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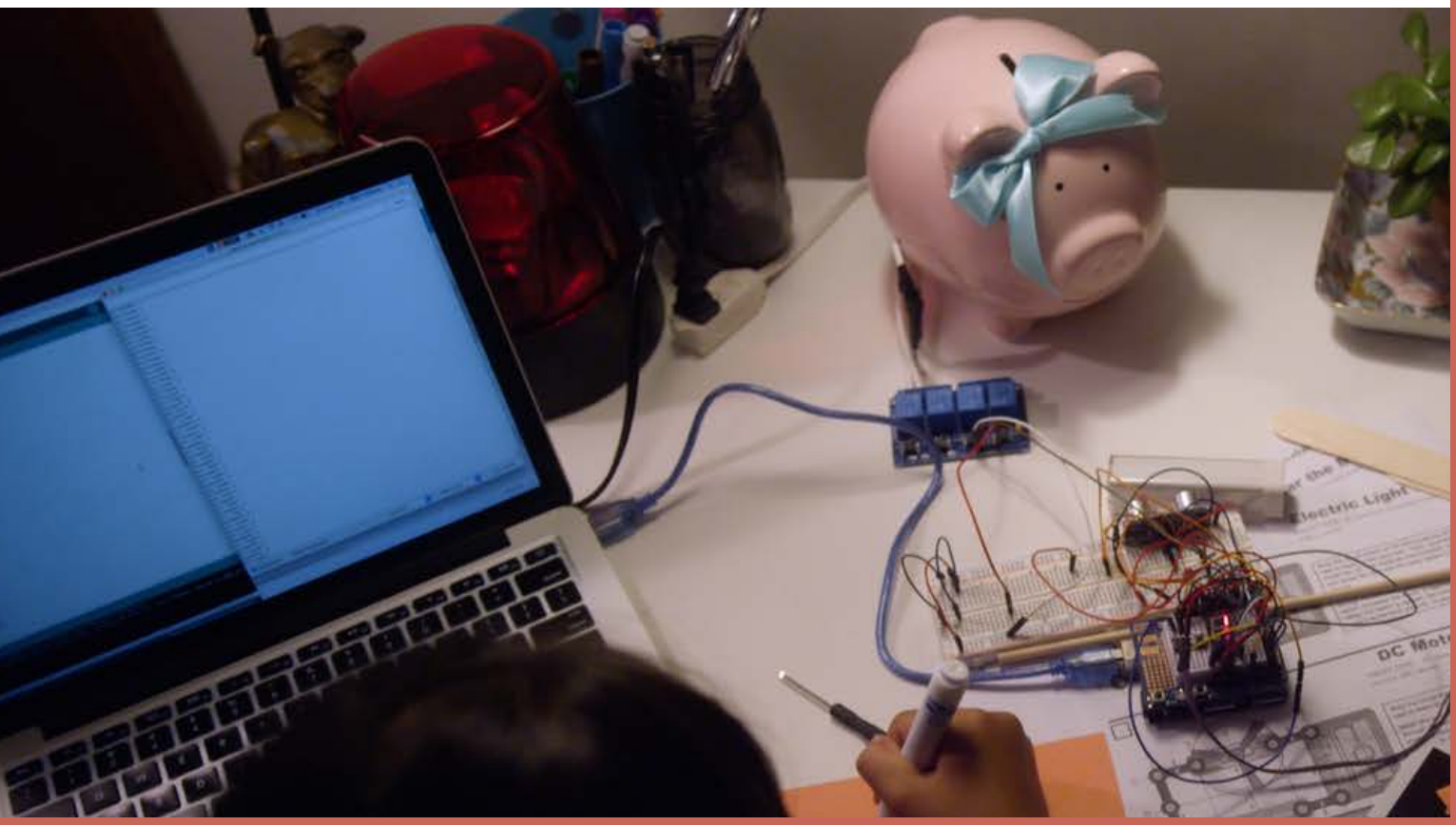
INDIANA UPLANDS | PROUD PARTNER

Grade K-2 STEM Challenge

Keep It Safe!

Inspired by cybersecurity careers in the Indiana Uplands.



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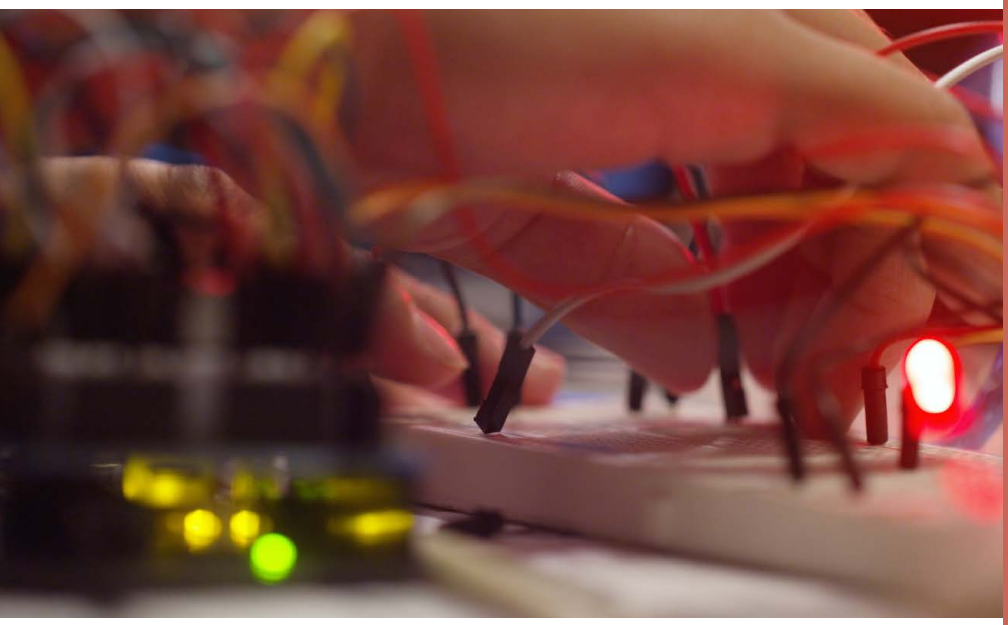
GRADE K-2 STEM CHALLENGE

Keep It Safe

Inspired by cybersecurity careers in the Indiana Uplands.

Students will design a way to decode and encode messages and learn about how cybersecurity keeps information safe.



CAREER CONNECTION AND LESSON OVERVIEW

Barry is an information assurance analyst for TriStar Engineering, a defense contractor in southern Indiana. Barry's job to keep important or sensitive data out of the wrong hands and protect computer networks and systems. His role at TriStar is especially important because the information he protects belongs to the United States military. He designs systems to allow data to be accurate, safe, but also accessible for the intended users.

Information security and cybersecurity professionals like Barry work to protect many different kinds of data, including banking information, health records, and people's personal information. In this activity, students will learn ways to protect both information and physical items from being accessed without permission.

LESSON TIMELINE

DAY 1 60 Minutes

- Show the inspiration video, "Protecting My Piggy Bank
- Introduce the idea of security for both information and physical objects
- Decode picture codes
- Encode secret words (optional)

DAY 2 60 Minutes

- Revisit physical security systems
- Students create and prototype a model physical security system

DAY 3 50 Minutes

- Students share prototypes and present

Recommended Supplies

Per group of 3-4 students:

- Picture code sheets
- Planning sheet
- Blank paper
- Box of crayons
- Variety of building and craft supplies, including:
  - Cardboard
  - Craft sticks
  - Rubber bands (variety of sizes)
  - Plastic spoons
  - Straws
  - Chenille sticks
  - Yarn
  - Other household objects

IN THIS CHALLENGE, STUDENTS WILL:

- Learn about how objects and information are kept private.
- Decode a picture code to reveal a secret word and encode their own secret words.
- Create a model security system to protect a toy.

Standards

Science & Engineering Process Standards
SEPS.1 Posing Questions (for science) and defining problems (for engineering)
SEPS.2 Developing and using models and tools
SEPS.6 Constructing explanations (for science) and designing solutions (for engineering)
SEPS.8 Obtaining, evaluating, and communicating information

Engineering Standards
K-2.E.2 Develop a simple sketch, drawing, or physical model to illustrate and investigate how the shape of an object helps it function as needed to solve an identified problem.

Computer Science Standards
K-2.IC.2 Identify positive and negative social and ethical behaviors for using technology.

English/Language Arts
K.SL.2.3 Listen to others, take turns speaking, and add one's own ideas to small group discussions or tasks.
K.SL.3.1 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

1.SL.1.3 Listen to others, take turns speaking about the topic, and add one's own ideas to small group discussions or tasks.
1.SL.3.1 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

2.SL.2.30 Listen to others, take one's turn in respectful ways, and speak one at a time about the topics and text under discussion.
2.SL.3.1 Determine the purpose for listening (e.g., to obtain information, to enjoy humor) and paraphrase or describe key ideas or details from a text read aloud or information presented orally or through other media.

Planning and Implementation

KEEP IT SAFE!

Essential Vocabulary

- BREACH: break in security.
- SECURITY: to protect from danger or keep safe from being accessed without permission.
- CYBERSECURITY: measures taken to protect a computer or computer system (as on the Internet) from unauthorized access or attack.
- PROTOTYPE: a first model of something from which other models are developed or copied.

In this challenge, students will:

- Watch "Protecting My Piggy Bank"
- Learn about how objects and information are kept private.
- Decode a picture code to reveal a secret word and encode their own secret words.
- Create a model security system to protect a toy.

Day 1

Introduction (15 minutes)

Begin the conversation about security and protecting information by building personal relevance. Ask students:

> *"Have you ever had a secret you wanted to keep safe? A surprise gift for someone you didn't want spoiled? A toy you didn't want someone else to play with? Every day, lots of people have information or things they want to keep people from seeing. Cybersecurity experts work to make sure that people's secret information stays safe and can't be read without permission. One way to keep information safe is to put it in code or come up with symbols or rules for how to find a secret word or message."*

Show the "Protecting My Piggy Bank" video found at https://regionalopportunityinc.org/protect/. Discuss that security systems can be designed to protect physical things, like a piggy bank as well as ideas, like information or numbers. If need be, talk about what it means to keep something "private."

Keeping Information Private (45 minutes)

Part 1: Decoding Information

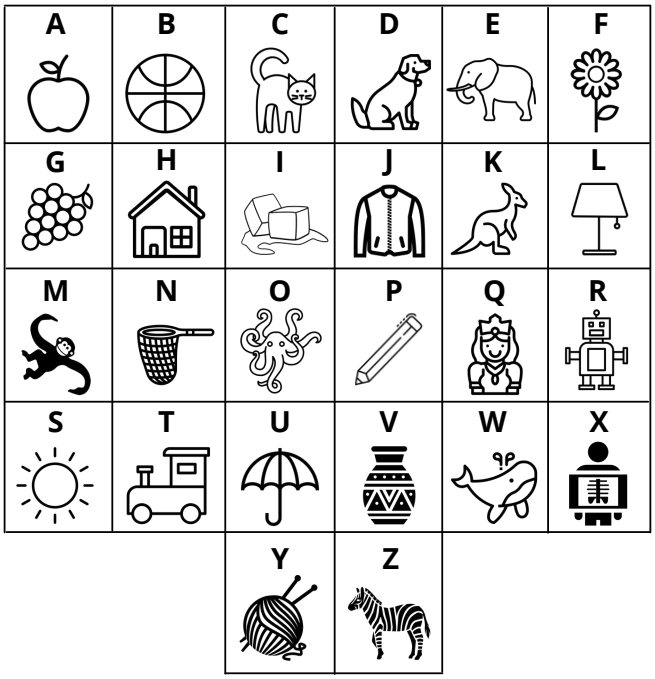
Cut out the Picture Code word sheets (pg S4-S6). Place students in groups of two and give each group a word to decode. Explain to students that a secret word has been encoded using pictures. For this code, the beginning sound of each picture is the letter it represents.

Give students 10 minutes to decode their word. If students have trouble, provide them with the Picture Code Key (pg S7).

Invite groups to share their word with the class and how they decoded their word. Once the words have been reported out, prompt students to discuss reasons someone would want to keep these things safe from others.

Modifications for very young students:

For early readers, working through a single word, projected onto a screen or smart board, or supporting them in reading the word they have decoded on their own may be the best approach.



Part 2: Encoding Information (optional extension)

Once student teams have decoded their words, challenge them to use the picture code to encode a new word of their choice. Ask each group to choose a different word (shorter is better – 6 letters or fewer) and encode it using the provided code. Provide students with the Picture Code Key and paper and crayons to draw the code pictures themselves. Alternately, the Picture Code Key can be copied onto heavy paper and cut out and provided to students as a set of cards. Once students have encoded their word, have them trade words with another group and try to crack each other's codes.

Day 2

Keeping Things Safe (60 minutes)

In Protecting My Piggy Bank, the girl designed a way to keep her brother out of her bank by creating an elaborate system of lights and sirens. Challenge students to think about a special object that they would want to keep safe and to prototype a way to do just that, like the girl in the video. The item will be placed in a box and they must design a strategy to protect it.

Introduce the Engineering Design Process (EDP).

- Use the graphic (also included at the end of this plan, pg S8) to illustrate the EDP for the students.
- Explain that you will be using the EDP to design a security system to keep their object safe.
- Introduce students to the materials they will have available to work with.

Explain that groups will have time on their own to come up with some ideas to protect the item within the box. They will work with their group to share ideas and build a model of their proposed security system.

Prompt students to think about how they could keep someone from either using the item or opening the box.

- What kind of barriers could they add?
- What could they include in their prototype?

Allow students time individually to complete the IMAGINE section of their handout by drawing and describing two security ideas. Once complete, assign students a partner to share their ideas and decide what they will build. Remind students that engineers usually try many ideas before coming to a decision on how to design a final product. Pieces of each person's design might come together to make the best solution. Listening to your partners is important! Have groups construct their security system.

Day 3

Share Student Prototypes (50 minutes)

Once students have completed their models, ask them to share out what they built and why.

- What are the components of their systems? Are there lights? Locks?
- How do the parts work? Is there more than one line of defense?
- What are the strengths of their system? The weaknesses?

After each group has had a chance to share, ask students reflect on how they might improve their design in the future.

- Students will record these ideas in the IMPROVE section of the Engineering Design Process handout.

Wrap up the discussion by drawing connections between their codes and security designs and how cybersecurity experts keep information safe. Remind students that they designed ways to keep important physical objects safe just like cybersecurity specialists use computers and computer systems to design ways to keep important information safe. The COMMUNICATE section included in the student handout is a good place for students to record these ideas. This reflection can be completed as a class or individually depending on grade level and abilities of the students.

Career Exploration and Extension

Prompt students to think about and research what a career as a cybersecurity specialist might entail.

- What does someone in this career field do all day?
- What kind of training would a student need to have a job protecting information?

Name: _____

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Engineering Design Process Sheet

ASK

What is the problem we are going to solve?

How can we design a security system to keep a toy safe?

IMAGINE

Brainstorm solutions to the problem above.
Record your ideas in words or pictures.

Name: _____

PLAN Create a drawing of the prototype you will build. What materials will you use?	CREATE You will have _____minutes. Use this time to build the prototype you planned.

IMPROVE

Edit the prototype that your group made.

What did you about your design?

Why did you change it?

Name: _____

COMMUNICATE

Share your prototype with the class or another group.

What went well during this STEM challenge?

What part of this STEM challenge was difficult?

I learned ---

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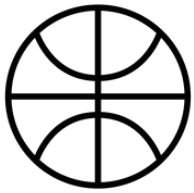
Picture Codes - 1

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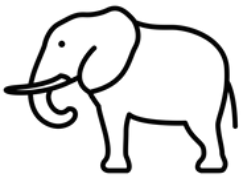

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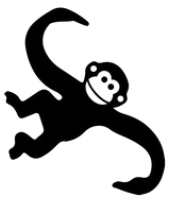
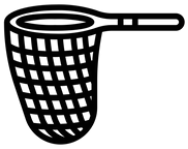
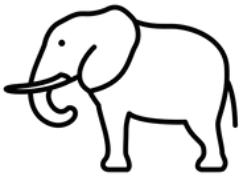
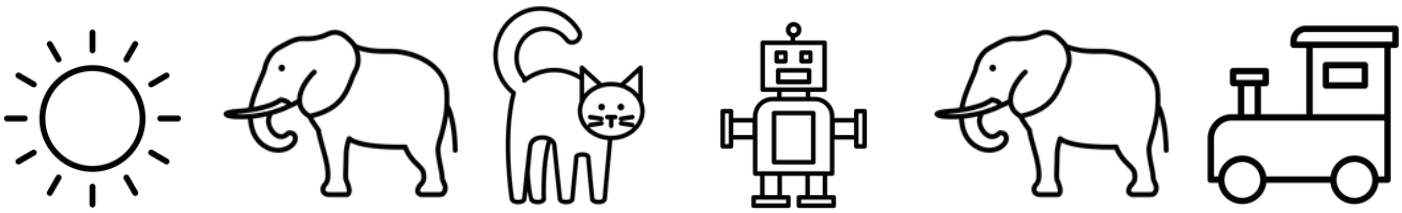


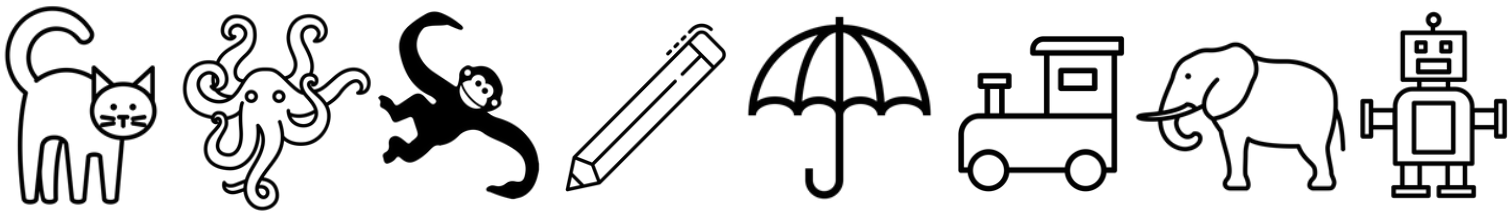



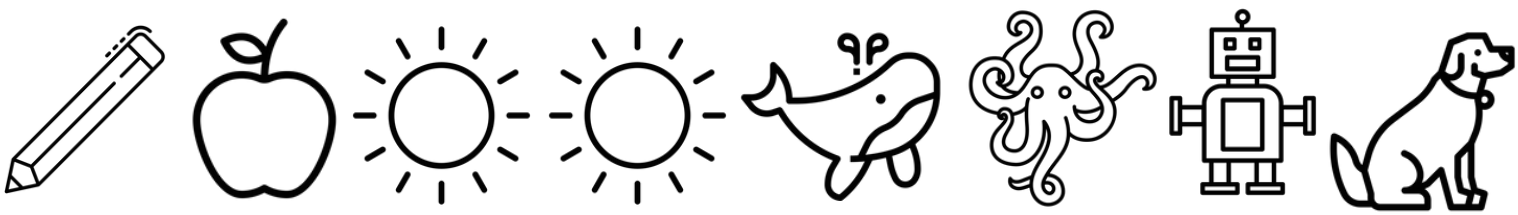

_____ _____ _____ _____ _____

Keep It Safe!

Picture Codes - 2







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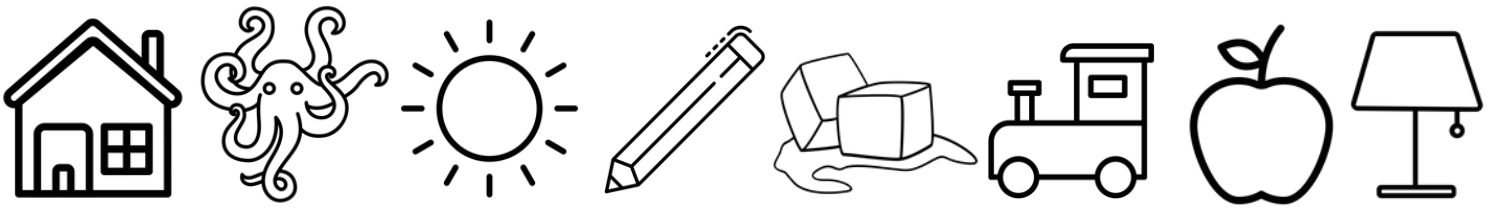
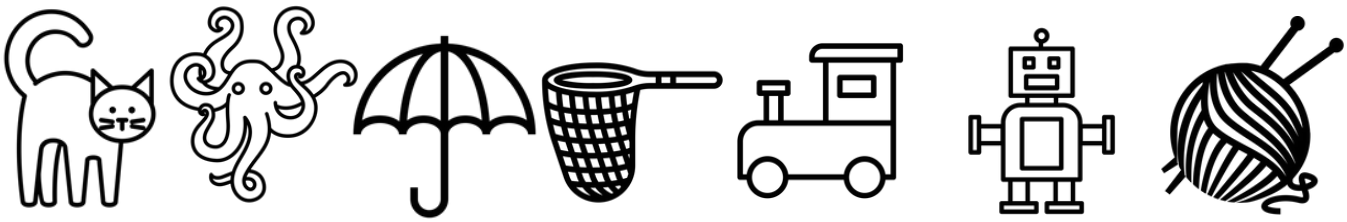
Picture Codes - 2





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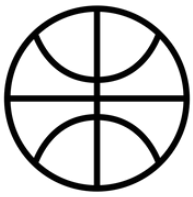
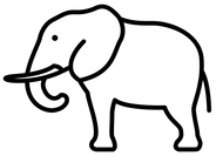
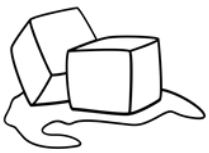
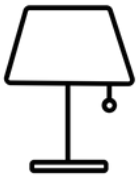
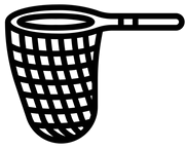
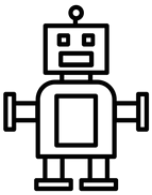
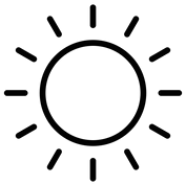
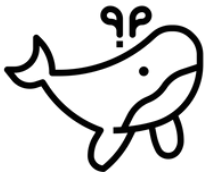
Picture Code Key

A 	B 	C 	D 	E 	F 
G 	H 	I 	J 	K 	L 
M 	N 	O 	P 	Q 	R 
S 	T 	U 	V 	W 	X 
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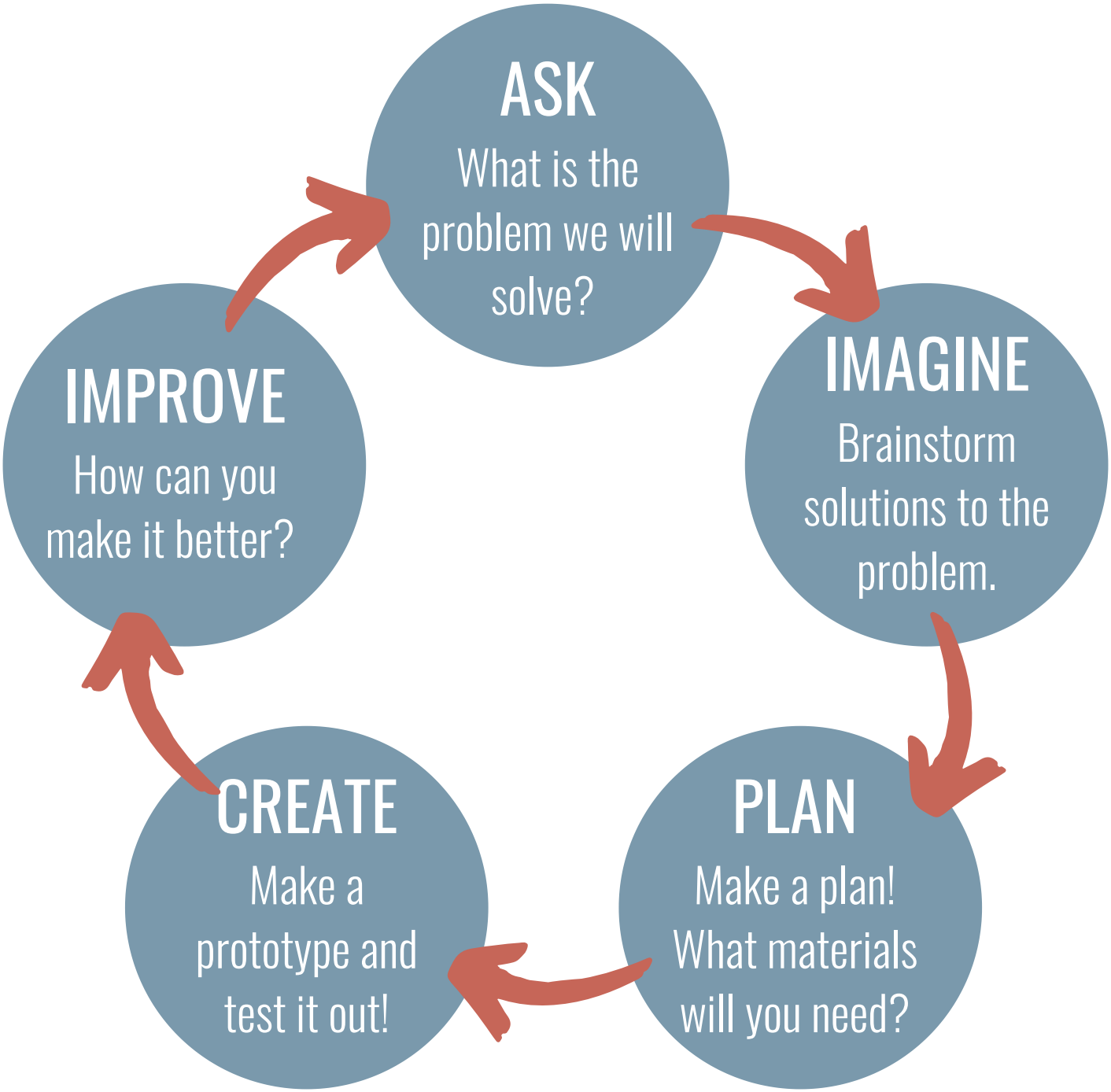
Engineering Design Process



ACKNOWLEDGEMENTS

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ROI would like to thank the following members of our Educator Advisory Group for their gracious support and review of this curriculum:

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IMAGE AND CONTENT CREDITS

Images

Stock photography and icons courtesy of Canva.com
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Black and white icon assets courtesy of The Noun Project, including:

- sun by fausan mayeh
- Elephant by Matt Dean
- Cat by Myly
- Dog by supalerk laipawat from the Noun Project
- Robot by Kiran Shastry
- Train by Kiran Shastry
- Key by Eagle Eye
- Ball by Smalllike
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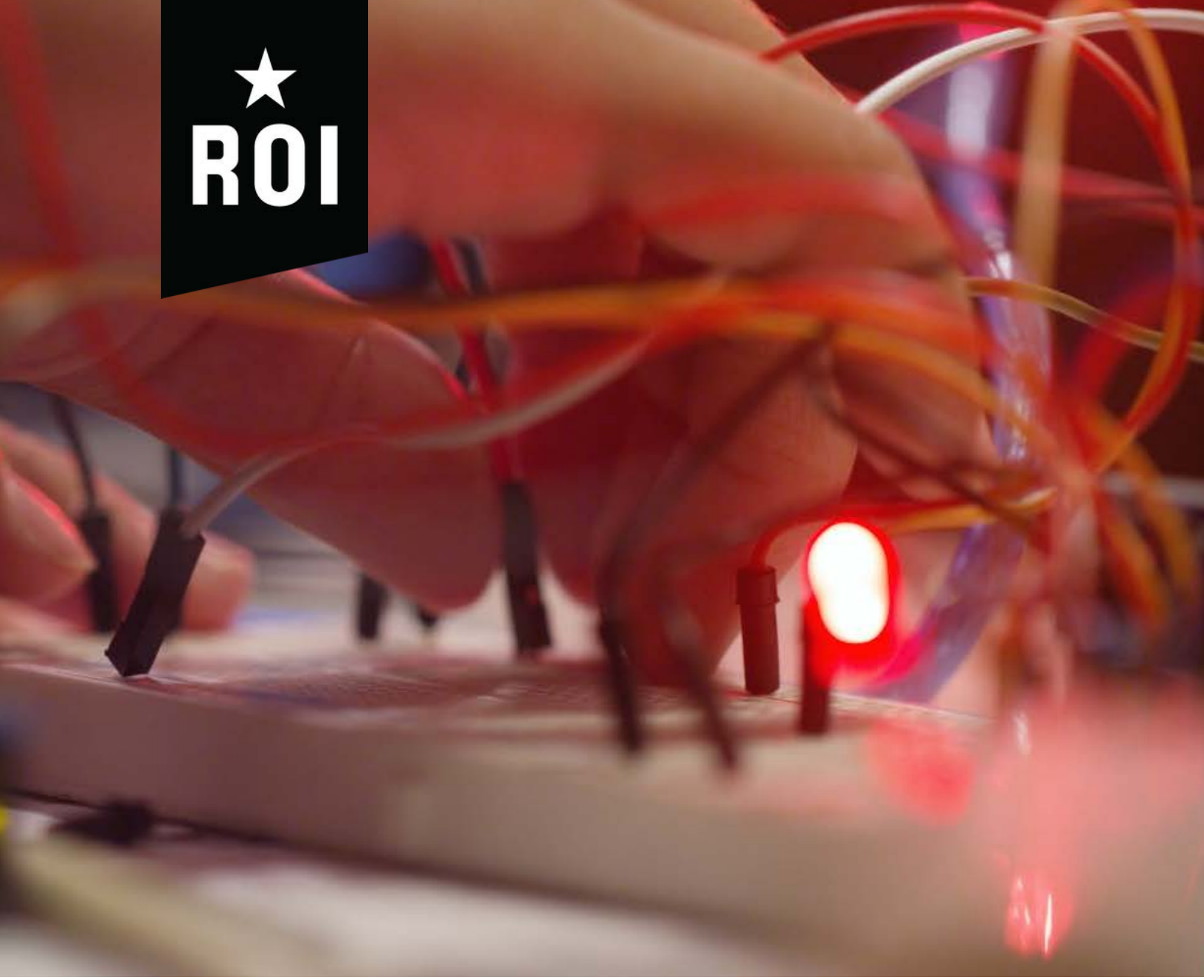

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