

ENGINEER IT!

NATIVE INNOVATIONS

Activity Guide



An engineer is someone who...

observes and wonders

uses tools to solve problems

constructs inventions

asks questions

explores the world around them

discovers and creates new things

You can engineer too!

Here is what you need to get started.



Poster—Check out the posters to see technologies designed by Oregon's first engineers.



Kit Materials—Many of the items you need are included in this kit.



Additional Supplies—Gather a few more items from around the house.

Your Team—This is a family adventure! Enjoy the activities together and remember that the youngest explorers will need help. The difficulty of challenges can be ramped up or down to match each engineer.



Exploration Time—The activities can be done in any order and spread out over multiple days. Some are quick and others take a bit more time.



Curiosity—Have fun inventing solutions and designing technologies!

ENGINEERS DESIGN TECHNOLOGIES

When you hear **technology**, what do you picture? Computers and phones? TVs and video games? Technologies are more than things that require electricity or batteries!

A technology is anything designed by a person to help solve a problem or meet a need.

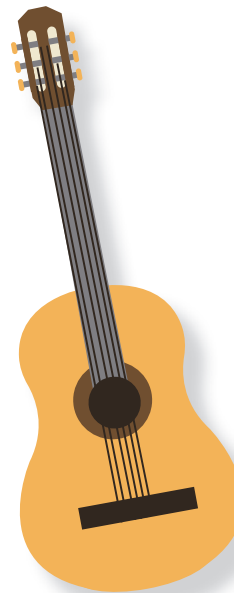
Which of these technologies have you used today?



Utensils



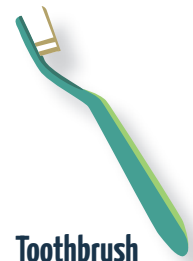
Recipe



Guitar



Cell phone



Toothbrush



Shoes



Basketball



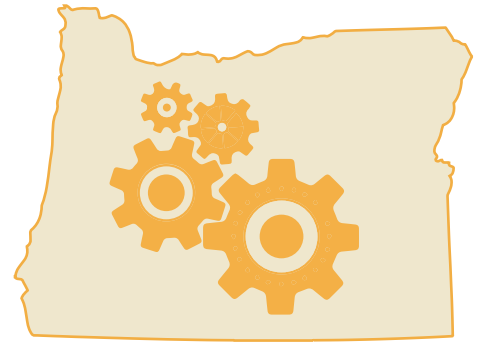
Backpack



Engineers use curiosity, knowledge about how the world works, and problem-solving skills to design solutions for challenges. When people design technologies, they are engineering.

OREGON'S FIRST ENGINEERS

Native Americans have long used science and engineering to create tools, homes, clothing, cooking methods, and more—passing this knowledge down through generations. Check out the posters to see technologies designed by Oregon's first engineers.



Technologies are all around us. Draw a technology you used today. Or, design and draw a new technology that helps you solve a problem.

Exploring Engineering at Home—A Note for Adults

Engaging in engineering activities builds creativity, critical thinking and problem-solving skills. Encourage your child to ask questions, brainstorm possible solutions, and try different ideas.

Let the fun happen! Help your child to “do it themselves” by allowing some messiness, letting them make mistakes, and guiding them with hints or open-ended questions—What happened? What do you want to try next? Can you show me how this works?



Visit the museum online and find more ways to explore Oregon's science and culture.
www.mnch.uoregon.edu

Challenge

DESIGN A BOAT

How many pennies can you float in a boat made from one piece of aluminum foil?

What you'll need:

- ☐ 2 aluminum foil sheets
- ☐ Scissors
- ☐ 15-30 Pennies (or other small items)
- ☐ Container of water

What to do:

1. Cut each large foil sheet into four equal pieces.
2. Use one piece of foil to make a boat and place it on the surface of the water. Does it float?
3. Add pennies slowly—one at a time. Count how many pennies your boat holds before it sinks.
4. Try again—can you improve your boat's design so it will hold more pennies?



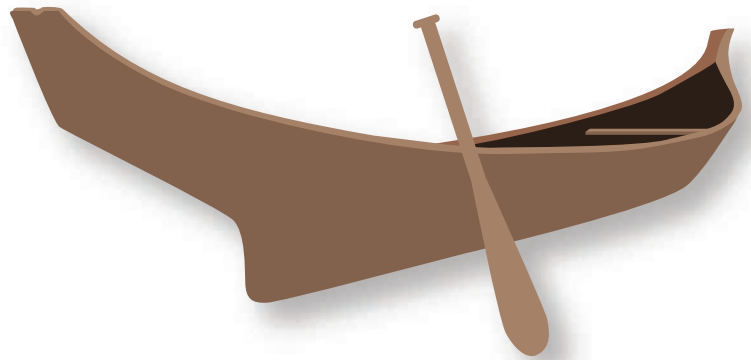
Keep on
Engineering

Design a boat using different materials that will hold even more weight before sinking.

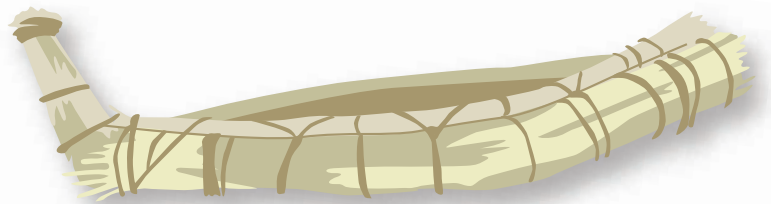
NATIVE AMERICAN CANOES

Native Americans in the Pacific Northwest developed methods for making effective watercraft using the resources available in their environment.

Coastal Tribes carved dugout canoes from a single, hollowed-out log.



Native peoples in Eastern Oregon communities made lightweight canoes using bundles of tule grass reeds.



Coquille Indian Tribe members paddle into the Ni-les'tun Marsh near Bandon after a restoration program opened tidal channels in the Coquille River estuary.

Photo: Roy W. Lowe/ U.S. Fish and Wildlife

Challenge

DESIGN A SHELTER



Using only index cards and paper clips, design and build a structure that:

- Measures at least six inches tall
- Fits at least three "people" inside
- Holds at least one beanbag on top

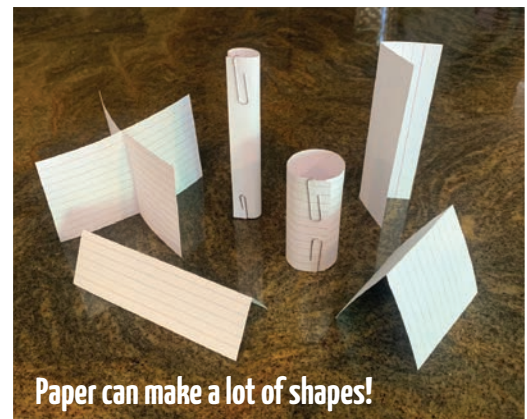


What you'll need:

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| ☐ Index cards | ☐ Beanbag (or a resealable bag partially filled with rice, beans, or flour) |
| ☐ Paperclips | |
| ☐ Ruler | ☐ "People"—small toy people, animals, or blocks |
| ☐ Scissors | |

What to do:

1. Gather your materials and start designing!
2. Build and test your structure to meet this challenge.
3. Make up your own shelter challenge—design a structure that is even taller, holds more weight, or has a door for people to enter and exit.



**Keep on
Engineering**

Design towers using different materials, such as cups, sticks, twist ties, cardboard tubes and boxes, or even pillows. How tall can you build? Can the tower hold any weight on top?

OREGON'S FIRST ARCHITECTURE

Early Native American people built homes made from natural materials that were designed to fit their lifestyle, as well as the climate and surroundings of the area in which they lived.

In Eastern Oregon, Native people, such as the Umatilla Tribe, designed lightweight shelters covered with woven mats to match their mobile lifestyle.



Come winter, coastal Tribes lived in plank houses built from cedar or redwood planks. These structures suited the wet climate and a more stationary lifestyle.



The Grand Ronde Plank House. Cedar logs form the support posts, while split cedar planks are used for the walls and roof. Note the size of the posts—they needed very large trees!



Photo: Confederated Tribes of the Grand Ronde

Challenge

DESIGN A BASKET

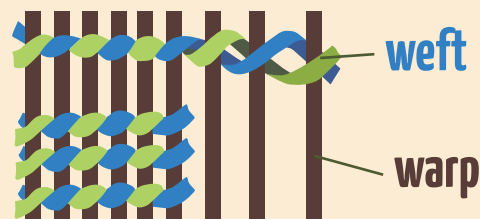
Use a traditional method of weaving, called twining, to create a basket out of a paper cup and yarn.



What is twining?

Twining is a traditional form of weaving that has been used for thousands of years to create baskets, sandals, woven mats, and other useful items.

Twining has two components—warps and wefts. The warps act like a skeleton, supporting the structure and shape. The wefts are twisted around the warps to create patterns and designs.



Klamath basket

What you'll need:

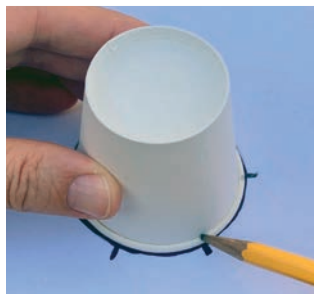
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| ☐ 2 paper cups | ☐ Scissors |
| ☐ Yarn—2 different colors | ☐ Pen |

What to do:

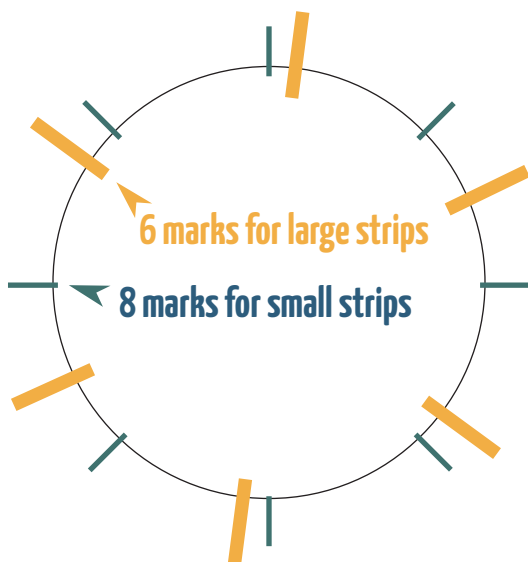
Prep the Yarn. Cut a piece of each color yarn about 4 feet long and tie the pieces together at one end. It will take 3-4 sets of yarn to complete a basket. Using multiple lengths of yarn will keep it from tangling and allows you change the design as you go.



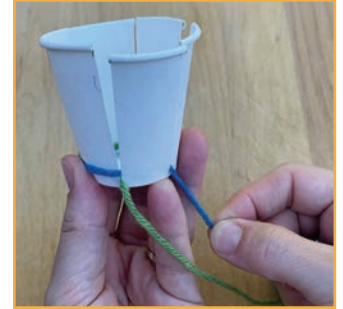
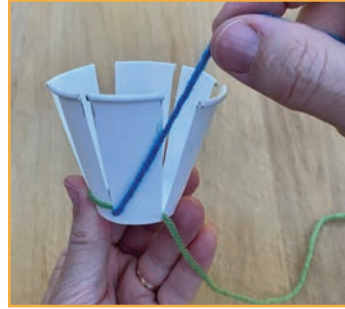
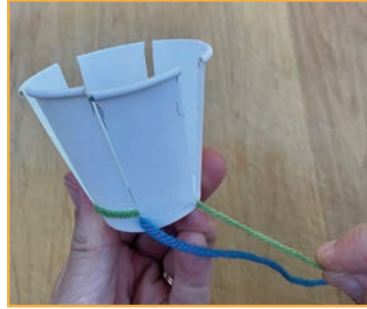
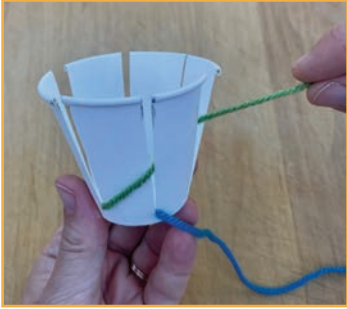
Prep the Cup.



Use the template to make an even number of marks around the rim of the cup. Place the yarn knot inside the cup, pulling one yarn piece through a slot and the other yarn piece through the next slot.



Start Weaving



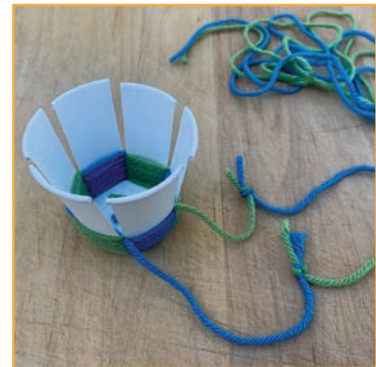
1. Start with the yarn color on the left. Weave it to the right by placing it **in front** of one strip and then **behind** the next strip. Pull gently down on the yarn and let go.

2. Pick up the other color of yarn and repeat step #1.

3. Continue weaving, switching to the opposite yarn piece after each weaving motion. This will make the yarn pieces “twine” around each other.

Hint: Gently push stacked yarn down on each paper strip as you go to keep a tighter weave.

4. When the yarn is almost out, tie another 4-foot length of yarn onto each piece to continue weaving.



Design Note: With an even number of paper strips, the colors will stack up together. You can keep colors the same or change colors to create a different design. Tying the opposite color onto each piece of yarn will make a checkerboard pattern.

5. Once you reach the top, tie the ends together. Tuck the loose yarn and knots down inside the woven yarn.



Keep on Engineering

Get creative and engineer your own basket design by changing colors of yarn or changing the shape of the paper strips. Try using other weaving materials such as pieces of plastic bags, fabric, string, or ribbon.

Natural basket challenge: Create a container out of natural materials that you can find outside. This might include weaving, but it does not have to.

Challenge

DESIGN A LAUNCHER

Design and build a tool that can “launch” a pom-pom.



What you'll need:

- | | |
|---|--|
| ☐ 10 craft sticks | ☐ Optional: masking tape; |
| ☐ 8-10 rubber bands | other recyclable materials |
| ☐ Plastic spoon | such as plastic bottles, lids |
| ☐ Pom-pom | or cardboard |
| ☐ Bouncy ball (optional) | |

What to do:

1. Think about tools that can launch, or propel, an object—like a catapult, diving board, pinball machine, or trampoline.
2. Gather your materials. Are some items stretchy or springy? How could this be helpful?
3. Start designing! Many different designs can work to solve this challenge. One option is pictured here. You can try **this design**, create your own, or do both.
4. Test your launcher tool. How does it work? Can you make improvements that will help the pom-pom go farther?



Keep on Engineering!

Launch a small ball or a ball of aluminum foil. How does it compare to the pom-pom?

Create targets using cups, tape circles, cardboard tubes, or other objects.

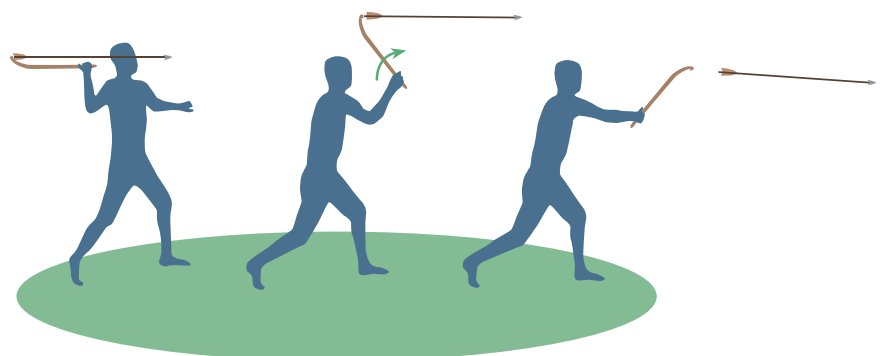
A TOOL FOR THROWING

The atlatl is a hunting tool designed to improve strength and distance when throwing a dart. By doubling the length of a hunter's arm, an atlatl can launch a dart six times farther than if it were thrown.



Photo: Hannah Schwalbe/ National Park Service

The atlatl is a technology that was invented and used by Native peoples prior to the later invention of the bow and arrow.



Challenge

DESIGN A GAME

Safety first! Once you have some ideas, check in with an adult to make sure your game plan is safe.

Invent a game to play with your family or a friend.

What to do:

1. Think about games you like to play. Do you want to design a board game, a ball game, a guessing game, or a game that involves building or balancing?
2. Gather your materials and start designing!
3. Think about:
 - How will people play your game?
 - Do players take turns or play at the same time?
 - What are the rules?
 - How does the game end?
4. Ask a family member or a friend to play with you!

Use any materials that are available at home such as balls, dice, string, paper, pens, crayons, scissors, tape, rubber bands, paper plates, cups or bowls, cardboard tubes, cereal boxes, plastic bottles, or other recyclable materials like plastic lids, twist ties, or boxes. Be creative!



Ball maze game made with a box lid, paper, cardboard, and tape.

FUN AND GAMES

Several Oregon Tribes played, and continue to play, a version of double ball—a game similar to lacrosse. The rules and equipment differed based on where a Tribe lived and the natural materials available.

Games and sports teach teamwork, fairness, and how to be respectful to opponents.



Photo: Tamástslikt Cultural Institute



Keep on Engineering!

Dream up new challenges and then design solutions using materials and supplies that you have at home, in the recycling bin, or even ones you can find outside.