

Examining the
Next Generation
Science Standards



Elementary



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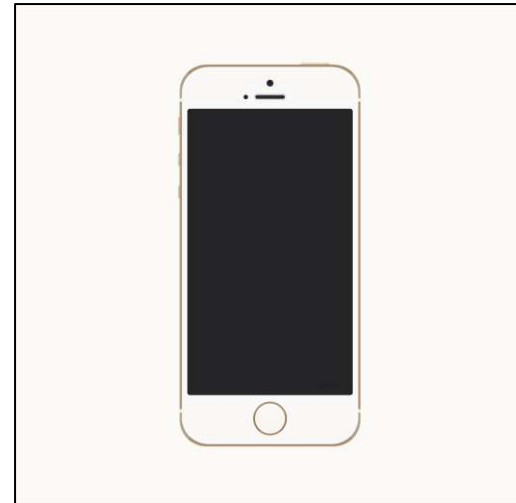
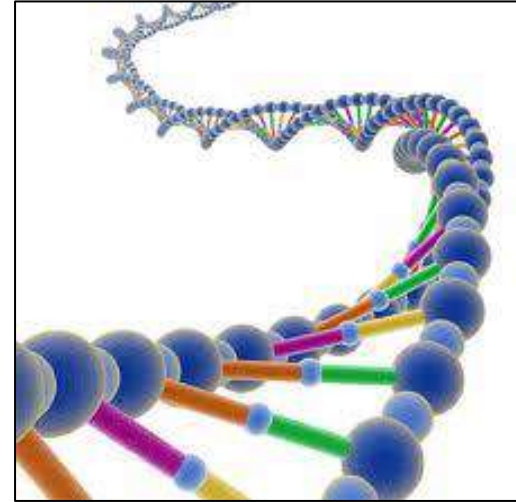


Our Changing World

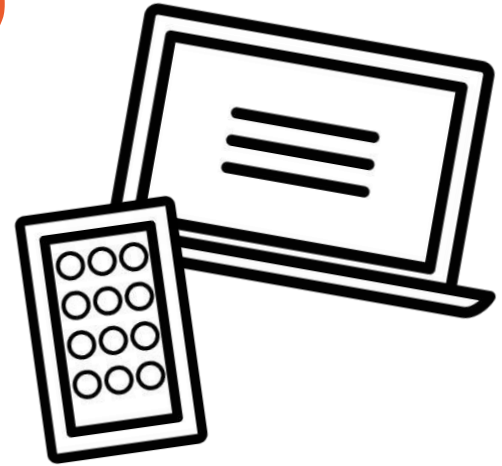
Think about how the world has changed in the past 15 years.



Our Changing World



More children ages **3 to 7**
with home internet access know how
to use **computers** and **smartphones**



than know how to



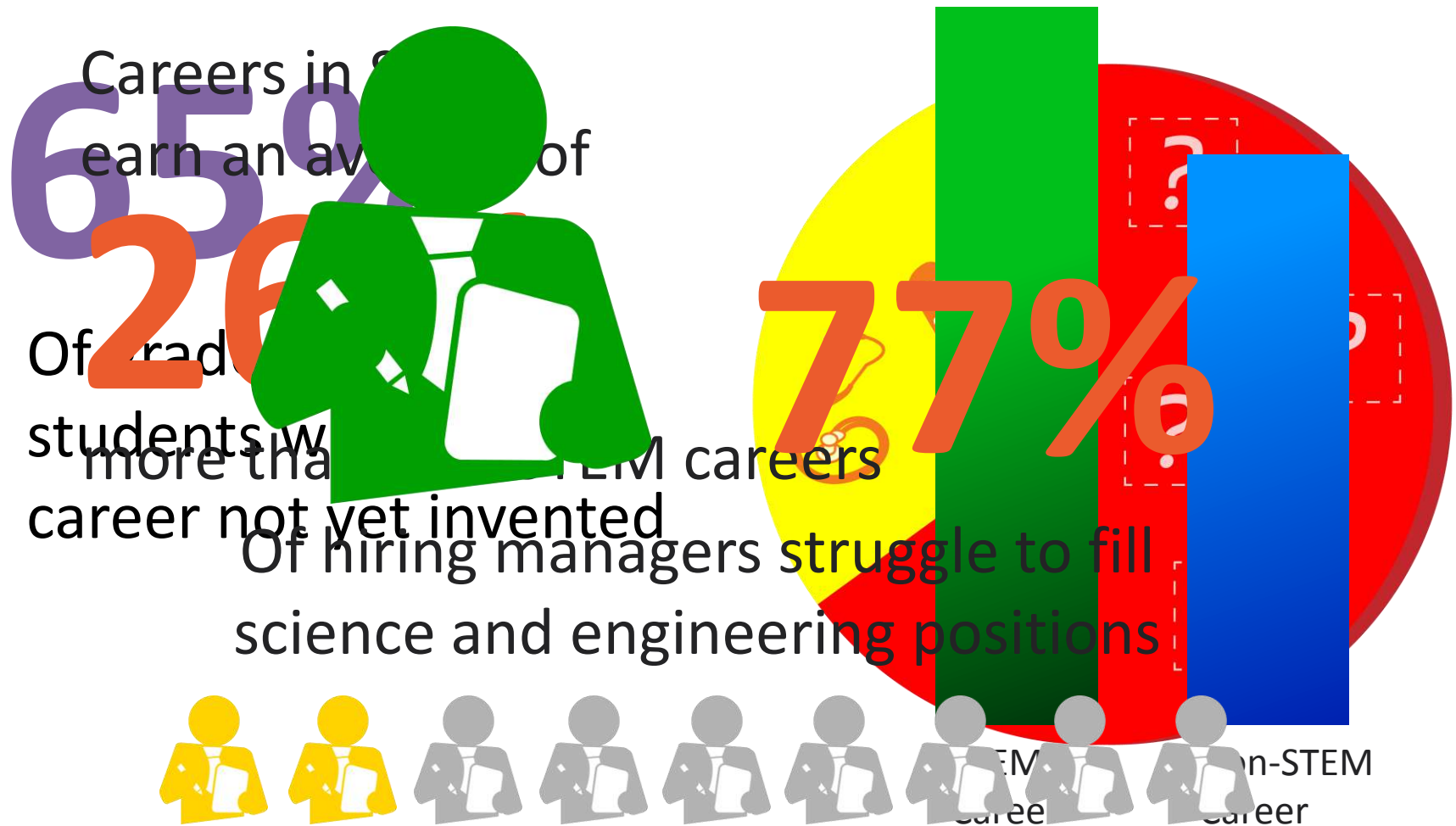
ride a bike

OR



tie their shoes

Statistics about STEM Careers



THE STEM CRISIS



STEM job growth
projected to
significantly outpace
all other fields by 2020

**Requirement for
STEM Skills**

**Qualified or
interested
candidates for
STEM Jobs**

**Global
Innovation
Leadership**

Kids not college ready
for science and math

38% STEM majors
abandon their path

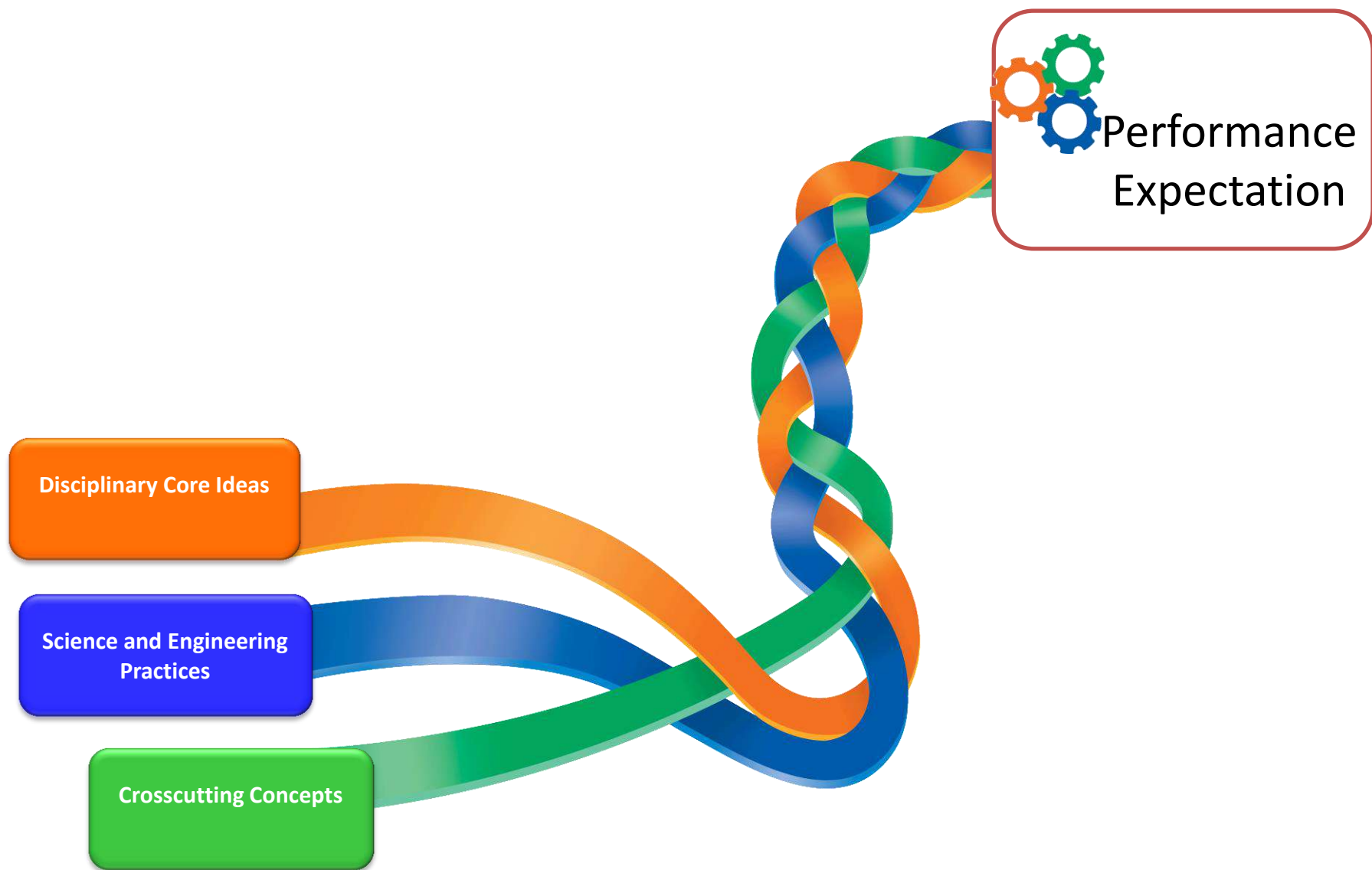
Global ranking for
science and math
slipping

Conceptual Shifts in the Next Generation Science Standards

Conceptual Shifts

**Reflect the
interconnected nature
of science**

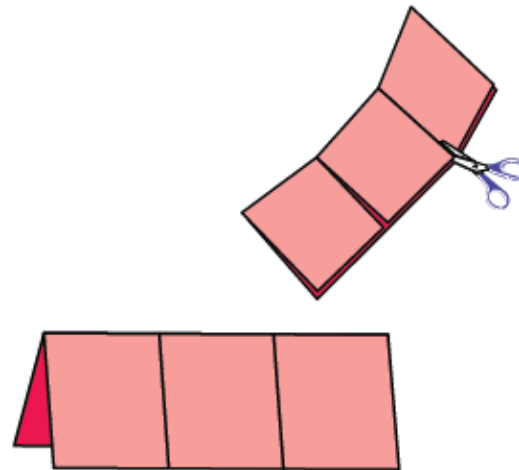




Let's create a model of this three-dimensional learning:

Three-Tab Book

- 1 Fold a sheet of paper like a hot dog.
- 2 With the paper horizontal and the fold of the hot dog up, fold the right side toward the center, trying to cover one half of the paper..
- 3 Fold the left side over the right side to make a book with three folds.
- 4 Open the folded book. Place one hand between the two thicknesses of paper and cut up the two valleys on one side only. This will create three tabs.



**Disciplinary
Core Ideas**

(Content)

**Science and
Engineering
Practices**

(Skills)

**Crosscutting
Concepts**

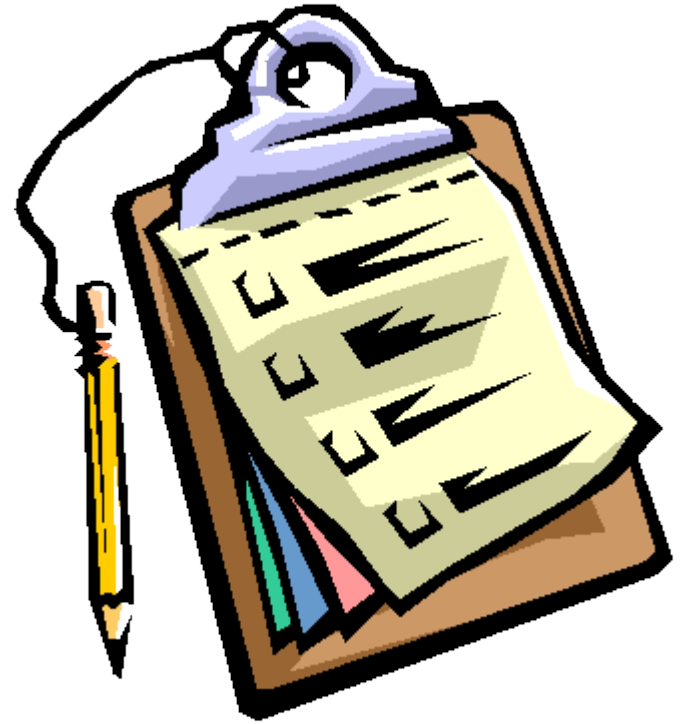
(Themes)



**Look at the picture of the oobleck.
What questions do you have?**

Conceptual Shifts

Student performance expectations



PROPERTIES OF MATTER

THREE DIMENSIONAL LEARNING

Three dimensional learning in science engages students through the following strands:

Disciplinary Core Ideas
Science and Engineering Practices
Crosscutting Concepts

These three strands support Performance Expectations, which require students to apply Science and Engineering Practices to content knowledge.

In this module, **Properties of Matter**, students will plan and conduct investigations and analyze data to explore types, properties, and purposes of matter.



Disciplinary Core Ideas

PS1.A Structure and Properties of Matter



Science and Engineering Practices

As students explore the content in this module they will use the following **Science and Engineering Practices**:

- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data



Crosscutting Concepts

As students explore the content, they will also use the following **Crosscutting Concepts**:

- Patterns
- Cause and Effect



Performance Expectations

2-PS1-1

Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

2-PS1-2

Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

More detailed information about Next Generation Science Standards can be found on page xxx.

Crosscurricular Connections

ELA/Literacy

RI.2.8 Describe how reasons support specific points the author makes in a text.

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

Mathematics

MR.2 Reason abstractly and quantitatively.

MR.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

Performance Expectation	<i>Students who demonstrate understanding can:</i> 2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
Disciplinary Core Ideas	Structure and Properties of Matter Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.
Science and Engineering Practices	Planning and Carrying Out Investigations Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.
Crosscutting Concepts	Patterns Patterns in the natural and human designed world can be observed.

BACK

2-PS1-1

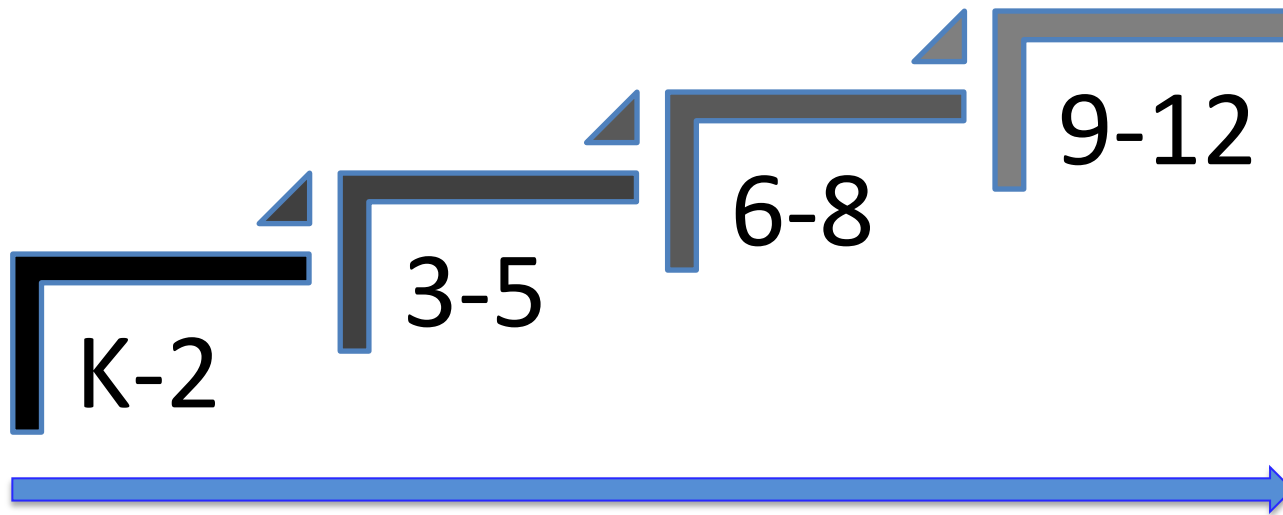
Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

FRONT

Disciplinary Core Ideas (Content)	Science and Engineering Practices (Skills)	Crosscutting Concepts (Themes)
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Conceptual Shifts

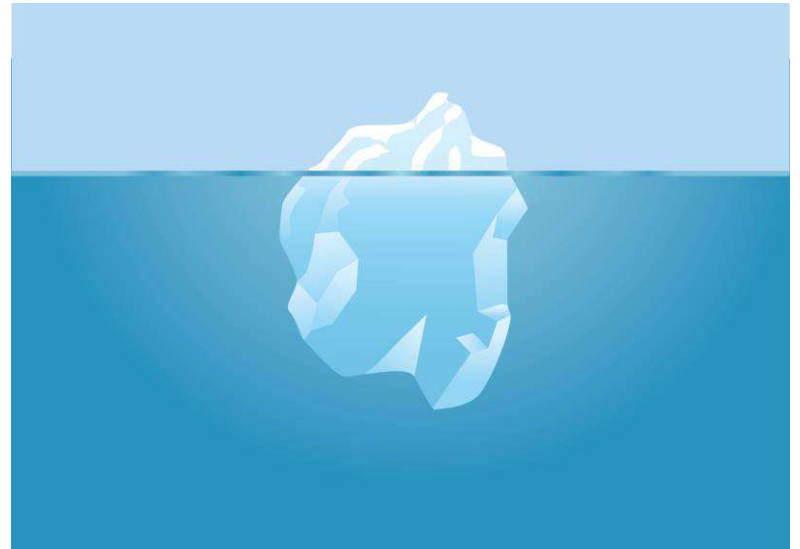
**Science concepts build
coherently from K-12**



	Grades K-2	Grades 3-5	Grades 6-8	Grades 9-12
PS1: Matter and Its Interactions				
PS1.A: Structure and Properties of Matter	Different kinds of matter exist and many of them can be either solid or liquid, depending on the temperature. Matter can be described and classified by its observable properties. (2-PS1-1)	Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1)	Substances are made of different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1) Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)	Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (HS-PS1-1) The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HS-PS1-1)

Conceptual Shifts

Focus on deeper understanding of content as well as application



**What are the
properties of
solids?**



Solids



Is It a Solid?

Circle the things that are solids.



Rock



Water



Rubber



Feather



Ice



Wool hat



Paper



Juice



Sand



Cotton ball

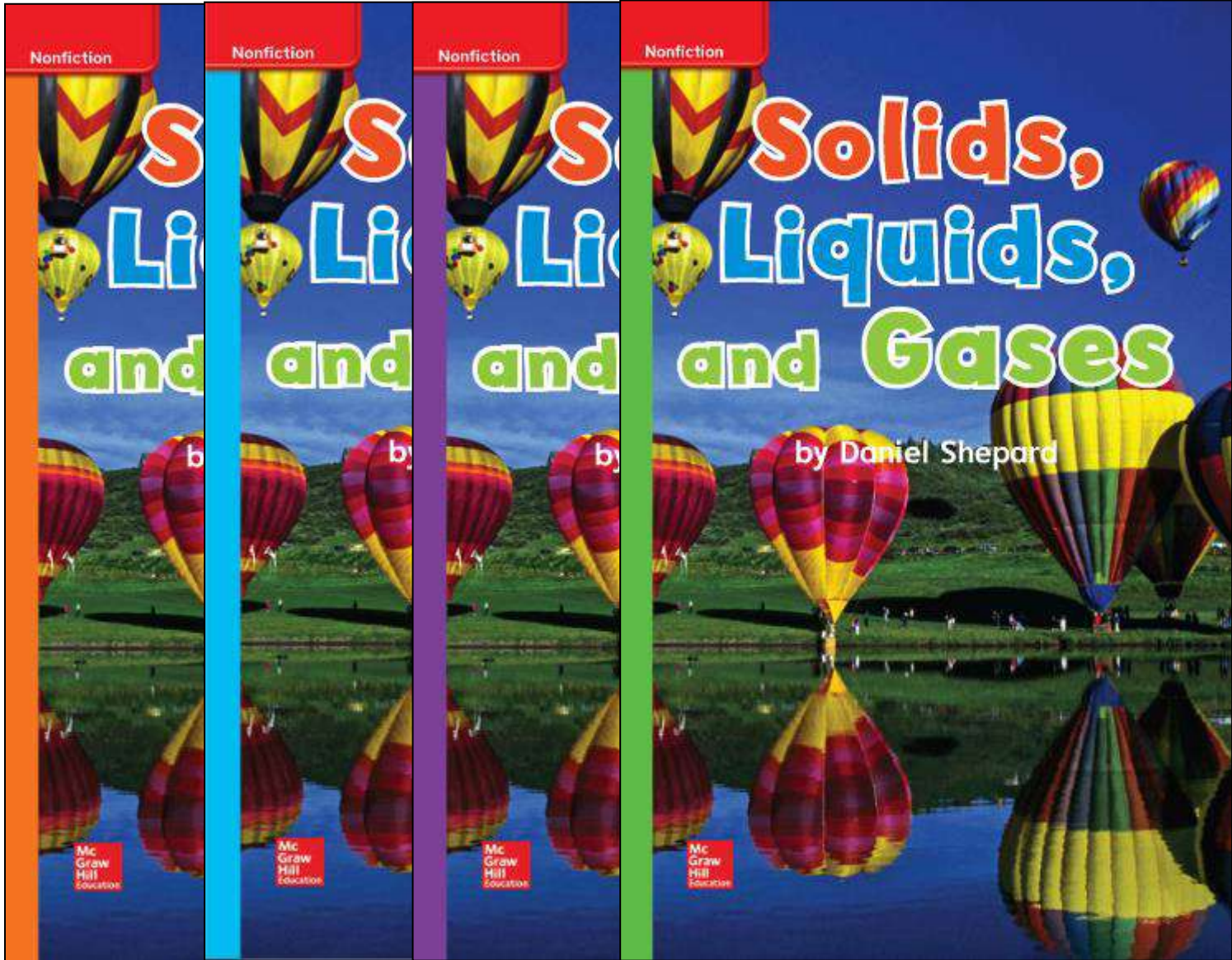


Air inside a balloon



Nail

Explain your thinking.



Carry out an Investigation

Oobleck

Make a material called oobleck and perform actions on it to determine if it's a solid.



Conceptual Shifts

**Science and
engineering are
integrated**





Inquiry Activity

Oobleck

Is this substance a solid?

Make a Prediction Do you think oobleck is a solid?

Materials

- ☐ bowl
- ☐ water
- ☐ cornstarch
- ☐ spoon

Carry Out an Investigation

- 1 Start with some water in the bowl.
- 2 Add the cornstarch slowly, a little bit at a time.
- 3 Stir the mixture well until it becomes gooey.
- 4 **Record Data** Record your results in the table. Then, perform your own actions and record the results.



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Action	Result
Squeeze it.	
Make a puddle and quickly drag your fingers through it.	
Roll it into a ball.	
Scoop it with your hand.	

Communicate Information

1. How is oobleck like a solid?

2. What properties of oobleck make it hard to classify?

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Talk About It



Disciplinary Core Ideas (Content)	Science and Engineering Practices (Skills)	Crosscutting Concepts (Themes)

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• Physical Science • Life Science • Earth and Space Science • Engineering, Technology, and Applications of Science		

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Conceptual Shifts

**Prepare students for
college, career, and
citizenship**



Aerospace Engineer

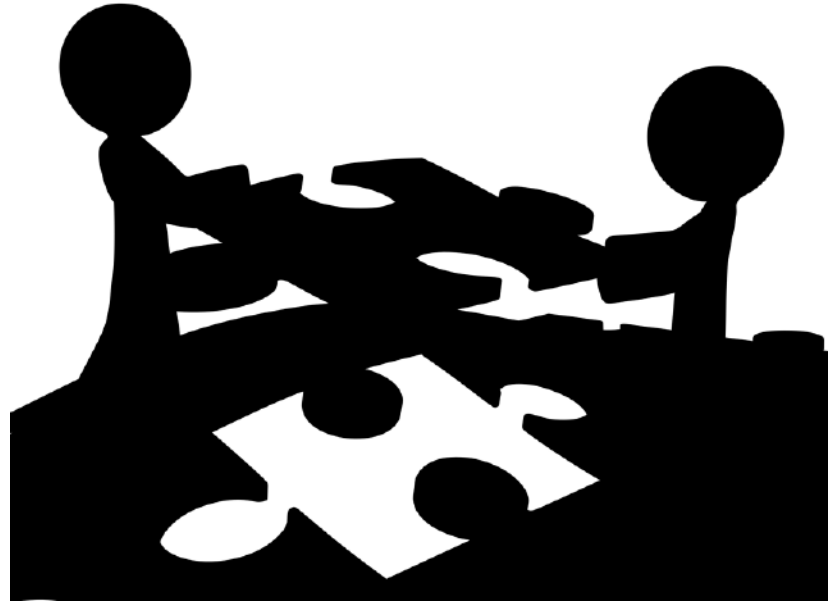
An aerospace engineer is a person who designs and builds machines that fly. Since airplanes and spacecraft are made of different solids they need to know about their properties. Like an aerospace engineer, you will investigate solids and their properties.

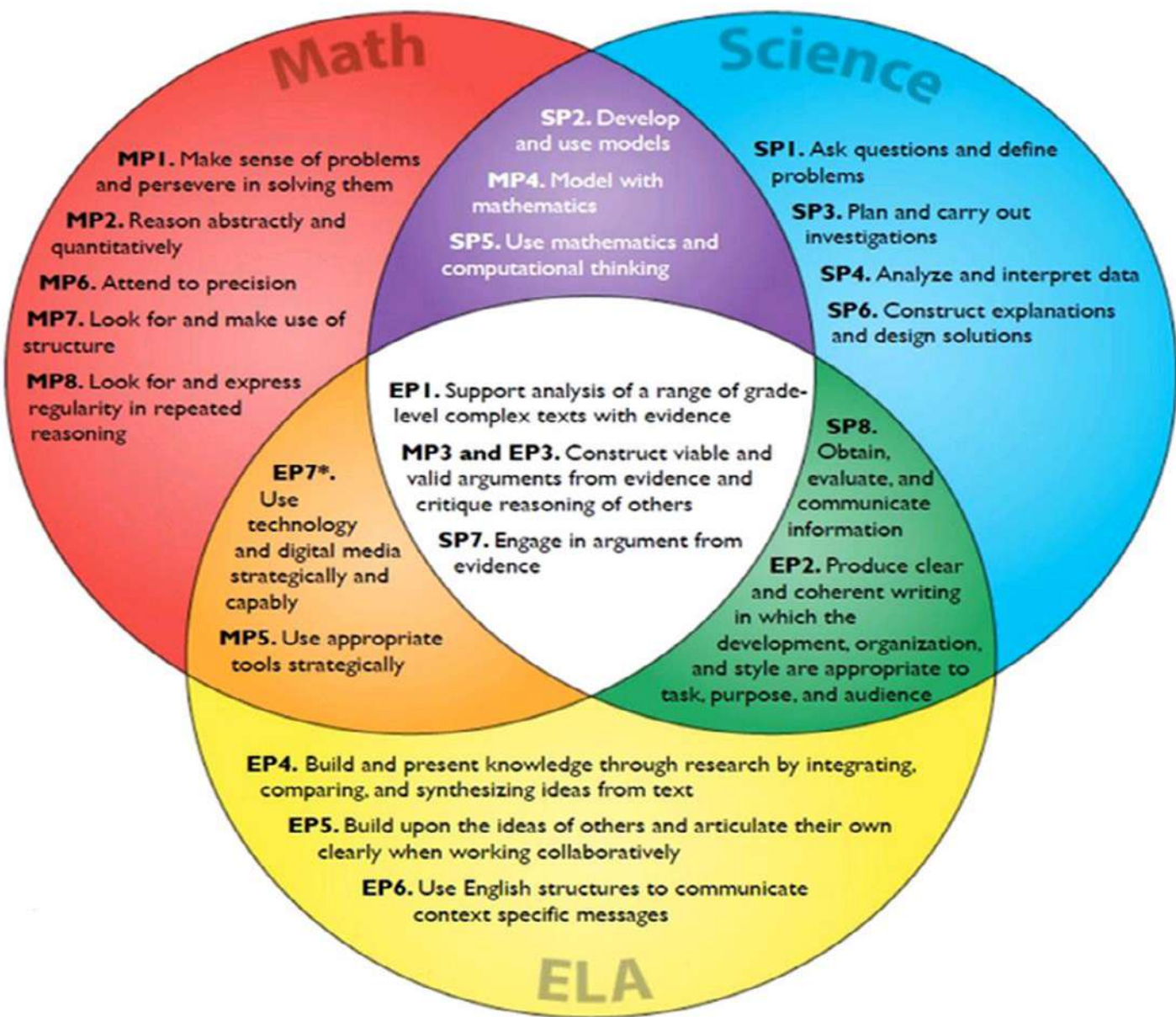


EMILY
Aerospace Engineer

Conceptual Shifts

**Aligned to the
Common Core
State Standards
(CCSS)**





PROPERTIES OF MATTER

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Performance Expectations

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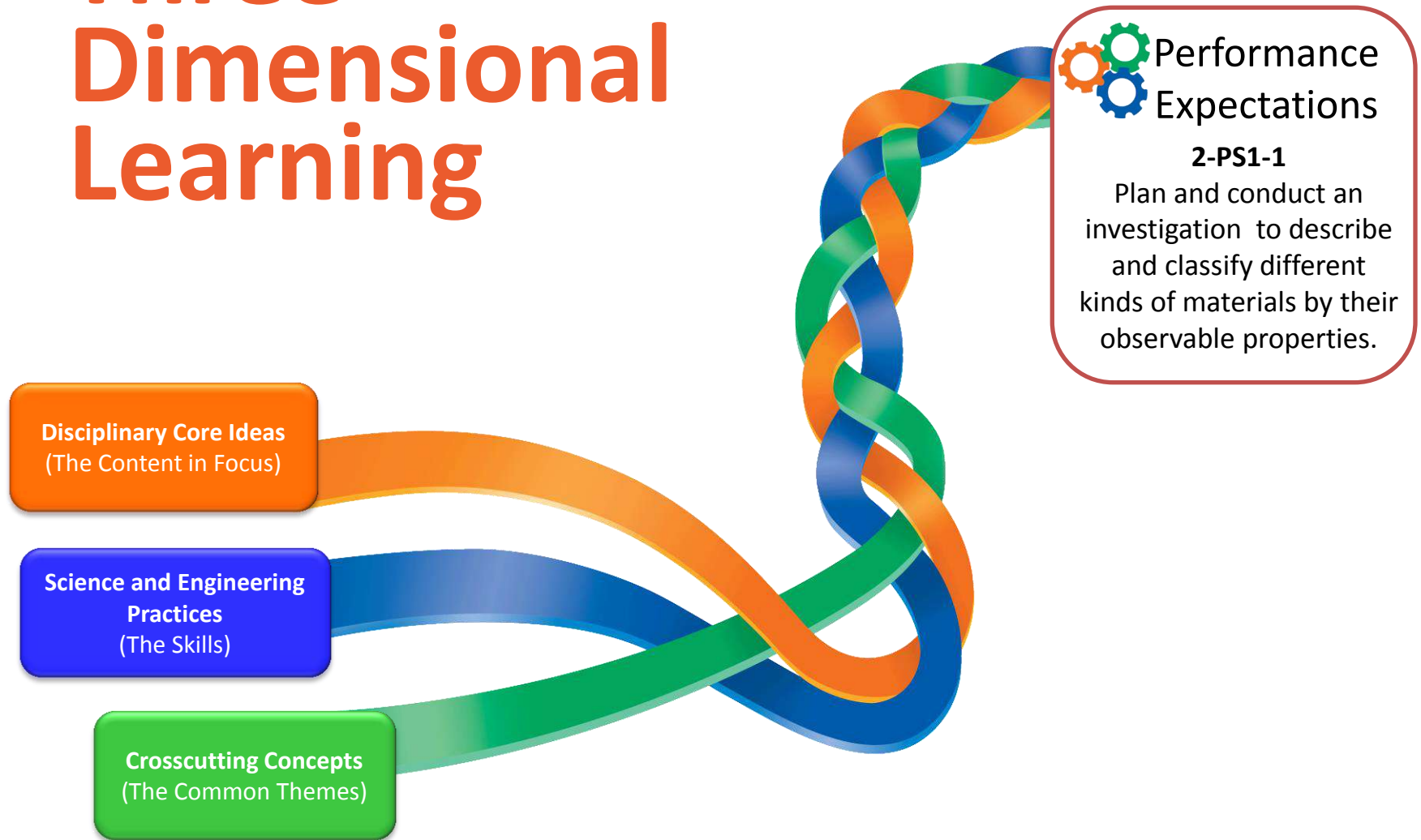
Conceptual Shifts in the Next Generation Science Standards

- 1-Reflect the interconnected nature of science
- 2-Provide student performance expectations
- 3-Concepts build coherently from K-12
- 4-Focus on deeper understanding of content as well as application
- 5-Science and engineering are integrated
- 6-Prepare students for college, career, and citizenship
- 7-Aligned to the Common Core State Standards (CCSS)

Reflection Questions

- Which conceptual shifts will have the biggest impact on classroom instruction?
- How can I get my students thinking about science and STEM careers while incorporating NGSS into instruction?
- What does assessment look like in the NGSS classroom?

Three Dimensional Learning



2-PS1-1

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