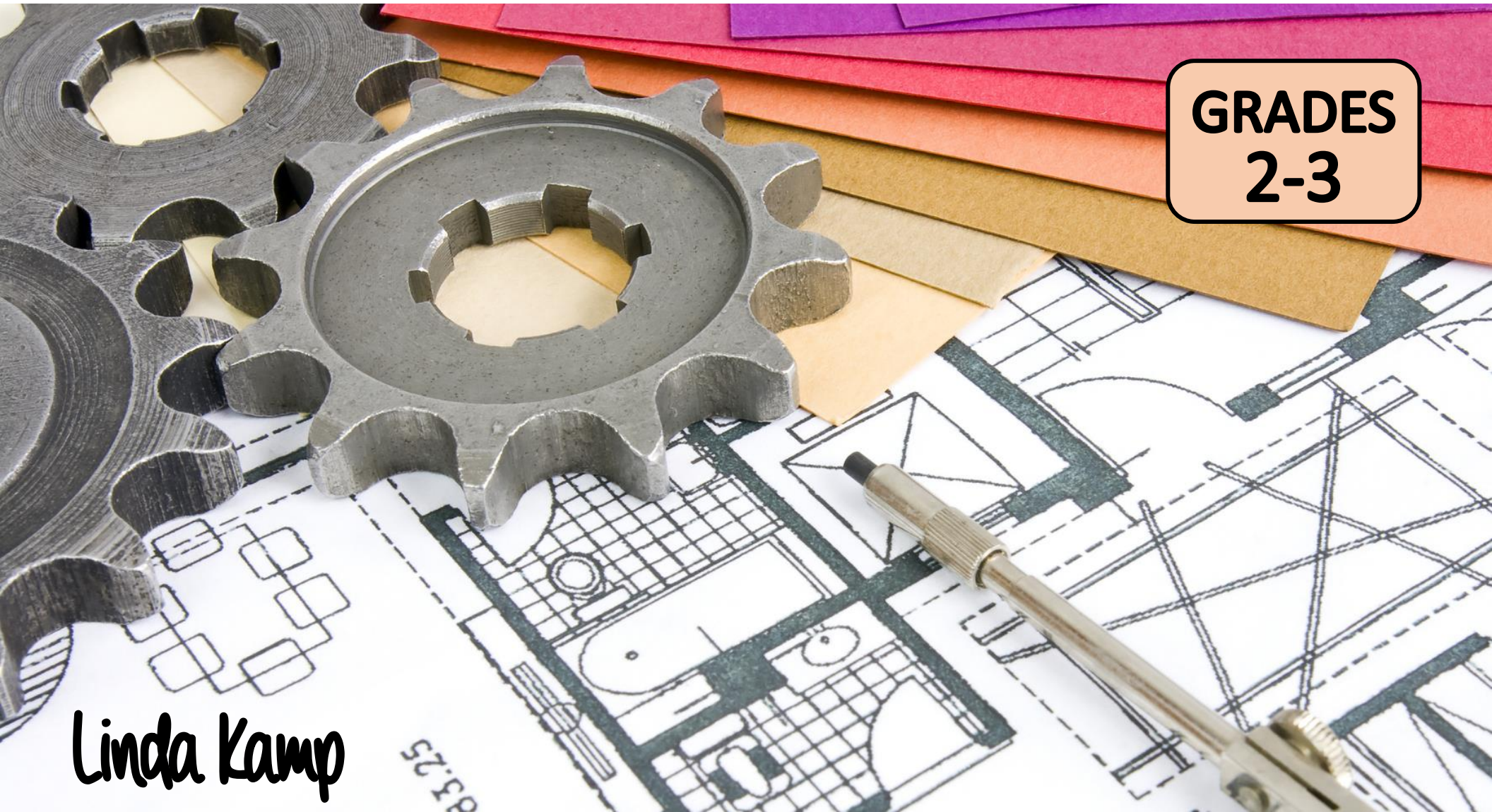


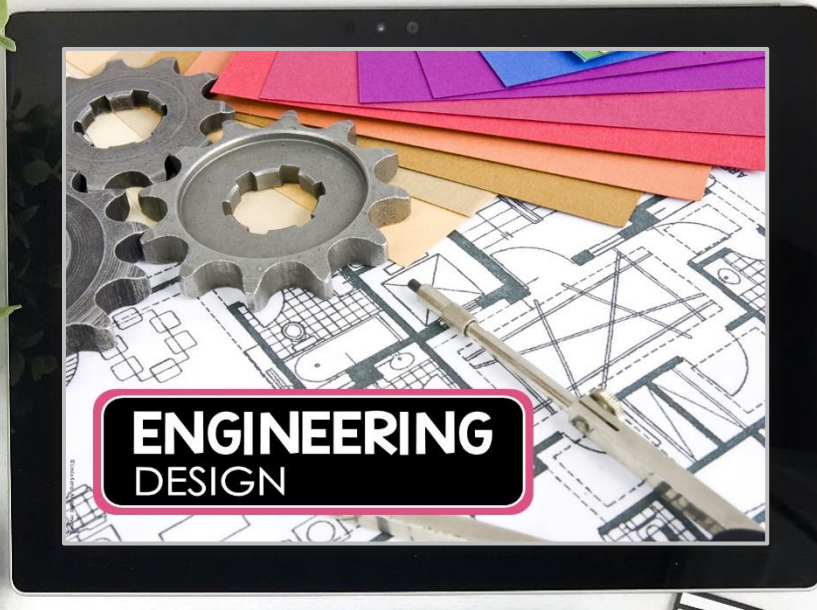
ENGINEERING & THE DESIGN PROCESS

GRADES
2-3

Linda Kamp

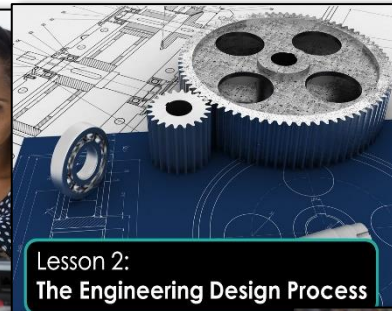


TEACHING POWERPOINT



6 ENGAGING LESSONS

- What is Engineering?
- The Engineering Design Process
- What is Technology?
- Natural & Man-Made Materials
- Engineering Inspired By Nature
- Designing Solutions



TEACHER GUIDE

- Scripted lesson plans
- Lesson objectives
- Performance tasks
- Pacing Guide
- Management tips
- Standards alignment
- Extension activities
- Assessment & quizzes

Meet An Engineer
Hello! My name is Dr. Jamila. I am an environmental engineer. I work to protect wildlife and preserve natural habitats on Christmas Island.
Here on the island, I study the migratory paths of animals. Currently, I help red crabs sail.

ENGINEERING DESIGN UNIT TEST
Name _____
Vocabulary Match
Write the letter for each definition next to the word it matches.
Detailed plan of how something will be

Investigation 5 Biomimicry: Build a Model
QUESTION: How can you model an example of biomimicry?
OBJECTIVE: Students will make a model of a man-made object with features inspired by nature.
MATERIALS:
Per student:
-Variety of building materials
-optional grey or blue construction paper
-glue sheet
-design process book
-reference
-Lesson 5 videos

Investigation 6 Design A Wildlife Crossing
QUESTION: What can you design to protect wildlife as they cross roads?
OBJECTIVE: Students will use the design process to create a solution that protects migrating red crabs.
MATERIALS:
-Variety of building materials
-optional grey or blue construction paper
-glue sheet
-design process book
-reference
-Lesson 6 videos

Investigation 2 Make a Design Manual
QUESTION: How do engineers use the design process to solve problems?
PROCEDURE:
1. Review the Lesson 2 Investigation

Investigation 1 Make a Blueprint
QUESTION: How do engineers use the design process to solve problems?
PROCEDURE:
1. Review the Lesson 1 Investigation

Engineering Design Process MANUAL

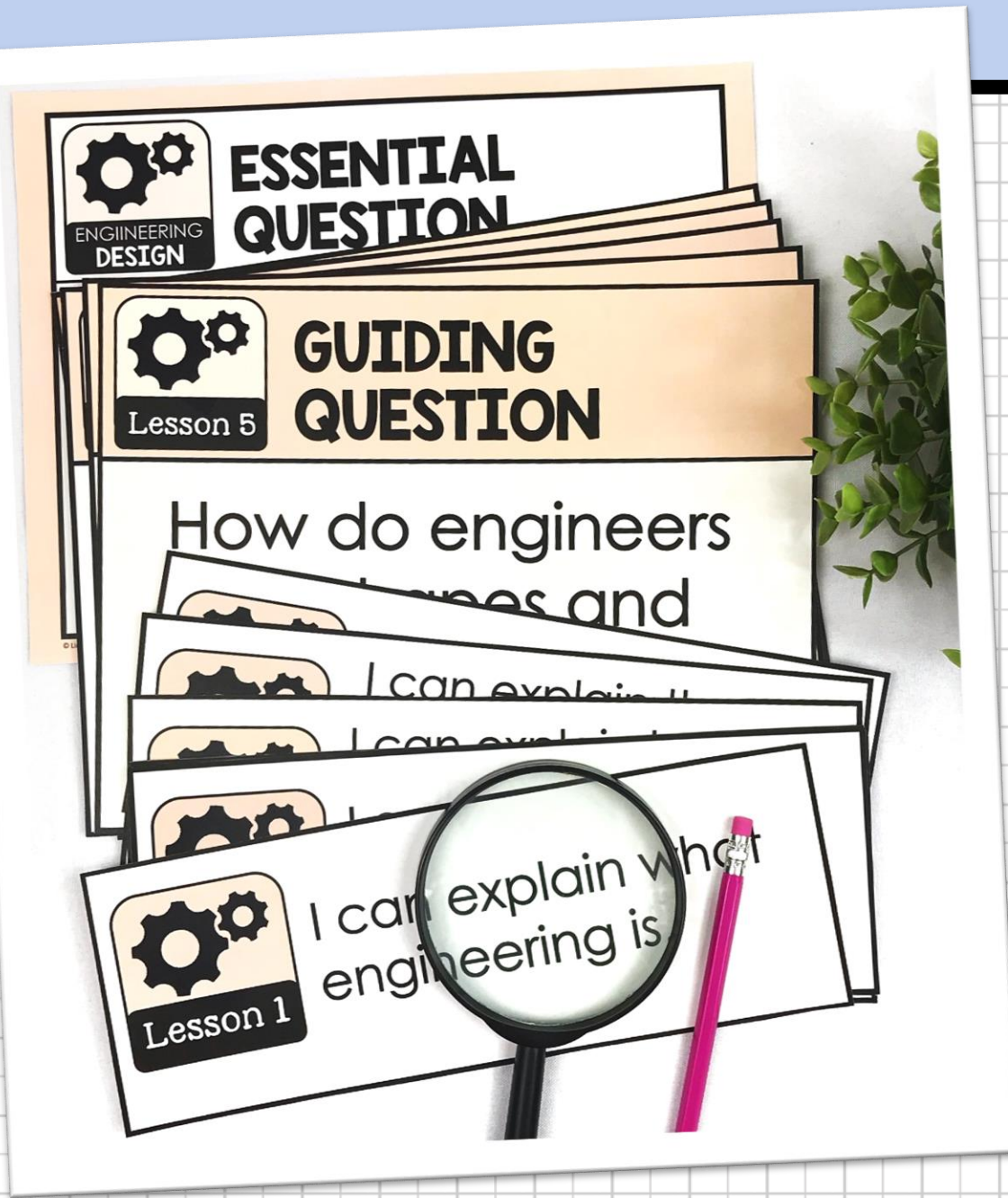
ENGINEERING DESIGN Unit Pacing
The following pacing allows 3 days for each lesson:
• 2 days for teaching the content & student response activities
• 1 day to do the lab.
This pacing allows time to work through the teaching slides, watch the related videos, complete the lesson's journal pages

Next Generation Science Standards Alignment
Science and Engineering Practices
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

ENGINEERING DESIGN Unit Materials
The following materials are needed to do all of the investigations. Please see the teacher notes for each lab as some of the materials are optional or can be replaced with items you may already have.
white crayons
rulers
scissors
student photos
blue and black construction paper
Playdoh or Crayola Air Dry Clay
Building materials

20 Day Pacing Guide

DETAILED LESSON PLANS

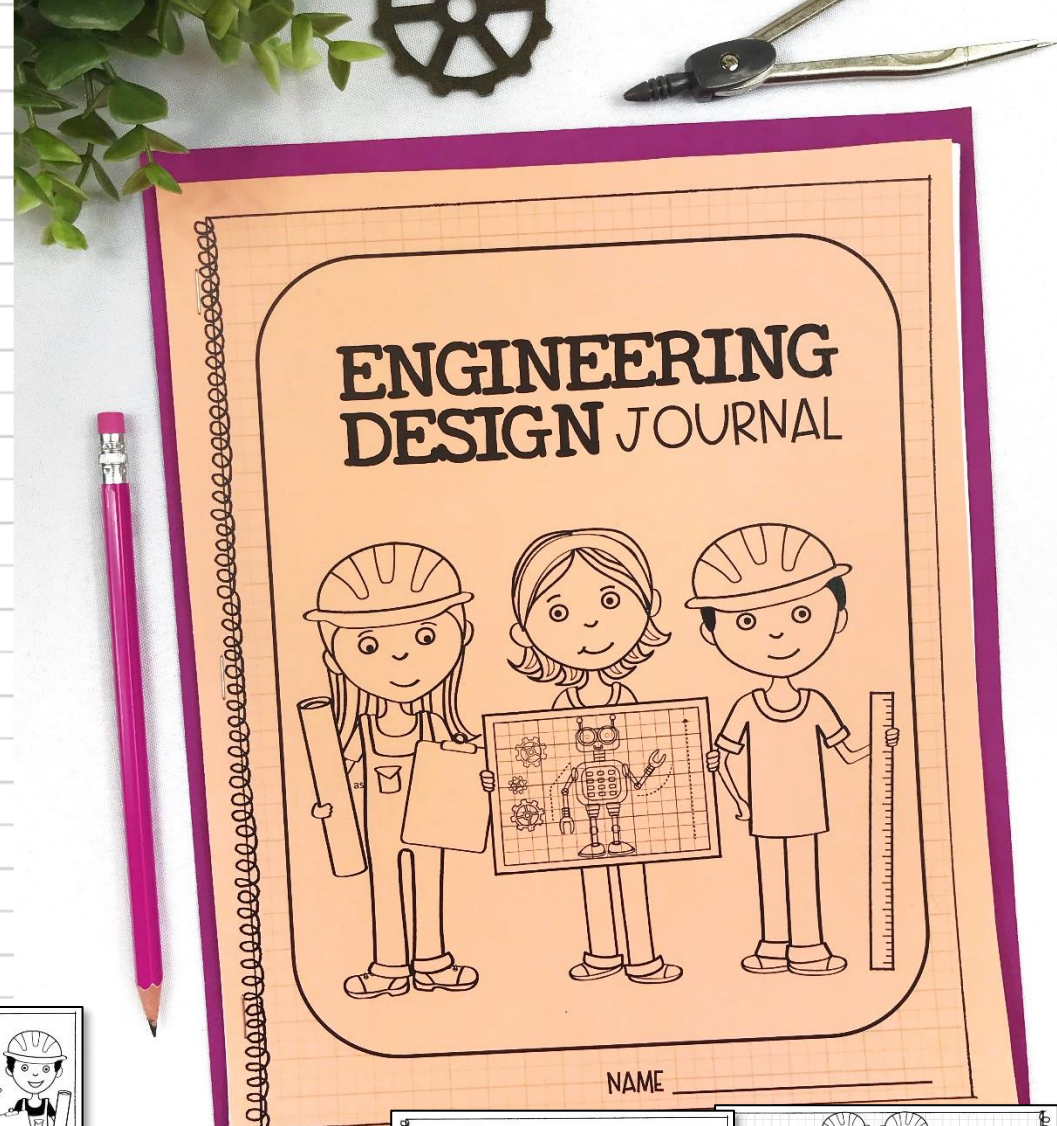


Aligned to
Next Generation
Science Standards,
TEKS,
and
Common Core State
Standards
for 2nd Grade

STANDARDS-BASED

Journal activities include:

- Applying vocabulary
- Short written response
- Writing to explain
- Labeling diagrams



How does the design process help engineers?

Lesson 6 Design a Solution
Brainstorm a list of ideas for a crab or Write all your ideas no matter how wild

Lesson 5 Inspired by Nature
What is biomimicry?
Many inventions are inspired by nature. What animals inspired these inventions?

Lesson 4 Natural & Man-made Materials
What are natural materials?

Lesson 3 What is technology?
Circle the pictures of technology.

Lesson 5 Inspired by Nature
Engineers observe nature. They look at special features animals have that help them. Engineers think about how they

Lesson 3 What is technology?
What is technology?
Is all technology electronic?
 yes
 no
Explain some ways people use technology every day.

Lesson 4 Natural & Man-made Materials
Write the names of these natural materials.
What man-made objects do you see in the picture below?

Lesson 2 The Design Process
What is the engineering design process?
Glue the steps to the design process in the correct order. Use your bookmark to help you.

Lesson 1 What is engineering?
What is a blueprint? Why do engineers make blueprints?
What toy have you seen that might have been designed by an engineer?

Lesson 1 What is engineering?
What are some kinds of engineers?
How do engineers improve people's lives?
Put a check next to things an engineer might design.
machines special shoes

Engineering Vocabulary
engineering needs
solution improve
design materials
blueprint natural
prototype man-made
diagram biomimicry
design process technology
Write any new words you learn.

ENGINEERING DESIGN JOURNAL

NAME _____

LESSON RESPONSE JOURNAL

HIGH-ENGAGEMENT LESSONS

Students discuss, write & investigate

LESSON 6 TALK ABOUT IT Designing Solutions

Talk with your partner about wildlife crossings you have seen.

What technology could you use to protect wild animals as they cross a



LESSON 4 TALK ABOUT IT Natural or Man-Made?

Tell your partner the difference between natural and man-made materials.

Make a list of the materials needed to



LESSON 3 TALK ABOUT IT What is technology?


Talk with your partner about the different technology people have in their homes.

What technology does your family use at home?

LESSON 3 INVESTIGATE Analyze a Design

QUESTION: How does the shape and material of an object help it to work?

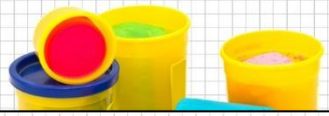
Think about the design



LESSON 5 INVESTIGATE Build a Prototype

QUESTION: How can you make a prototype of an object inspired by nature?

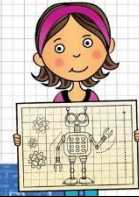
Use clay to make a prototype of a



LESSON 1 INVESTIGATE Make a Blueprint


QUESTION: How can you make a blueprint of an object in your classroom?

Draw a detailed diagram that includes measurements of an object in your classroom.



LESSON 2 INVESTIGATE Create a Design Manual


QUESTION: How do engineers use the design process to solve



LESSON 5 TALK ABOUT IT What is Biomimicry?

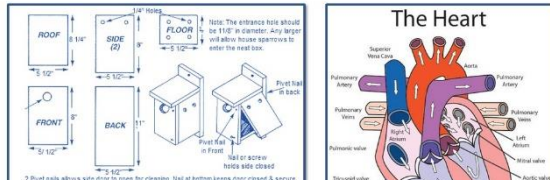
Talk with your partner about what biomimicry is.

Can you think of another example of biomimicry?



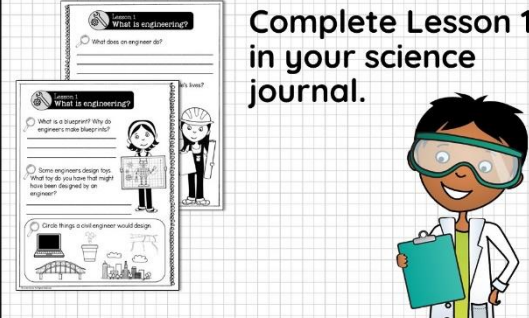
LESSON 1 TALK ABOUT IT What is engineering?

Talk with your partner and compare a blueprint to a scientific drawing. How are they the same and different?



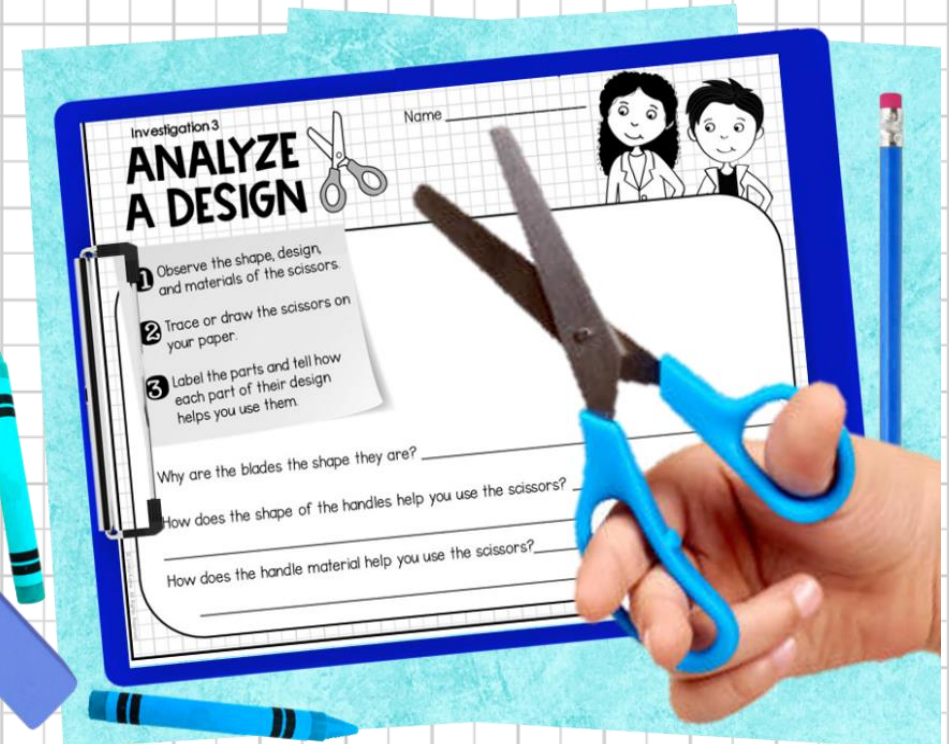
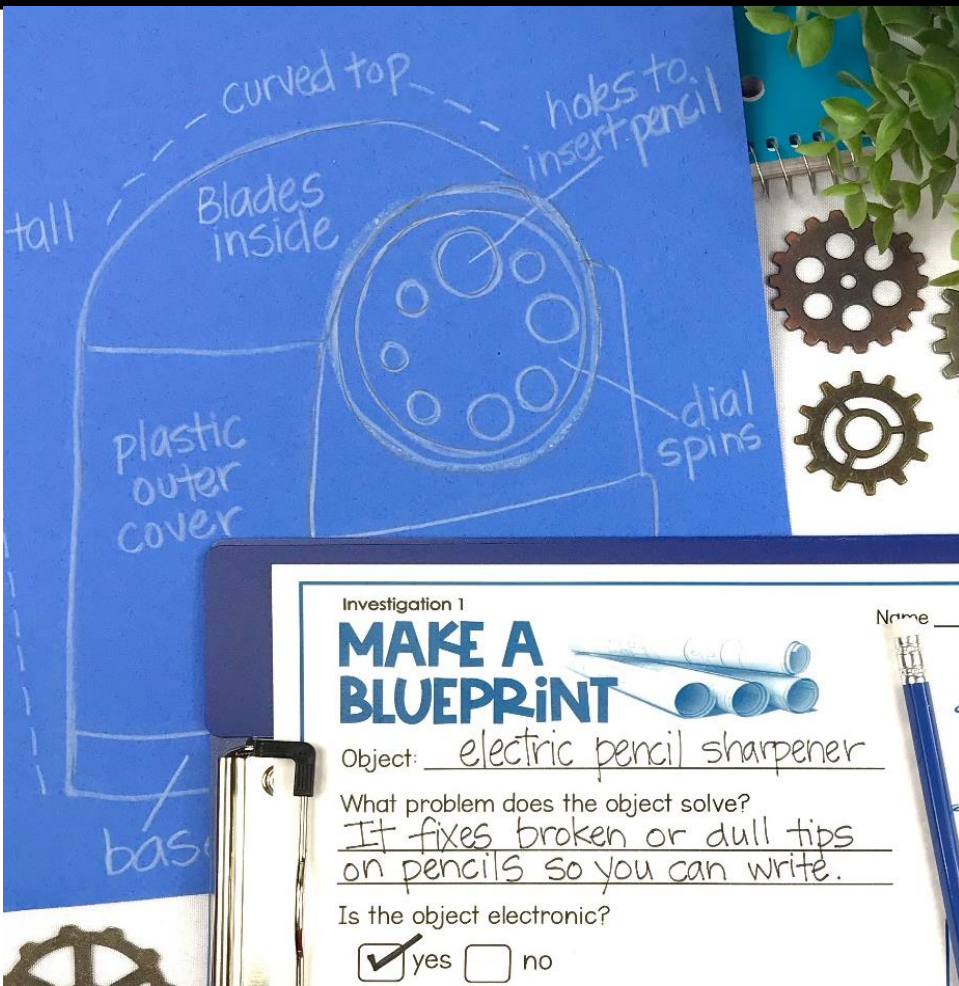
LESSON 1 JOURNAL Write About It

Complete Lesson 1 in your science journal.



6 HANDS-ON ENGINEERING LABS

Each lab builds on the previous one as students gain knowledge of engineering practices



and learn the steps of the design process

CULMINATING DESIGN PROJECT

Meet An Engineer

Hello! My name is Dr. Jamila. I am an environmental engineer. I work to protect wildlife and preserve natural habitats on Christmas Island.

Here on the island, I study the migratory paths of animals. Currently, I am working on a solution to help red crabs safely cross busy roads and railways as they migrate to the ocean to lay their eggs.

Would you like to help me?



Students apply the steps of the design process in a culminating project



LESSON 6 INVESTIGATE

Design a Crab Crossing

QUESTION:

What solution can you design to protect red crabs as they migrate to the ocean?

Use the steps of the engineering design process to help Dr. Jamila design a solution.



PLAN Draw a diagram of your design idea. Write the steps you will take.

DESIGN A SAFE WILDLIFE CROSSING

Name _____ Investigation 6

ASK
What is the problem?

IMAGINE
Brainstorm a list of ideas for solving the problem.

IMPROVE
How could you improve your design?

What materials can you use?

FOCUS WALL RESOURCES

ESSENTIAL QUESTION
ENGINEERING DESIGN

GUIDING QUESTION
Lesson 5

How do engineers use shapes and patterns found in nature?

Engineering Design

Focus Wall Cards



Vocabulary Cards

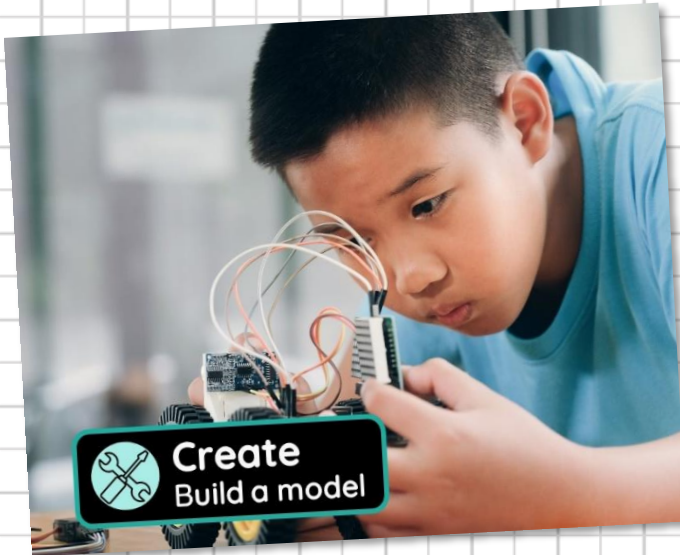
solution
technol
man-made
natural

design process
A series of steps engineers use to find solutions to problems
Lesson 2

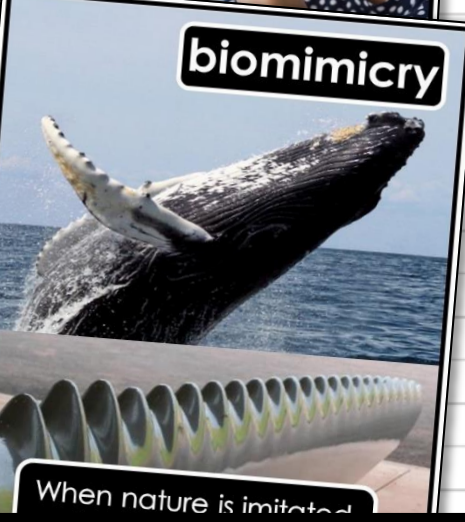
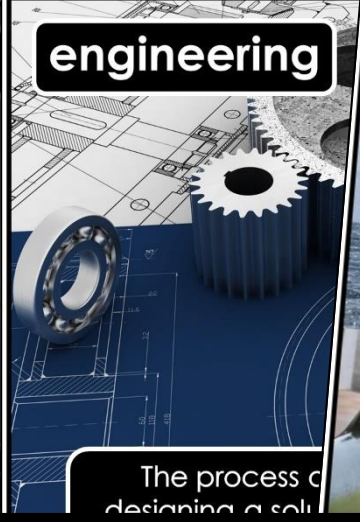
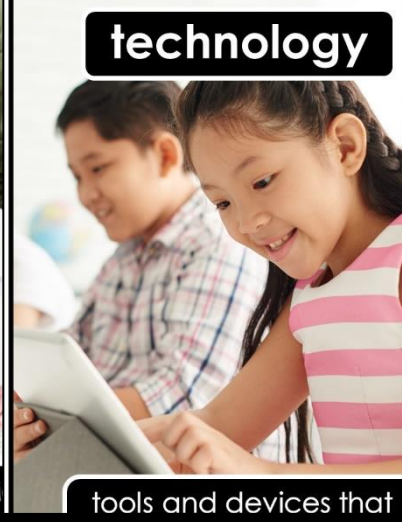
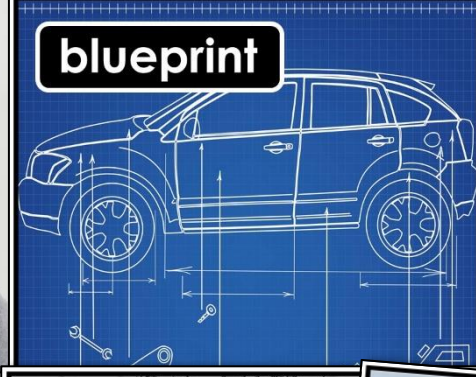
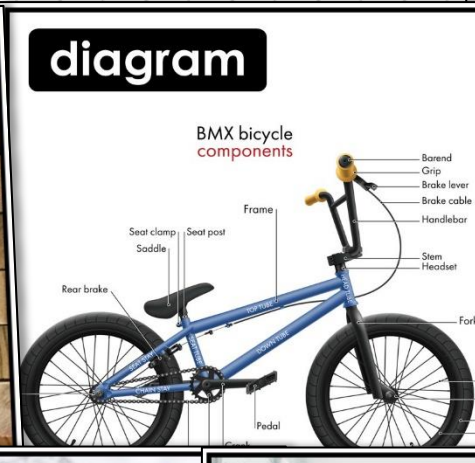
Lesson 1
I can explain what engineering is.

Objectives Cards

FULL PAGE POSTERS

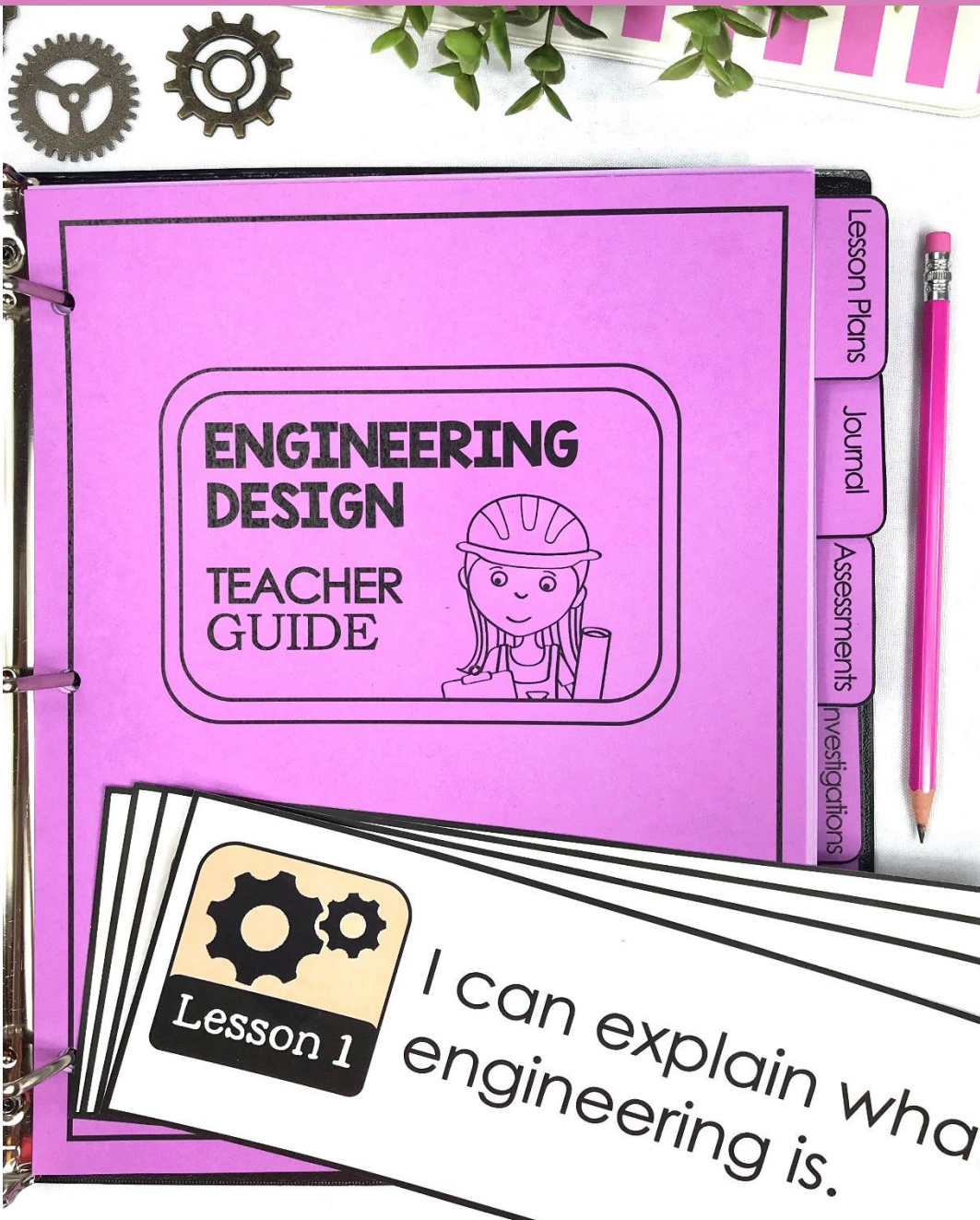


Engineering Design Process



Unit Vocabulary Posters

UNIT PLANNING BINDER



Organize the resources in a handy planning binder

- cover & spines
- section dividers
- divider tabs

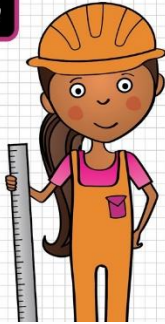
PLAN TEACH ASSESS

an in-depth
and effective unit

BONUS Bulletin Board Set

ASK *Identify the Problem*

- What is the problem?
- What are the rules or requirements?
- How would someone else solve it?



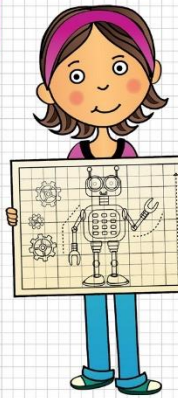
IMAGINE *Brainstorm ideas*

- Brainstorm ideas and solutions.
- Make a list of your ideas.



PLAN *Draw a design*

- Draw a diagram.
- What materials will you need?
- Write down the steps you will take.



CREATE *Follow your plan*

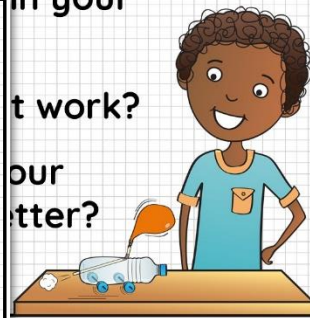
- Follow your plan to build your design.
- Test your design.
- Does it work the way you intended?



IMPROVE *Make it better*

What works in your design?

What doesn't work?
How can you improve your design?



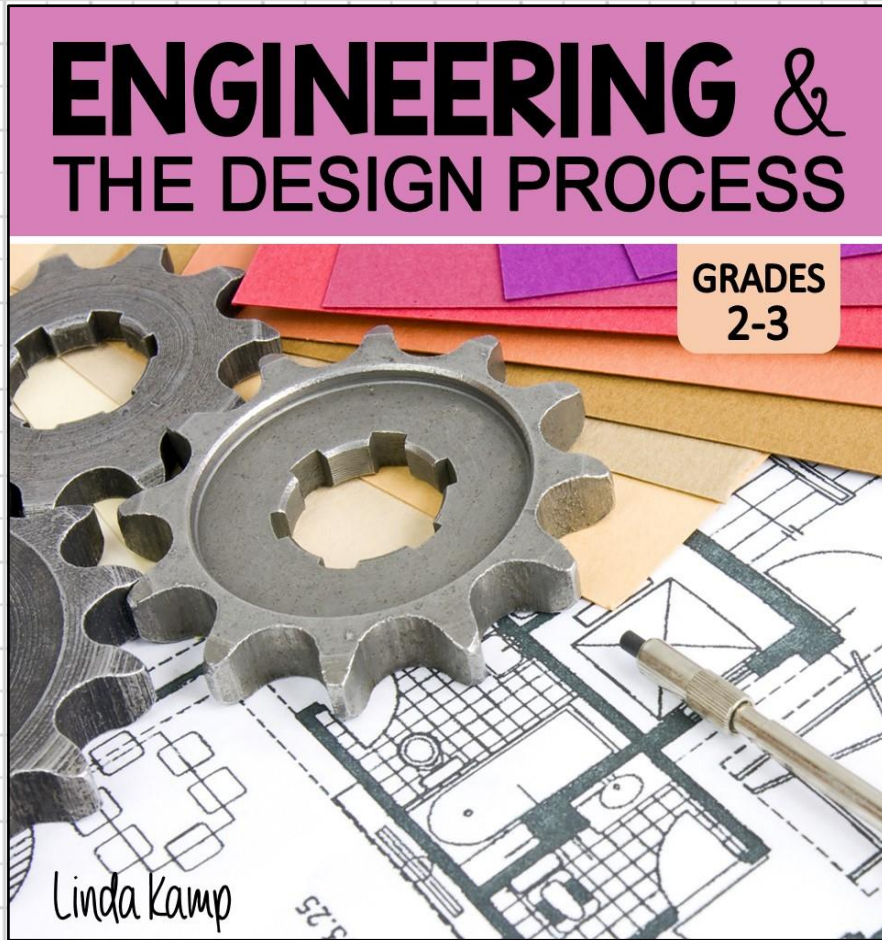
PRESENT *Show others*

- Share your design with others.
- Explain its parts.
- Share how it solves a problem.



Title letters, decorative elements & posters

Ready to use science resources



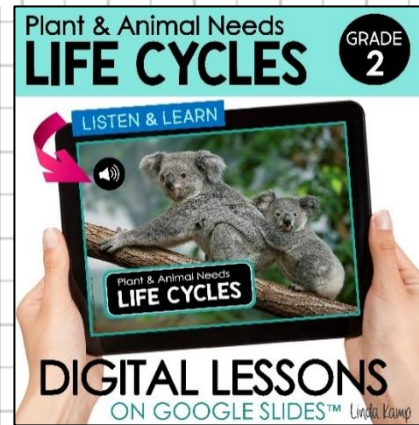
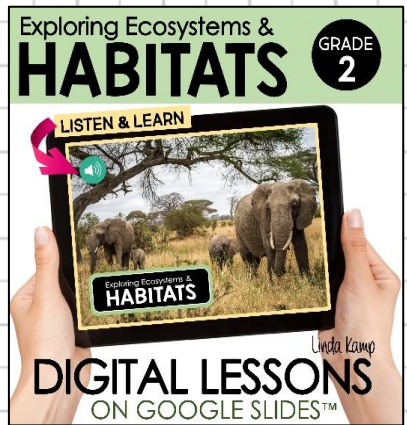
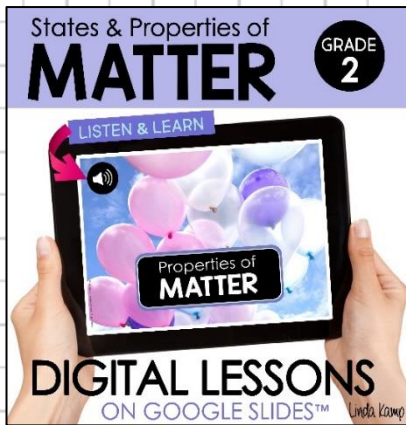
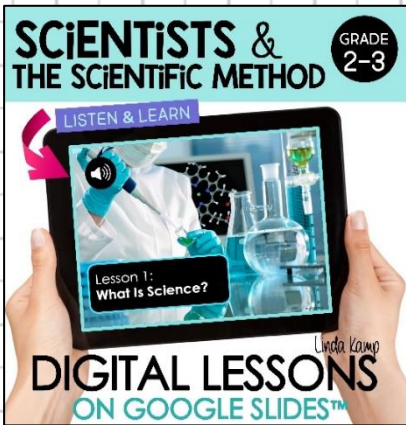
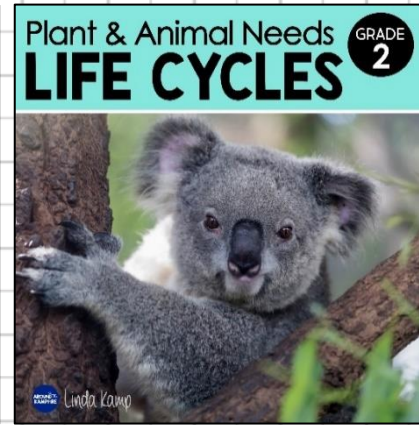
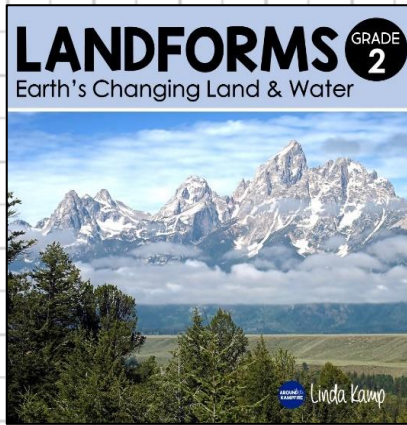
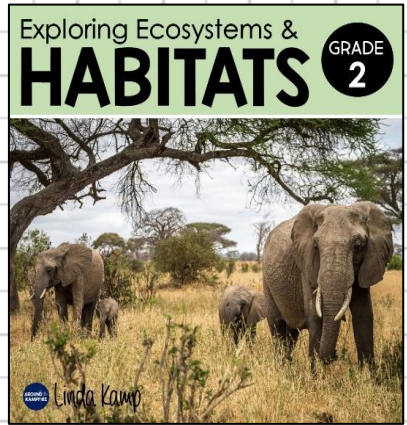
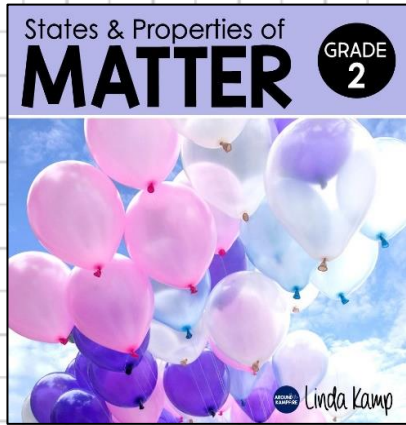
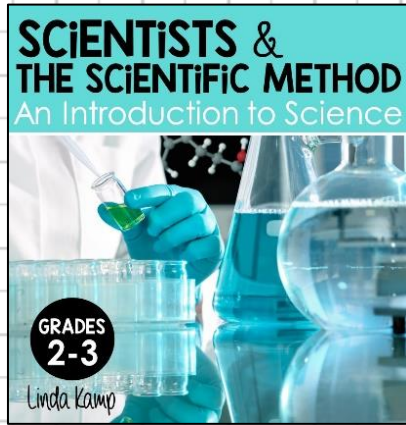
Students gain an understanding of:

- Engineering practices
- Types of engineers
- Engineering design process
- Drawing diagrams
- Building models
- Natural & man-made materials
- Biomimicry
- Technology in engineering
- Designing a solution
- Testing & evaluating a design



Build a science foundation!

See the entire series [CLICK HERE](#)



Second Grade Science Units for NGSS