Examining the Next Generation Science Standards

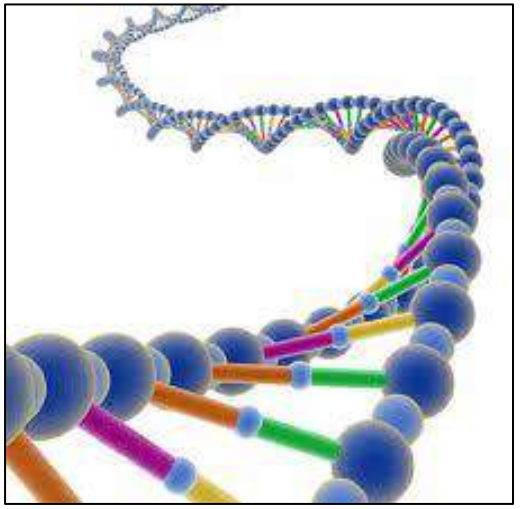
Elementary

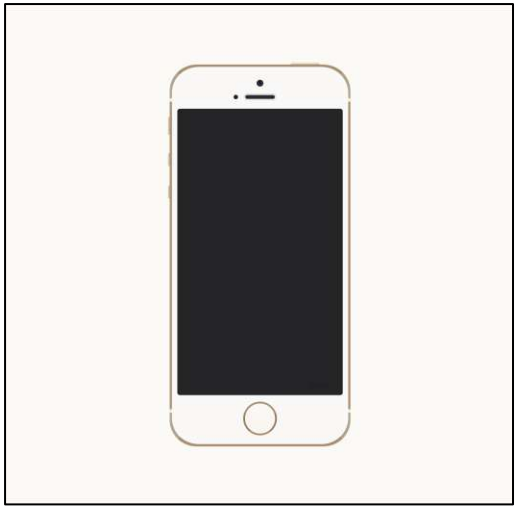
Mc Graw Hill Education

Our Changing World

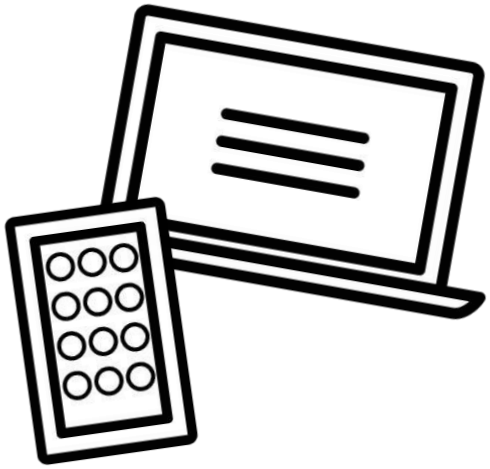
Think about how the world has changed in the past 15 years.

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

Careers in S

earn an av of

65%

Of grad

students w

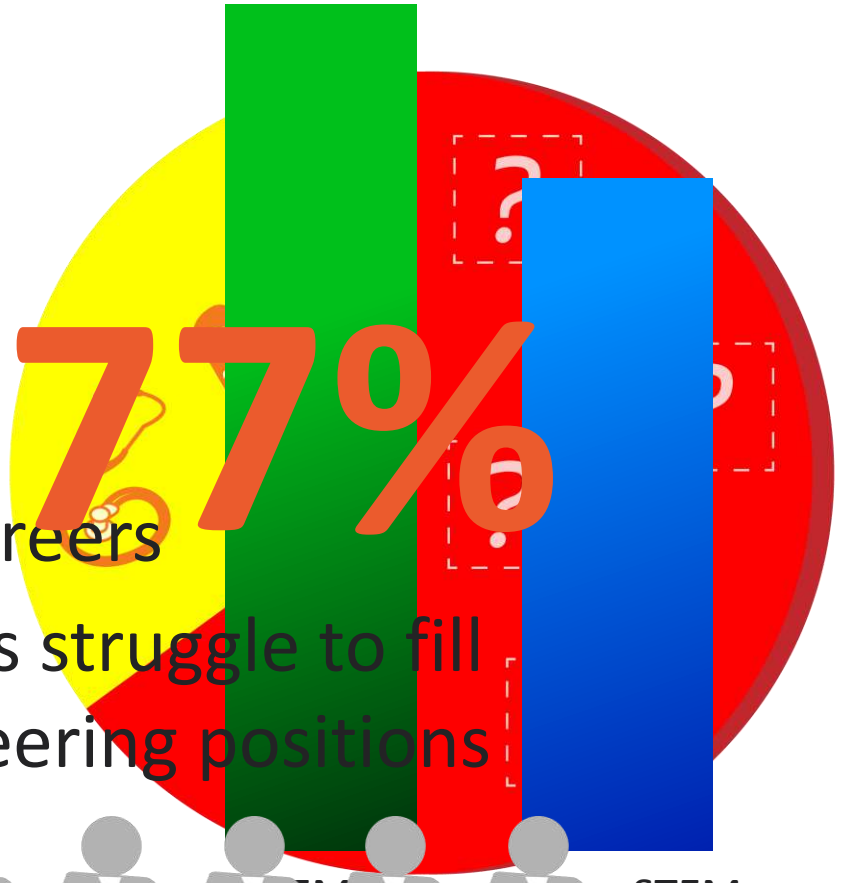
more tha TEM careers

career not yet invented

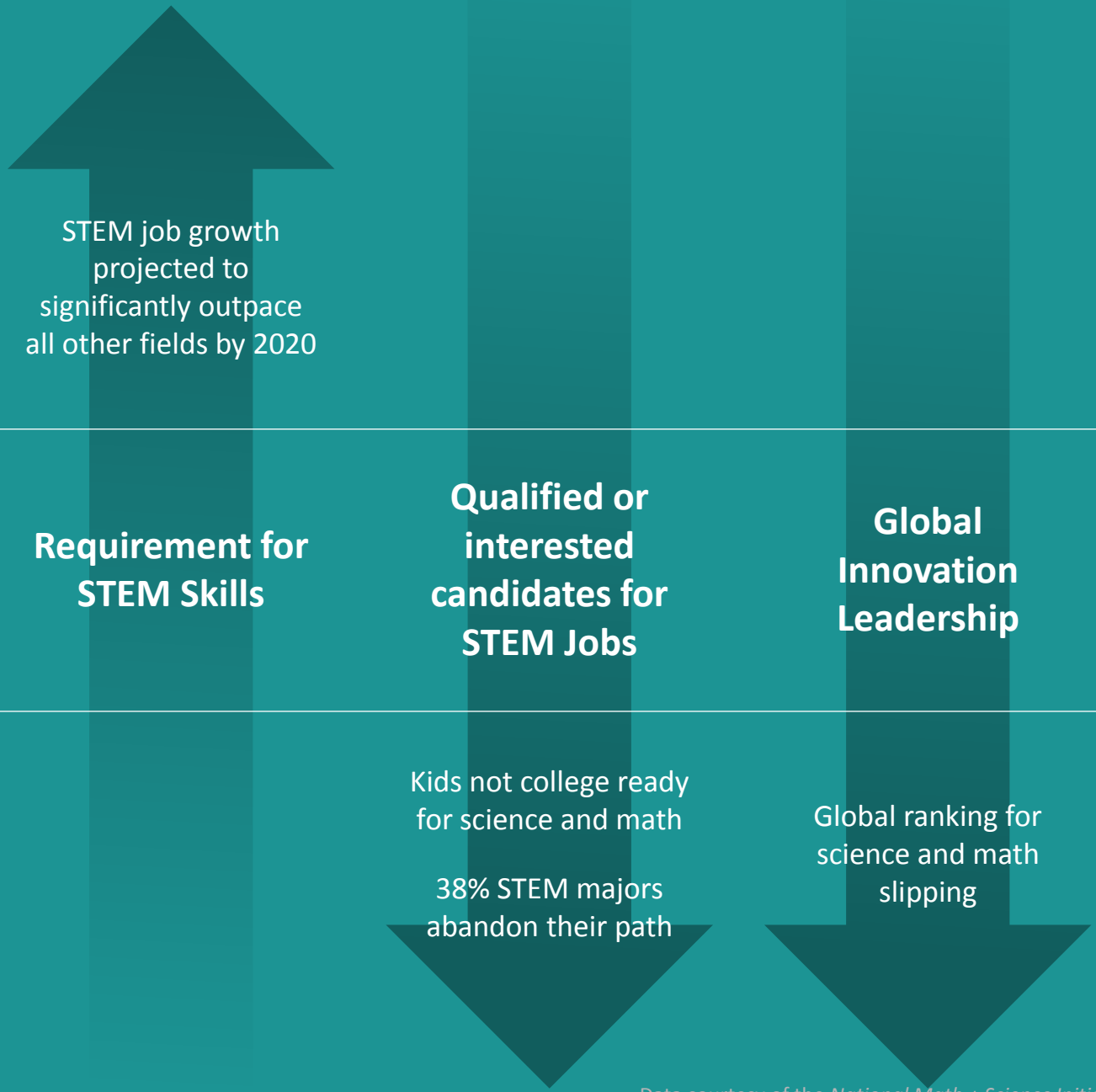
26%

77%

Of hiring managers struggle to fill science and engineering positions



THE STEM CRISIS

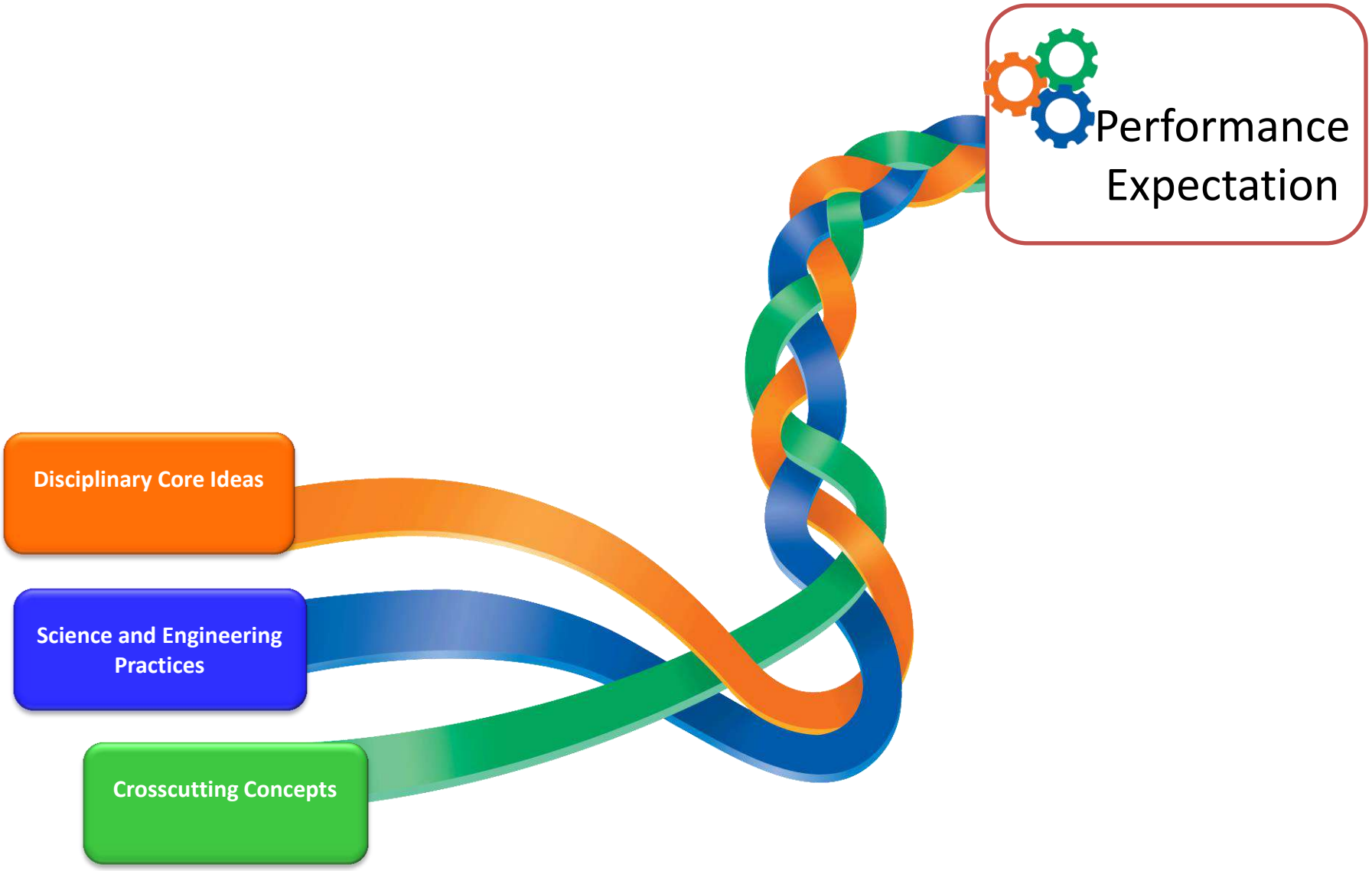


Data courtesy of the *National Math + Science Initiative*. 2013.

Conceptual Shifts in the Next Generation Science Standards

Conceptual Shifts

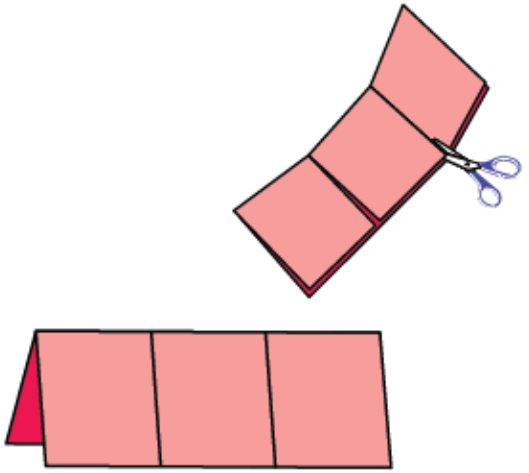
Reflect the interconnected nature of science



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.

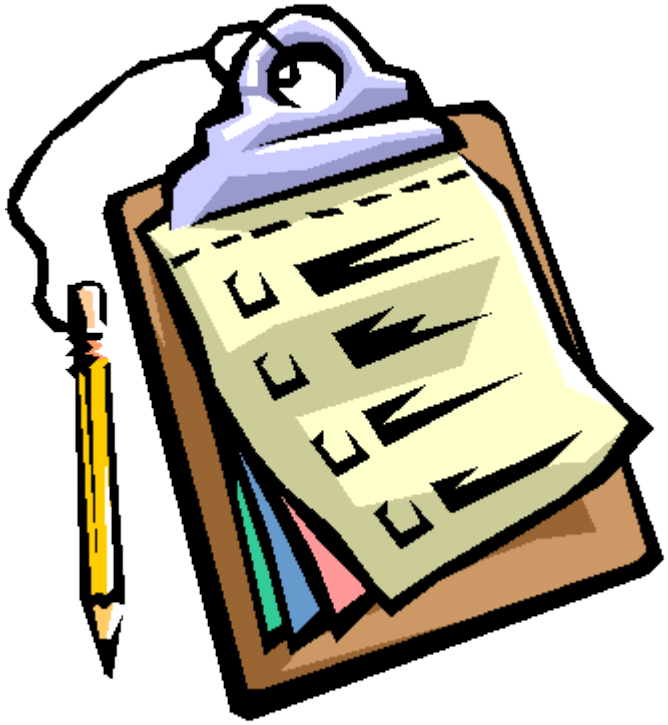


Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts
(Content)	(Skills)	(Themes)

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

Conceptual Shifts

Student performance expectations



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

MP.2 Reason abstractly and quantitatively.

MP.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	*Students who demonstrate understanding can:* **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

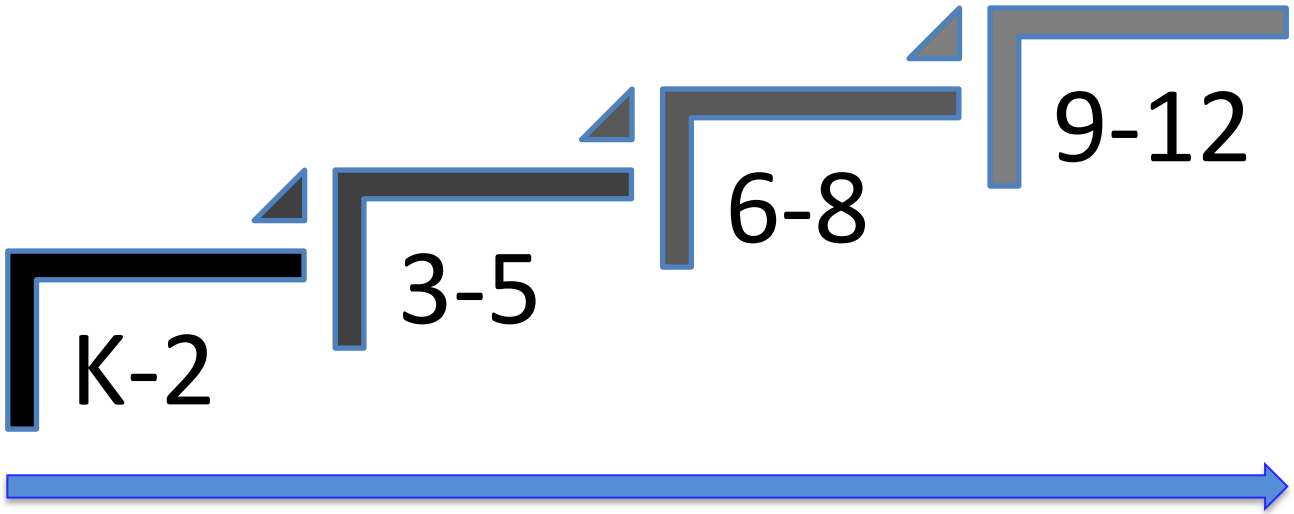
2-PS1-1
Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

FRONT

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

Conceptual Shifts

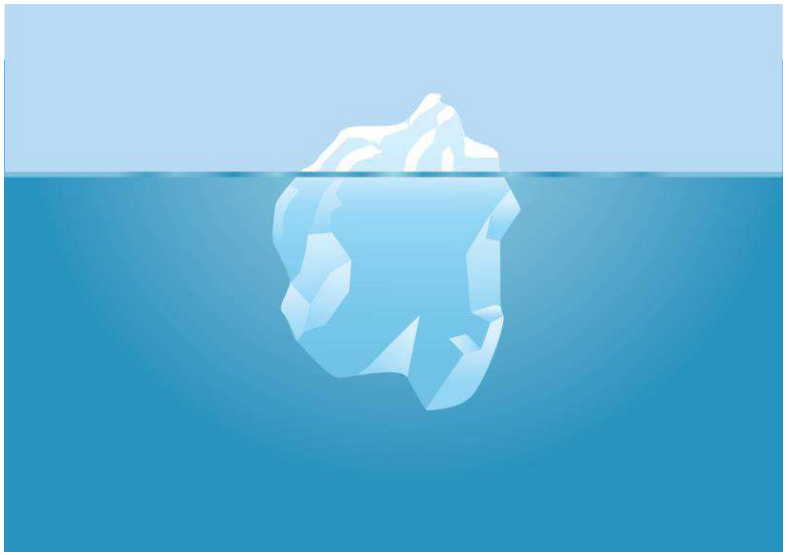
Science concepts build coherently from K-12



	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?

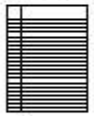
Name _____ Date _____

Solids

PAGE KEELEY SCIENCE PROBES

Is It a Solid?

Circle the things that are solids.

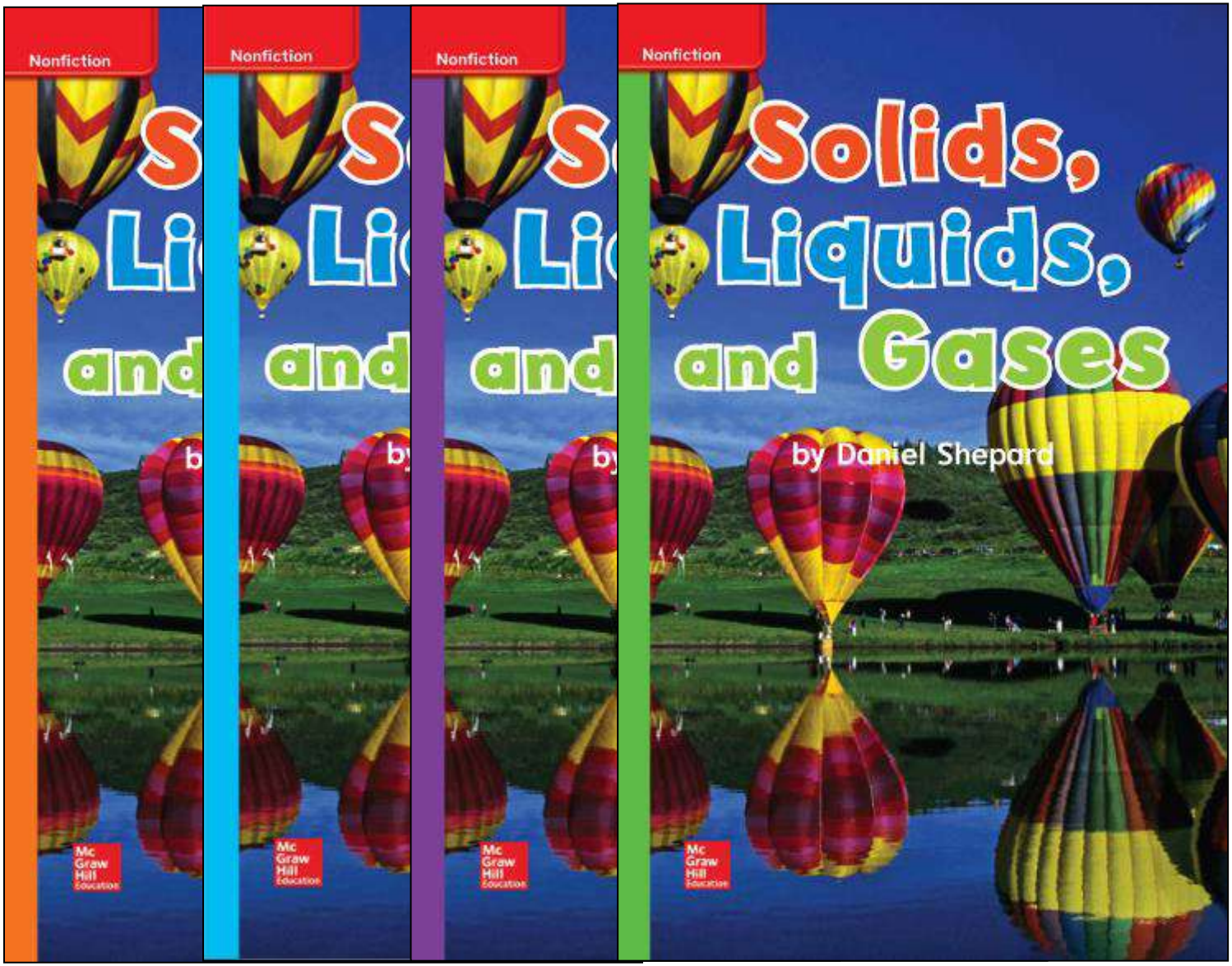
 Rock	 Water	 Rubber
 Feather	 Ice	 Wool hat
 Paper	 Juice	 Sand
 Cotton ball	 Air inside a balloon	 Nail

Explain your thinking.

_____

_____

_____


Nonfiction
Solids,
Liquids,
and Gases
by Daniel Shepard
Mc Graw Hill Education

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

EXPLORE Name _____ Date _____

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.

Name _____ Date _____ EXPLORE

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?

_____

_____

Talk About It

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

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Conceptual Shifts

Prepare students for college, career, and citizenship

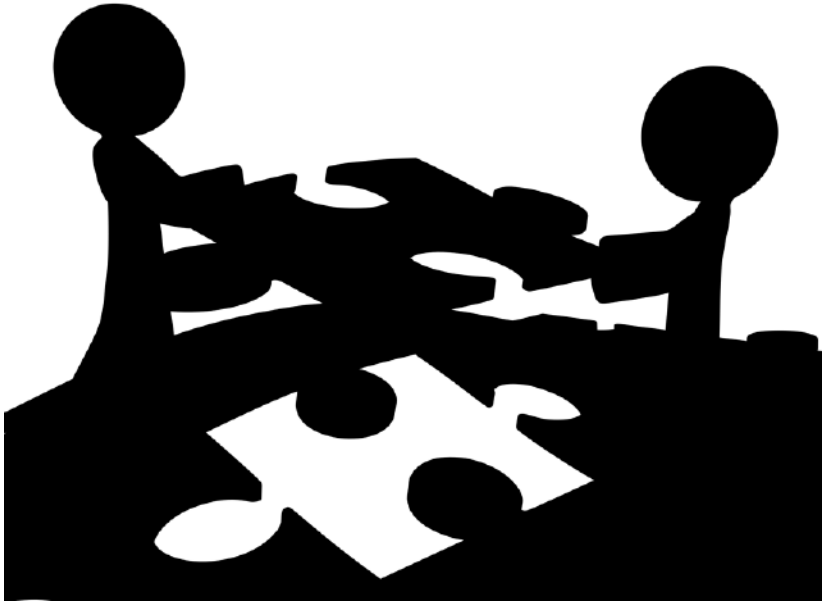
Aerospace Engineer

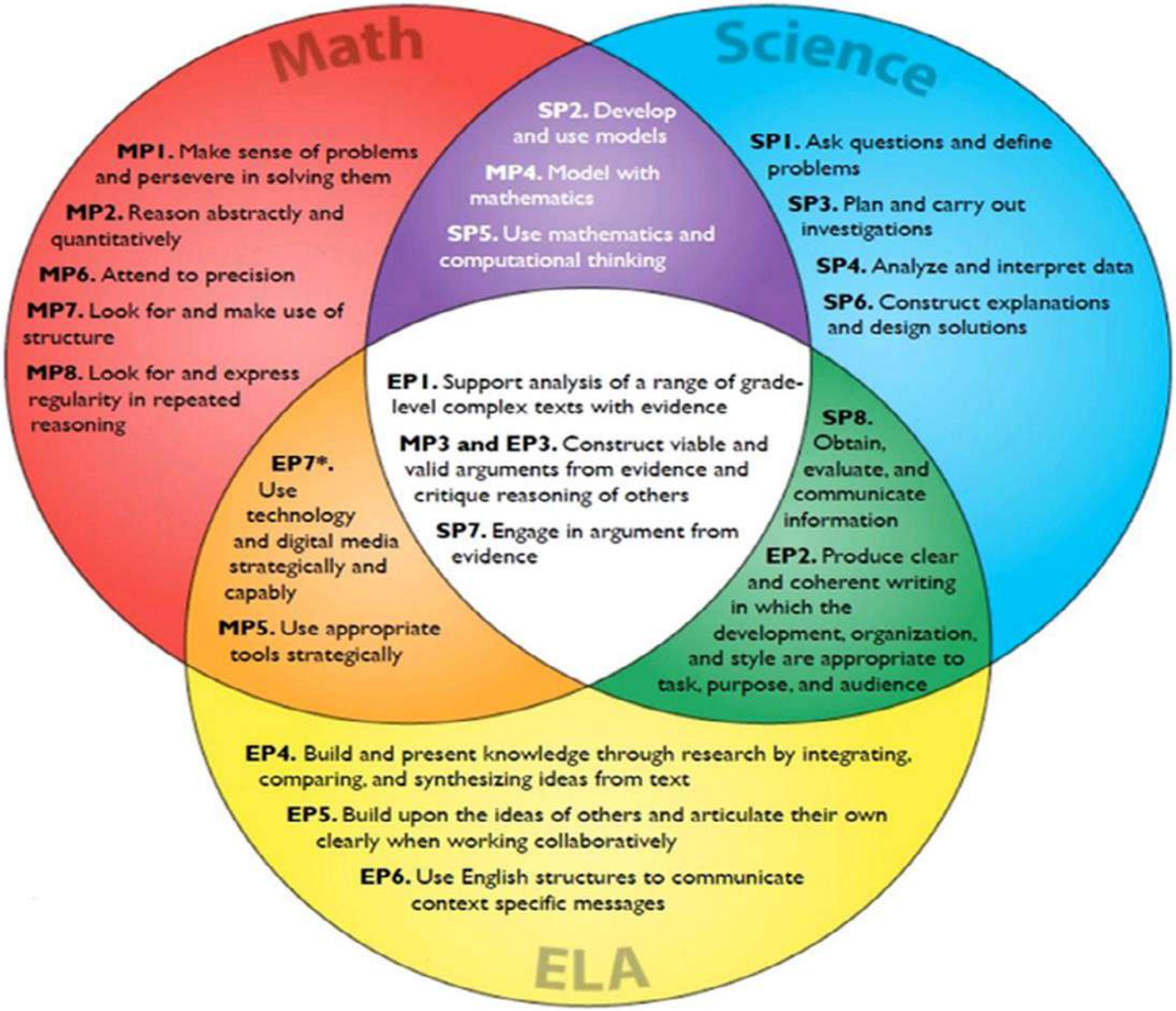
An aerospace engineer is a person who designs and builds machines that fly. Since airplanes and spacecraft are made of different solids they need to know about their properties. Like an aerospace engineer, you will investigate solids and their properties.

EMILY
Aerospace Engineer

Conceptual Shifts

Aligned to the Common Core State Standards (CCSS)





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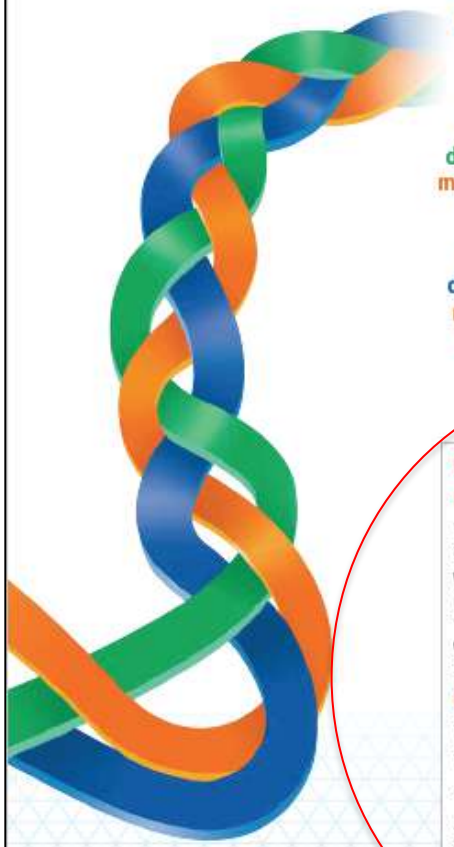

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Conceptual Shifts in the Next Generation Science Standards

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

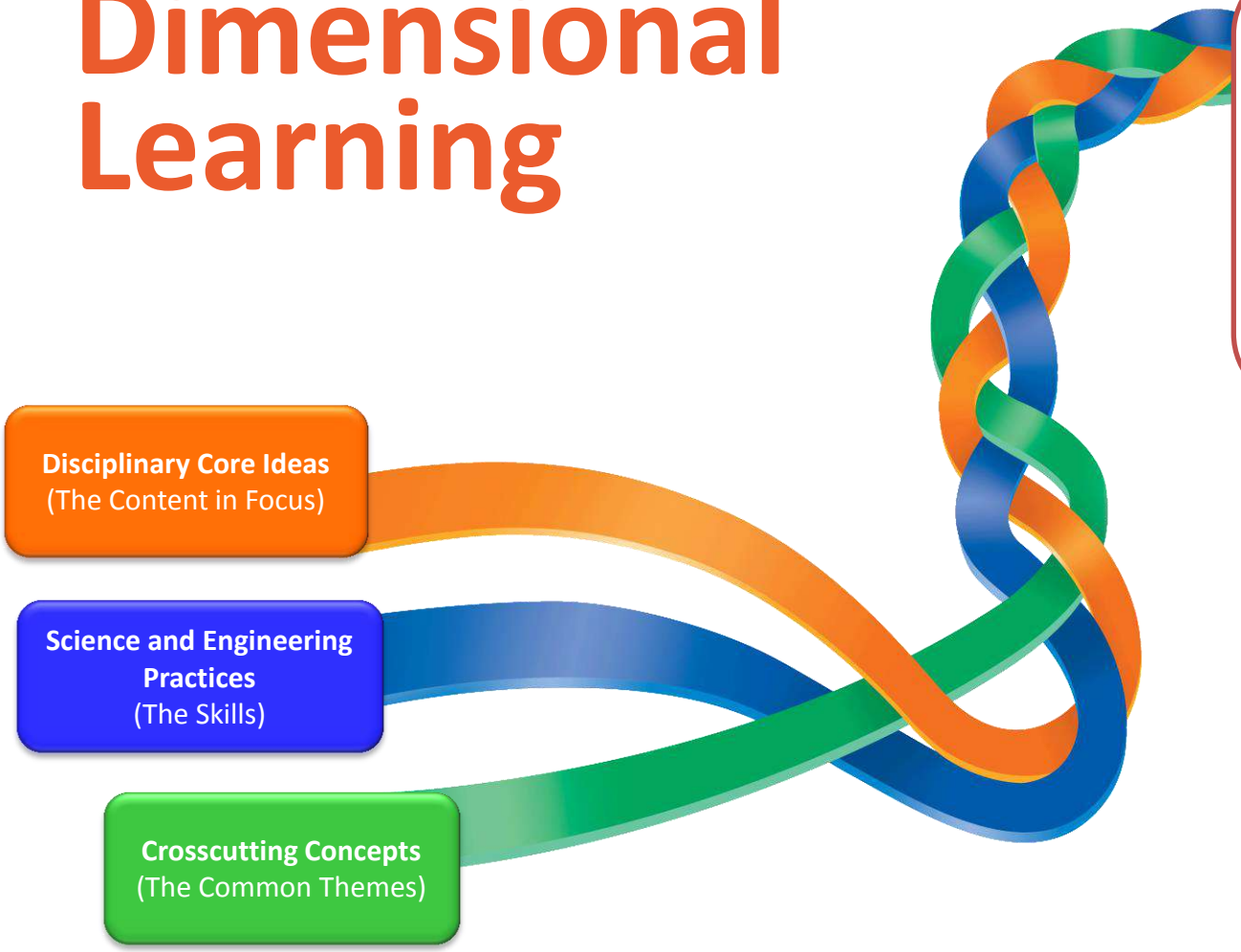
6-Prepare students for college, career, and citizenship

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



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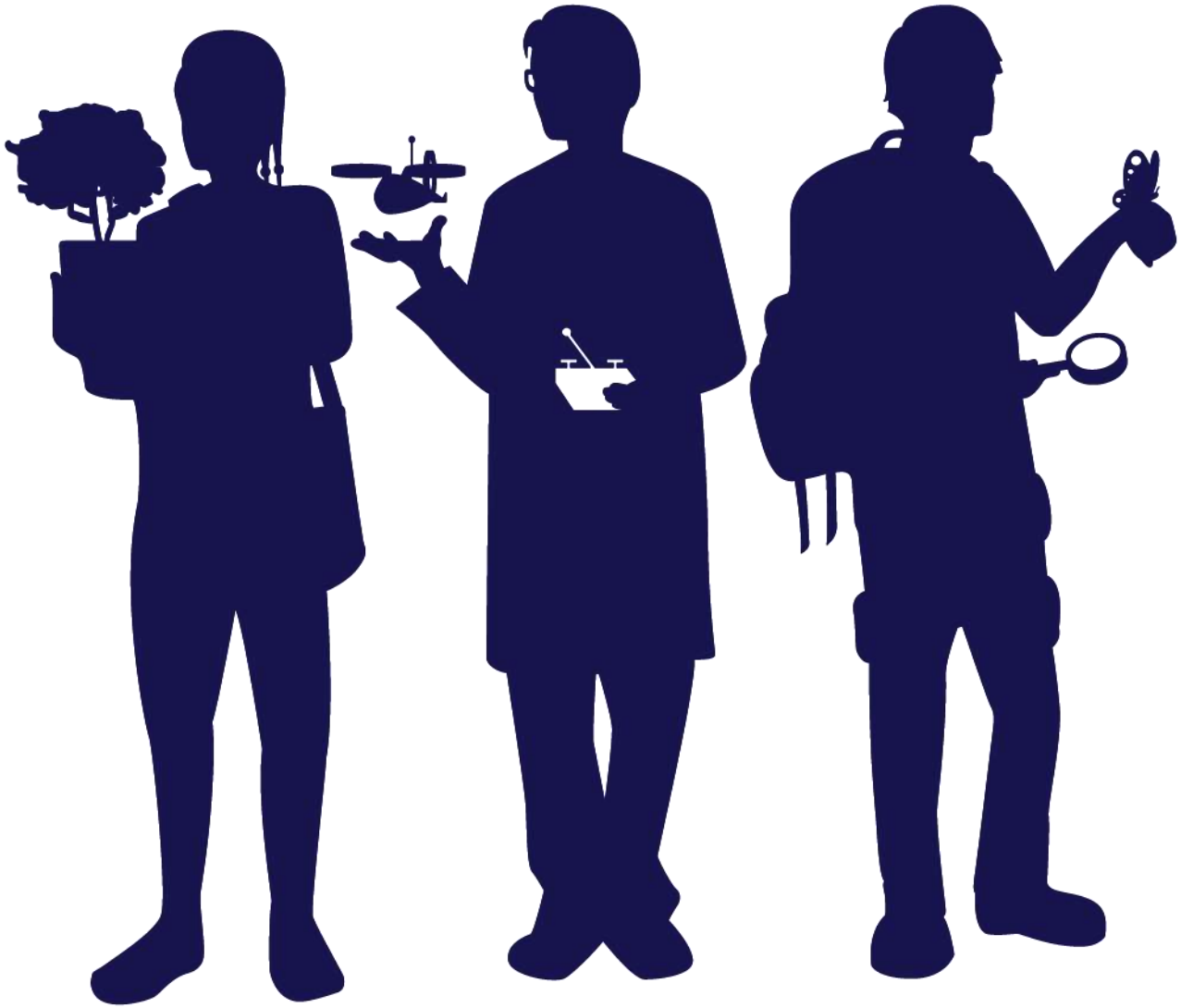


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