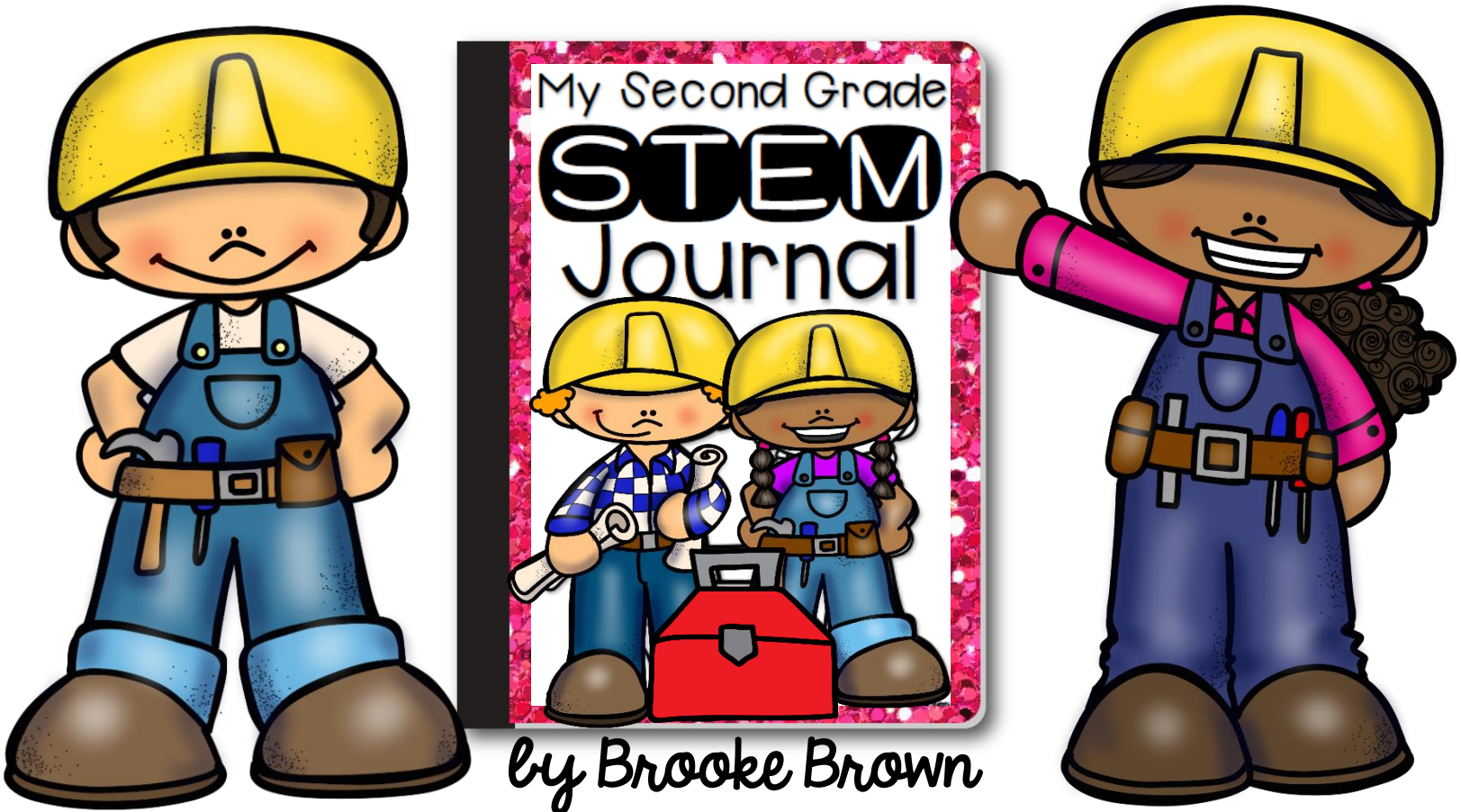
Second Grade STEM



HOW TO USE

The following materials are designed specifically for second grade students and align with crosscutting NGSS science, engineering and math standards. Six challenges are provided, two for each of the major science content areas. Student booklets can be cut and glued into composition notebooks (main cover provided on Page 4) or can be used as stand alone booklets by copying front to back and folding in half. Suggested materials for each challenge are inexpensive and/or found in most early childhood classrooms. Parents can also be asked to donate needed supplies. Students are encouraged to work in partners or small groups. Each challenge should be allotted 45-60 minutes from start to finish, including a whole class discussion both before and after the challenge.

<u>Each challenge in this package contains the following items:</u>

*Challenge Description, Aligned NGSS Standards, Suggested Materials, and Detailed Lesson Plans

*Photos of possible student products

*Teacher Chart to guide whole class discussion for use on a document camera or interactive whiteboard

*Student booklet to record prior knowledge, ideas, observations, questions, materials, blueprints, and reflections

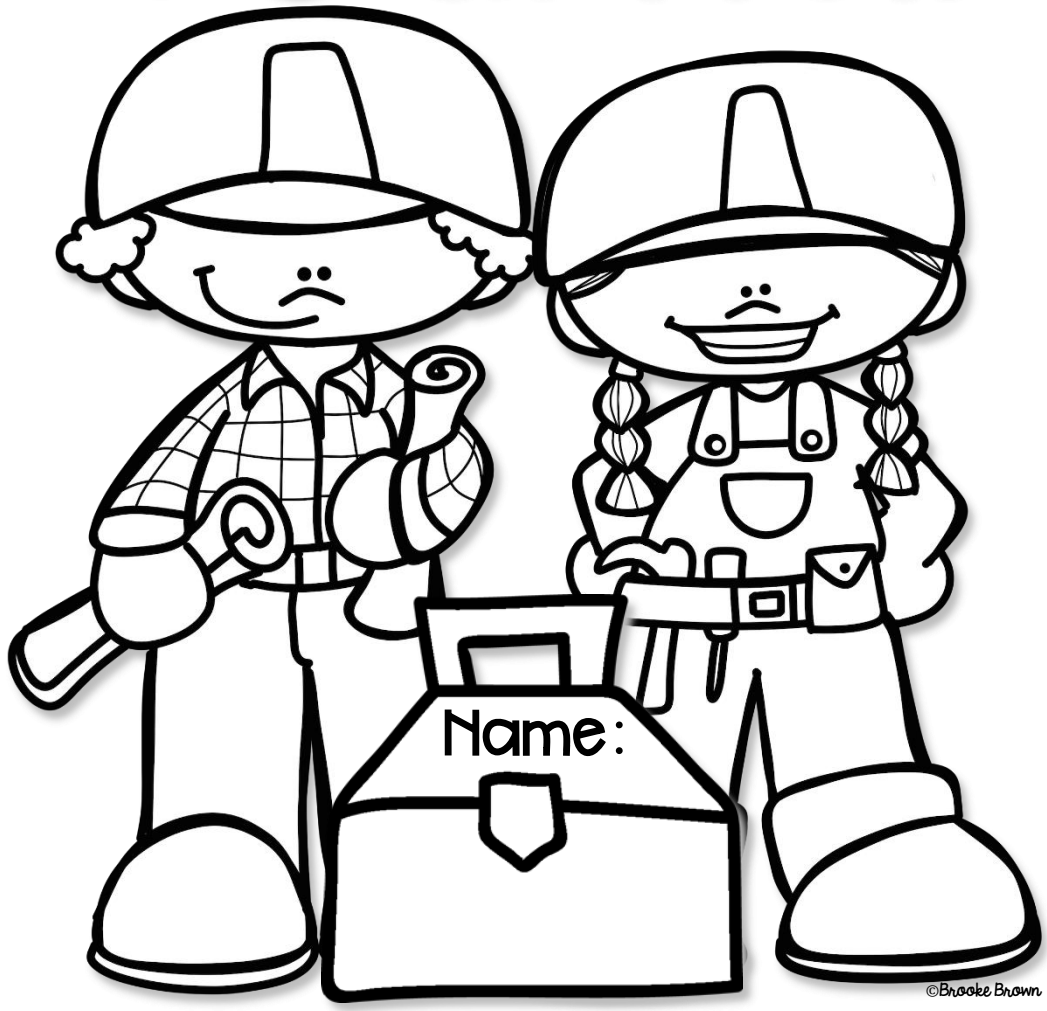
CONTENTS

My Second Grade

STEM Journal

My Second Grade

STEM Journal



Nature Friend

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

Challenge Description: Students will collect 10-15 different items during an outdoor "nature hunt." They will classify their items by observable properties using a Venn diagram. They will also use their items to construct and decorate a "nature friend," recording the observable properties of their creation.

Suggested Materials: informational books about properties or the five senses, gallon-sized ziplock baggies, Styrofoam cups, toothpicks, scotch tape, 10-15 items from nature per student, crayons/markers

Lesson Plan

1. Prime students' background knowledge about properties by reading aloud an informational book of your choice. You may also choose to display a few classroom items and have students describe their properties using their five senses.
2. Hold a class discussion, allowing students to brainstorm examples of different properties (i.e. texture, hardness, size, shape, color, flexibility). Record their ideas on the provided teacher chart and have them add ideas to their individual booklets.
3. Introduce permitted materials and share the challenge. Take students on a "nature hunt" outdoors to gather 10-15 items from nature. You may also choose to have students bring nature items from home. They can store their items in the large ziplock baggies.
4. When students return inside, have them classify their nature items in a variety of ways using the Venn diagram in their student journal. Have them choose one method of sorting to record in their journal, write the categories, and draw pictures of their items in each section.
5. Allow students to construct a "nature friend" out of their materials. The Styrofoam cup can serve as the base for their friend and the toothpicks and tape will allow them to attach items. They may also decorate their friend with crayons and markers. When they are finished constructing, have them list the properties of their nature friend in their student journal. They will also trade with a partner to write the properties of his or her nature friend.
6. Hold a whole class closing discussion and reflection, allowing students to share what they created and what they learned about properties. Record their ideas on the provided teacher chart.

Nature Friend

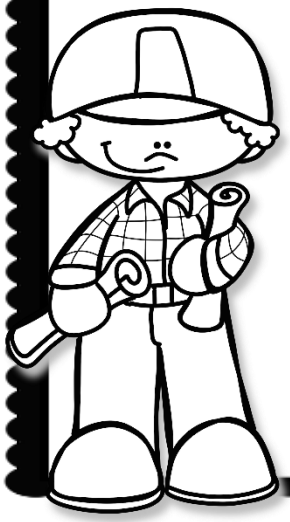
Possible Product

Nature Friend

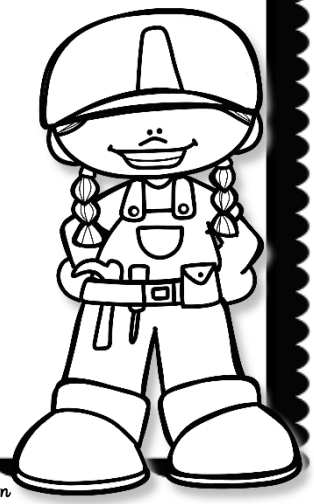
What are examples of properties?

How can we classify (sort) our nature items?

properties of our Nature Friends



What we LEARNED



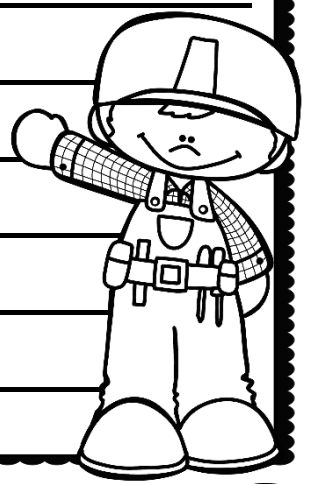
Nature Friend

Name:_____

THE CHALLENGE

Can you identify properties of items from nature, then use the items to construct a "nature friend"?

What are some examples of properties?



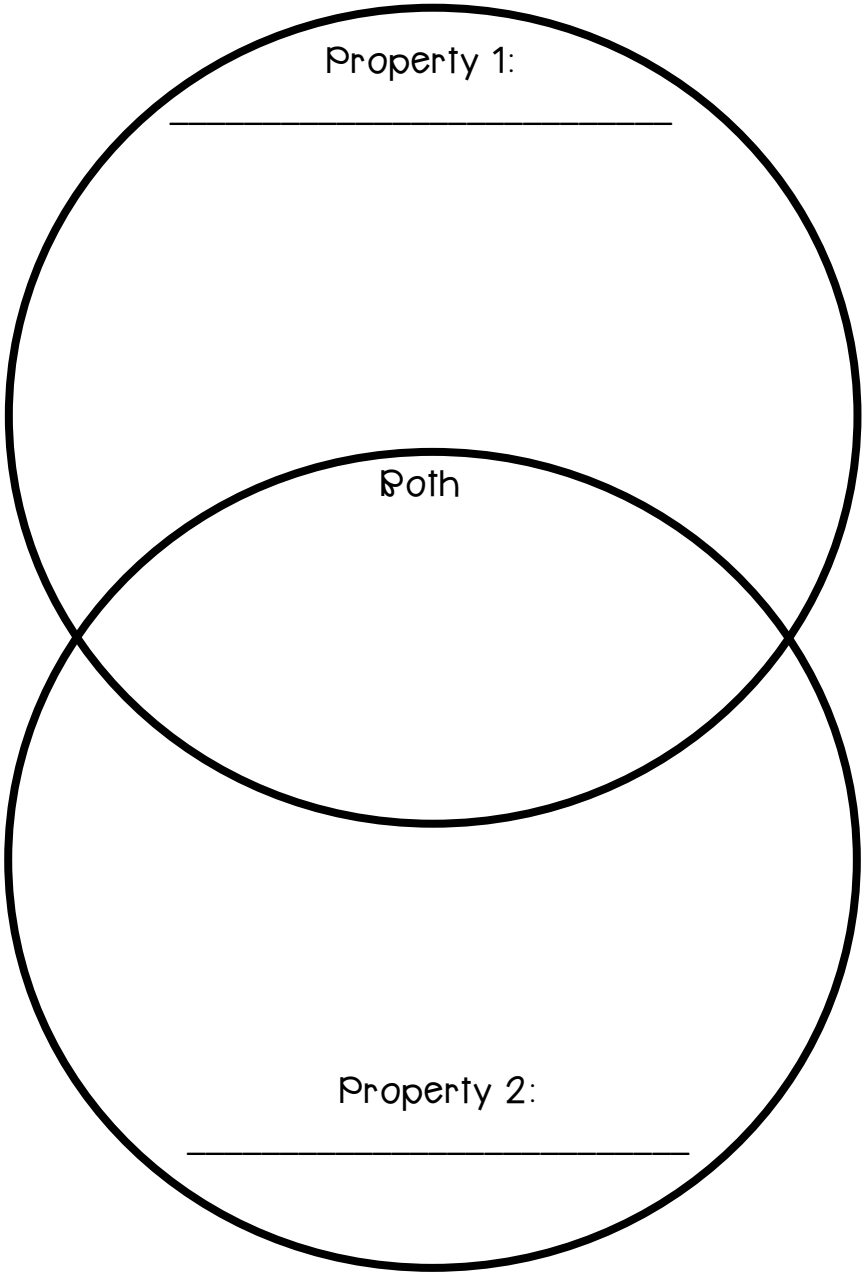
properties of my Nature Friend

Looks	Sounds
Feels	Smells

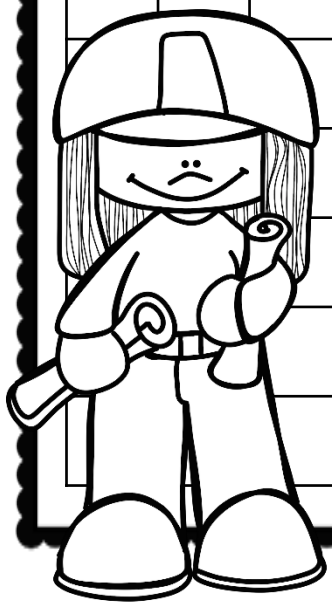
properties of another Nature Friend

Looks	Sounds
Feels	Smells

Classify (sort) your nature items into two property groups. Draw pictures of the items in each section of the Venn Diagram.



My Nature Friend



STICKY STRUCTURE

NGSS Standard Alignment: 2-PS1-3: Make observations to construct and evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object., 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, CCSS Geometry Grade 2: Reason with shapes and their attributes.

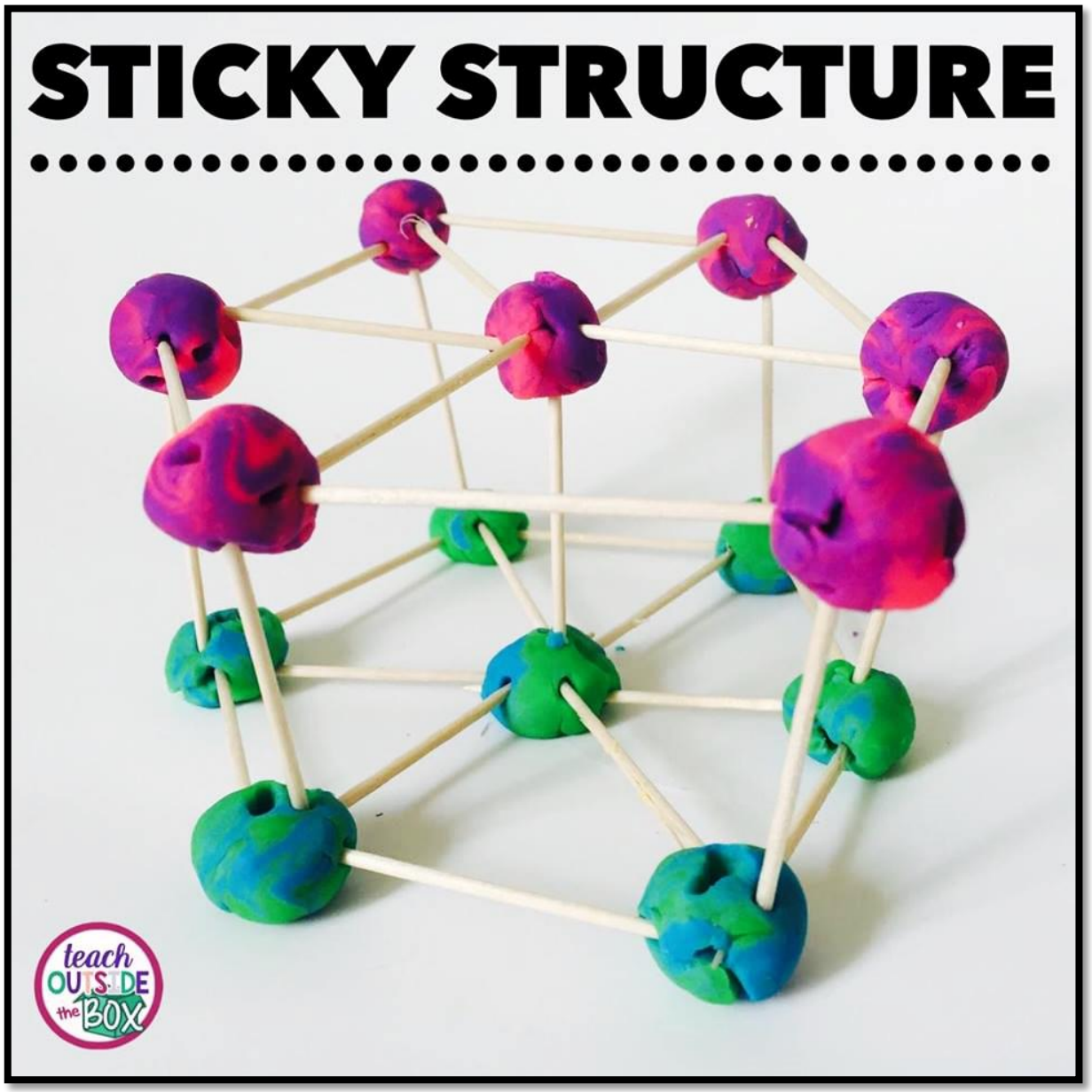
Challenge Description: Students will construct a variety of structures using small balls of playdough and toothpicks. The sticky playdough will connect toothpicks together at the joints, allowing students to experiment with a wide variety of three-dimensional patterns and structures. They will discover that certain patterns allow for more stability and balance of the structure than others.

Suggested Materials: playdough, toothpicks

LESSON PLAN

1. Prime students' background knowledge about communication by brainstorming different types of materials that can be used to build larger objects (i.e. Legos, building blocks.) Ask students to share different patterns, shapes, and styles that might be used while building and how they might relate to the strength, stability, and balance of a structure. Add their ideas to the provided teacher chart and allow them to add ideas to their student booklets.
2. Introduce permitted materials and share the challenge. Allow students to share ideas for how the materials work and might fit together in different ways to create a variety of shapes and patterns. Also, have them share ideas for how their structure could be taller, wider, or stronger.
3. Allow students at least 45 minutes with partners or small groups to create and test a variety of designs, as well as record in their STEM journals.
4. Hold a whole class closing discussion and reflection, allowing students to share what they created and compare/contrast creations with their classmates. Discuss what students learned about different patterns in structures. Record their ideas on the provided teacher chart and have them finish their individual booklets.

Sticky Structure
Possible Products

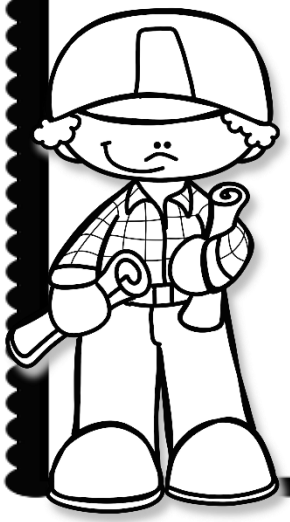


Sticky Structure

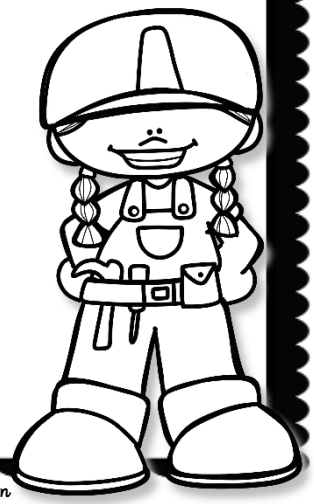
Types of Building Materials

patterns and styles

What we created



What we LEARNED



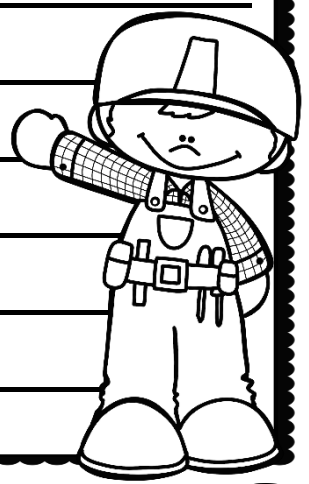
Sticky Structure

Name:_____

THE CHALLENGE

Can you create a structure using only playdough and toothpicks?

Types of Building Materials



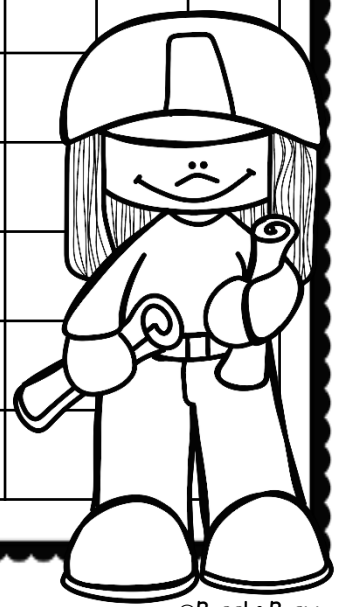
My structure has these shapes, patterns, and designs:

How did I make my structure strong and stable?

How could I improve my structure?

One new thing I LEARNED:

My Structure



My Classmates' Designs

1

2

Greenhouse

NGSS Standard Alignment: 2-LS2-1: Plan and conduct an investigation to determine if plants need sunlight and water to grow., 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. CCSS Geometry Grade 2: Reason with shapes and their attributes.

Challenge Description: Students will design a small greenhouse out of straws and plastic wrap to house a plant. They will plant two seeds in separate planters and water them regularly, one enclosed in a greenhouse and one not enclosed, to compare and contrast the results and determine the effects of sunlight/heat on each plant.

Suggested Materials: informational books about plant growth and greenhouses, plastic wrap or gallon-sized ziplock baggies, straws, pipe cleaners (to connect straws at joints), scotch tape, plastic cups for planters, soil, seeds, spray bottle or small watering can

Lesson Plan

1. Prime students' background knowledge about plant growth by reading aloud an informational book of your choice. You may also choose to project a variety Google images of different types of plants on an interactive whiteboard so that students can discuss the similarities, differences, and needs of each one.
2. Hold a class discussion, allowing students to share what they already know about plant growth and greenhouses and what questions they might have. Record their ideas on the provided teacher chart and have them add ideas to their individual booklets.
3. Introduce permitted materials and share the challenge. Allow students to share ideas for how the materials work and might fit together in different ways to create a greenhouse for their plant. Ideally, they will create some sort of cube-like shape to surround their plant with an optional triangular prism roof.
4. Allow students at least 45 minutes with partners or small groups to create and test a variety of designs, as well as record in their STEM journals. Allow them time to plant their seeds and set up their greenhouse plant and regular plant. Have them set up both plants as close as possible to a source of sunlight, either in a window or outside, if possible. Allow them to water plants daily.
5. Every few days, allow students to observe, compare, and record the growth of their two plants, as well as share how and why the growth of their plants might be different. While it is not necessary to share detailed information about "the greenhouse effect," students can be guided to understand how real greenhouses trap heat and energy and sustain plant growth for longer periods of time, despite changes in seasons/temperatures. Record their ideas on the provided teacher chart and have them finish their individual booklets.

Greenhouse

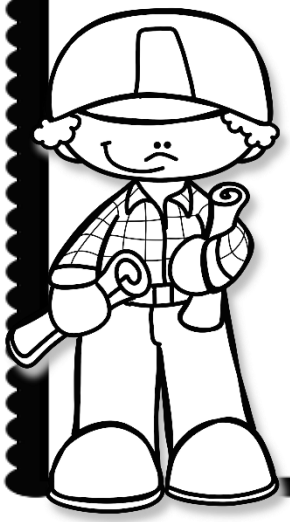
Possible Product

Greenhouse

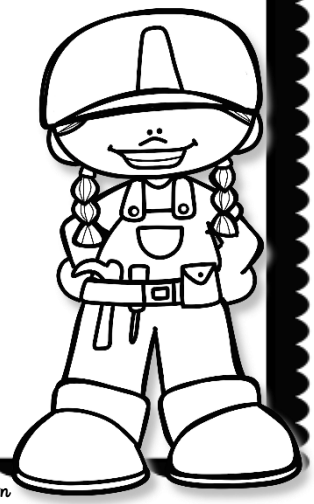
What we KNOW

QUESTIONS we Have

What we CREATED



What we LEARNED



comparing plants

Date	Plant 1 (Greenhouse)	Plant 2 (No Greenhouse)

What I Learned

1. _____

_____

2. _____

_____

Greenhouse

Name: _____

THE CHALLENGE

Can you create a greenhouse that completely surrounds a plant?

What I Know About Plant Growth

1. _____

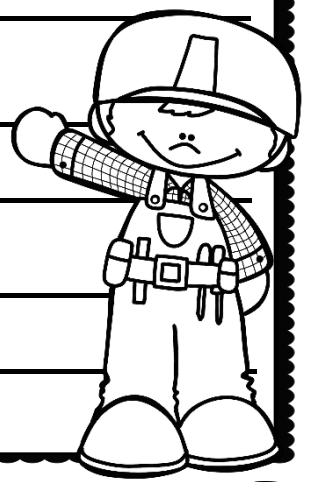
_____

2. _____

_____

3. _____

_____



Questions I Have About Plant Growth

1. _____

_____

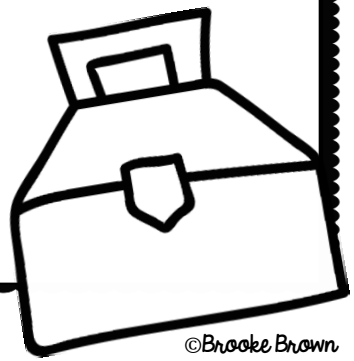
2. _____

_____

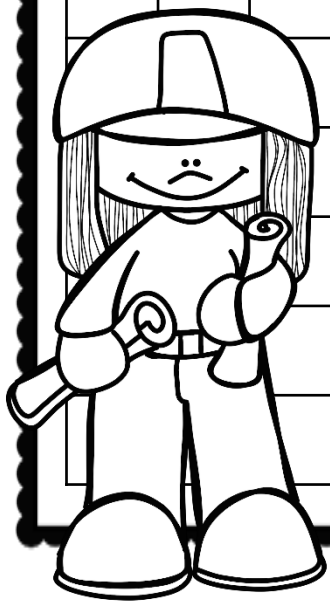
3. _____

_____

MATERIALS



My Greenhouse



Seed Transporter

NGSS Standard Alignment:2-LS2-2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants., 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.

Challenge Description: Students will experiment with a variety of animal-like body coverings to mimic seed dispersal and determine the effectiveness of different materials. They will test materials one at a time, then design their own seed transporter using popsicle sticks and materials of their choice.

Suggested Materials: informational books about seed dispersal and travel, feathers, faux fur scraps, cotton balls or pom pom balls, faux snake skin scraps, felt scraps, popsicle sticks, liquid glue, scotch tape, small containers of seeds

Lesson Plan

1. Prime students' background knowledge about seed dispersal by reading aloud an informational book of your choice. You may also choose to project a variety Google images of animals on an interactive whiteboard so that students can discuss how different animals might disperse seeds.
2. Hold a class discussion, allowing students to share what they already know about seed dispersal and why it might be important. Ask students what questions they have about how seeds travel. Record their ideas on the provided teacher chart and have them add ideas to their individual booklets.
3. Introduce permitted materials and share the challenge. Allow students to test each material by dipping it into the seed container to determine which materials are most effective.
4. Allow students at least 45 minutes with partners or small groups to create and test their seed transporter design, as well as record in their STEM journals.
5. Hold a whole class closing discussion and reflection, allowing students to share what they created and what they learned about seed dispersal. Write the 3 ways that seeds travel (wind, water, animals) and why it is important (so that new plants can grow in different areas and plants won't become crowded to compete for sunlight, water, and nutrients). Record their ideas on the provided teacher chart and have them finish their individual booklets.

Seed Transporter

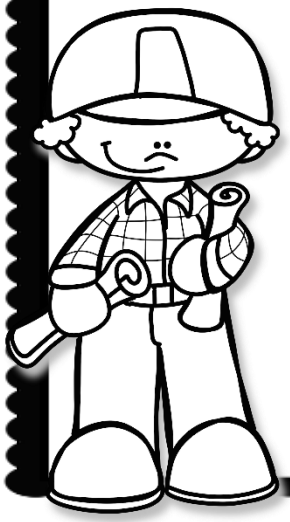
Possible Products

Seed Transporter

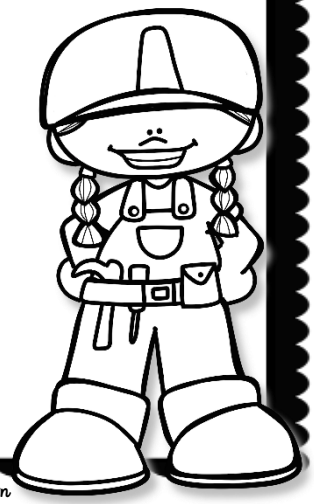
What we KNOW

QUESTIONS we Have

What we CREATED



What we LEARNED



Seed Transporter

Name: _____

THE CHALLENGE

Can you create a seed transporter that will move the most seeds from one place to another?

What I know About Seeds

1. _____

2. _____

3. _____

What are the 3 ways that seeds Travel?

1. _____

2. _____

3. _____

Why is it important that seeds travel?

_____

_____

_____

_____

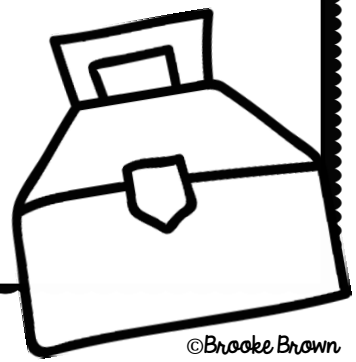
_____

_____

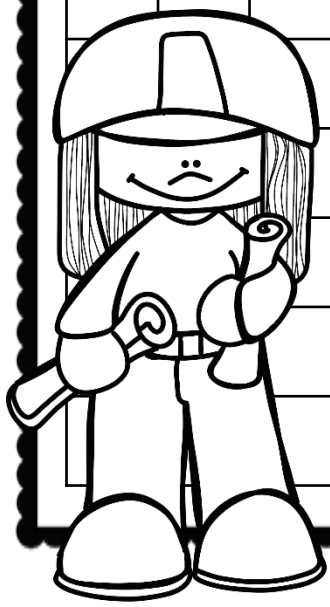
Material Tests

Material	What Happened

Materials for My Seed Transporter



My Seed Transporter



Landform Construction

NGSS Standard Alignment:2-ESS2-2: Develop a model to represent the shapes and kinds of land and bodies of water in an area., 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.

Challenge Description: Students will use playdough, model magic, or clay to create models for landforms and bodies of water such as mountains, plains, hills, plateaus, islands, rivers, and lakes. You may wish to assign a different landform or body of water to each group or allow them to create one large model as a small group with several structures included.

Suggested Materials: variety of informational books about landforms and bodies of water, paper plates, playdough, model magic, or air dry clay in green, brown, and blue

Lesson Plan

1. Prime students' background knowledge about landforms and bodies of water by reading aloud an informational book of your choice. Discuss the difference between landforms, which were created naturally, and manmade structures. Allow them to use photographs from the books for inspiration as they construct their models.
2. Hold a class discussion, allowing students to brainstorm different types of landforms and bodies of water and what questions they still have. Record their ideas on the provided teacher chart and have them add ideas to their individual booklets.
3. Guide students as they record small drawings of each type of landform and body of water in their student journal.
4. Introduce permitted materials and share the challenge instructions. You may choose to assign specific landforms to each group or allow them to choose their own.
5. Allow students at least 45 minutes with partners or small groups to create their models and observe their classmates' models.
6. Hold a whole class closing discussion and reflection, allowing students to share what they learned about landforms and bodies of water. Record their ideas on the provided teacher chart and have them finish their individual booklets.

Landform Construction

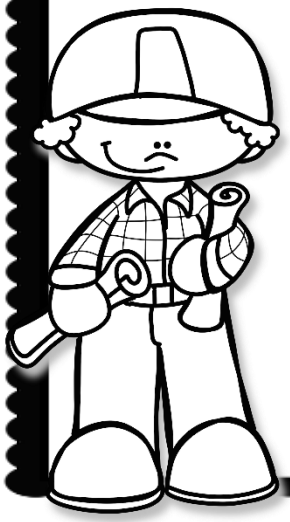
Possible Products

Landform Construction

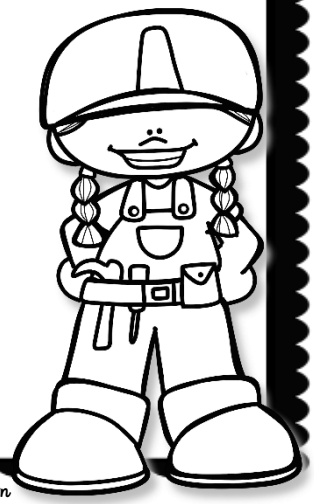
Types of Landforms and Bodies of Water

QUESTIONS We Have

What we CREATED



What we LEARNED



Landform Construction

Name: _____

THE CHALLENGE

Can you create a model of a landform or body of water?

What is a landform?

_____

_____

_____

What are some examples of landforms and bodies of water?

_____

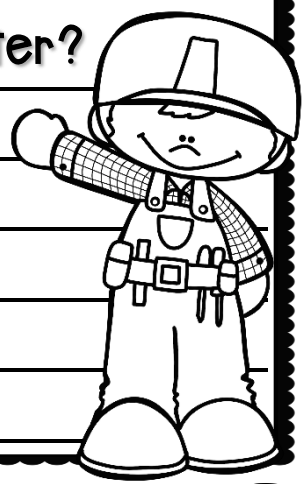
_____

_____

_____

_____

_____



BODIES OF WATER

Lake	River
Waterfall	Ocean

What I Learned

1. _____

_____

2. _____

_____

3. _____

_____

Questions I Have About Landforms and Bodies of Water

1. _____

_____

2. _____

_____

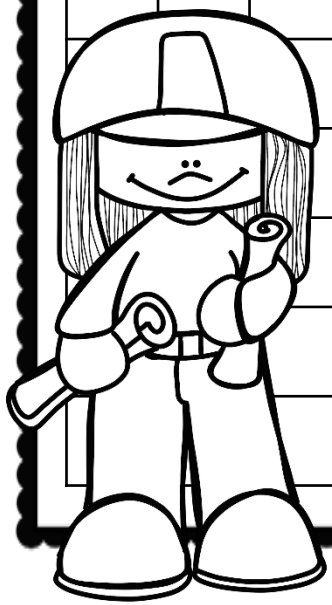
3. _____

_____

LANDFORMS

Mountain	Hill
Plain	Plateau
Island	Valley

My Landform



BLOCK the WATER

NGSS Standard Alignment:2-ESS2-1: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land., 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.

Challenge Description: Students will design a model of a dike in a plastic container that will keep water from flowing from one side to the other. They will use air dry clay and blocks to build the dike.

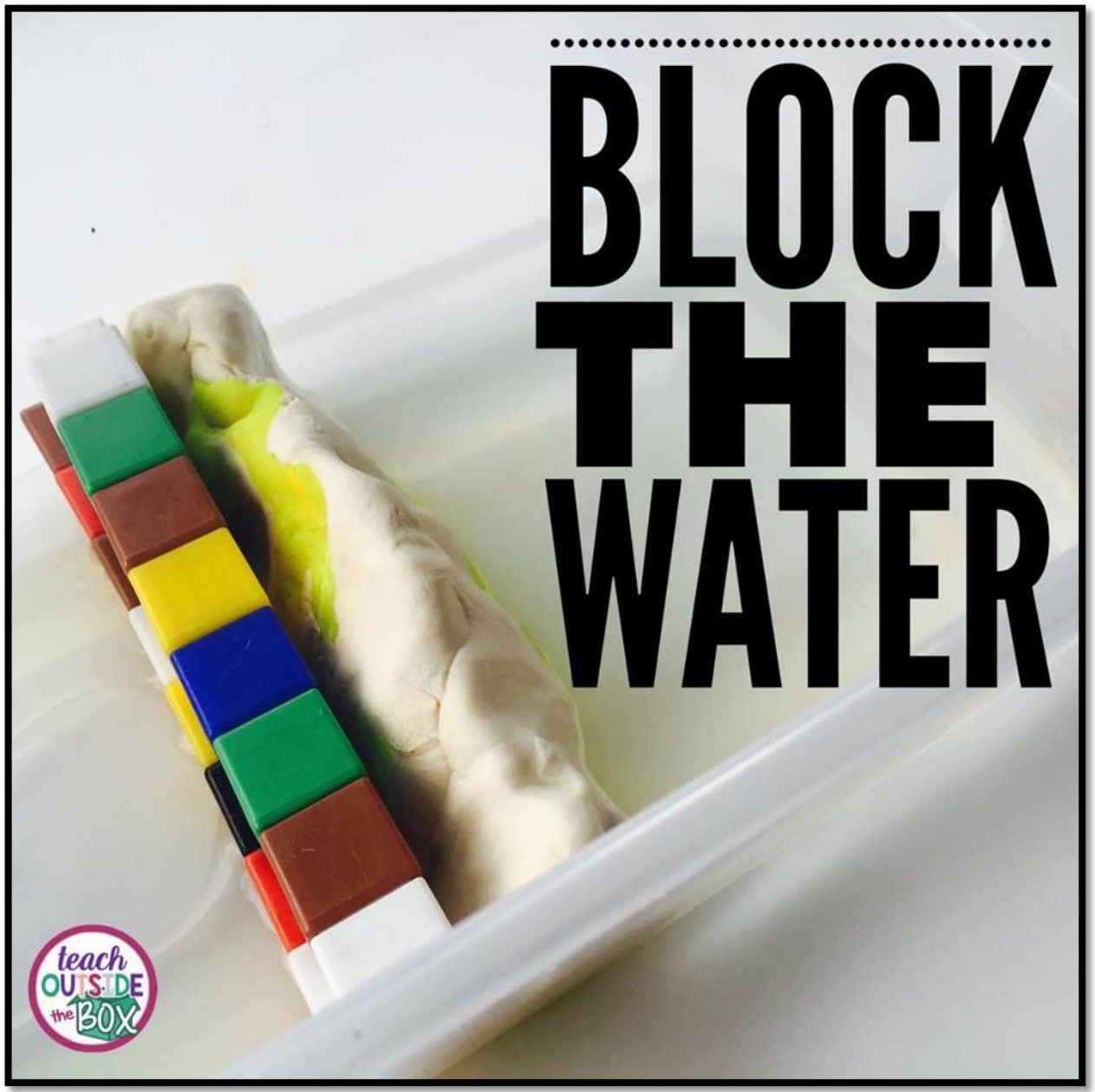
Suggested Materials: informational books about manmade structures such as dams, dikes, sewers, and windbreaks that control wind or water, small plastic tub, air dry clay, building blocks

LESSON PLAN

1. Prime students' background knowledge about water and wind control by reading aloud an informational book of your choice. If possible, project real Google images of dams and dikes and discuss the similarities and differences.
2. Hold a class discussion, allowing students to share why they think wind and water control might be necessary or important. Have them list examples of manmade structures that slow or prevent water and wind from changing the shape of the land. Record their ideas on the provided teacher chart and have them add ideas to their individual booklets.
3. Introduce permitted materials and share the challenge instructions. Allow students time to test a variety of designs and record in their STEM journals.
4. Hold a whole class closing discussion and reflection, allowing students to share what they learned about water and wind control. Record their ideas on the provided teacher chart and have them finish their individual booklets.

BLOCK the WATER

Possible Product

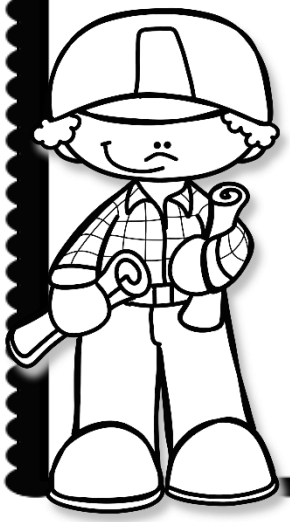


BLOCK the WATER

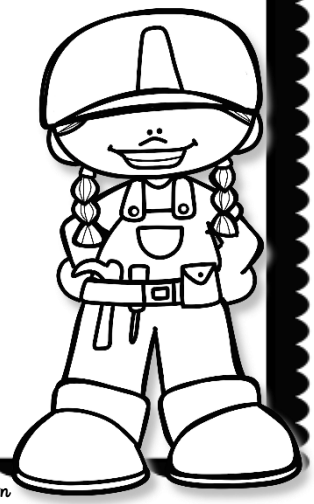
Examples of structures that control wind and water

QUESTIONS We Have

What we CREATED



What we LEARNED



Why is it important to control water?

Why is it important to control wind?

What I Learned

1. _____

2. _____

3. _____

BLOCK the WATER

Name: _____

THE CHALLENGE

Can you create a model of a dike that will block the flow of water?

Examples of structures that control wind or water

Questions I Have About water and wind control

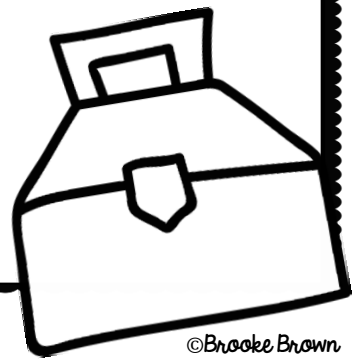
1 _____

_____

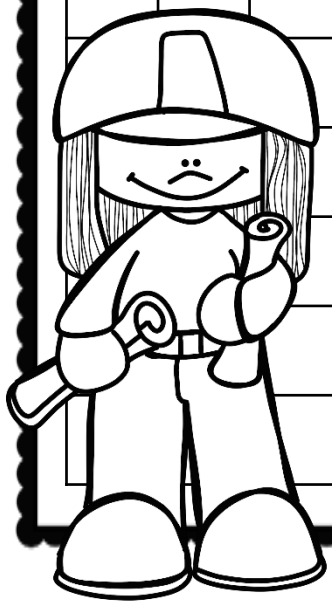
2 _____

_____

MATERIALS



My Blueprint



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