

Questions? Comments?

Kristen McKinney
Kristen.McKinney@dese.mo.gov
573-751-4445