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Bruce Museum at Home
STEAM Activities for Children
Lesson # 18: Spin Me Right Round
Week of July 27th, 2020

This week's STEAM At Home lesson will have you turning a full 360 as you and your learners make pinwheels and waterwheels. Expect to get a little wet as you and your learners will be using air and water to get your wheels spinning. Please plan accordingly before beginning any project with your learners, and don't forget to wear sunscreen if you are experimenting outside.

Learners will use their science journals to predict, record, and explore their experiments. If your learners haven't made a science journal, instructions can be found here. If learners have a notebook, or other paper they prefer to use, that's fine.

In order of appearance, this lesson contains: a materials list for Spin Me Right Round and a simple art activity, instructions for the experiment, ways to add on to the activity, a brief art activity, and NGSS Performance Expectations.

A note for adults: *The directions for the pinwheels suggest that you and your learners use push pins to hold your pins in place, and the directions for the waterwheels suggest that you and your learners use duct tape. Please be careful using these materials as the pins are pointy and duct tape is extremely sticky and can get stuck on anything. Help your learners use appropriate caution when handling these materials.*

Materials for the pinwheels: pinwheel template, paper, scissors, a pencil, straw or stick, push pins or straight pins, masking tape, ruler.

Materials for the waterwheels: paper plates, 12" skewers, small plastic cups, recycled yogurt containers, plastic spoons, duct tape, scissors.

Craft Project: markers, crayons, colored pencils, stickers, tape, tissue paper streamers.

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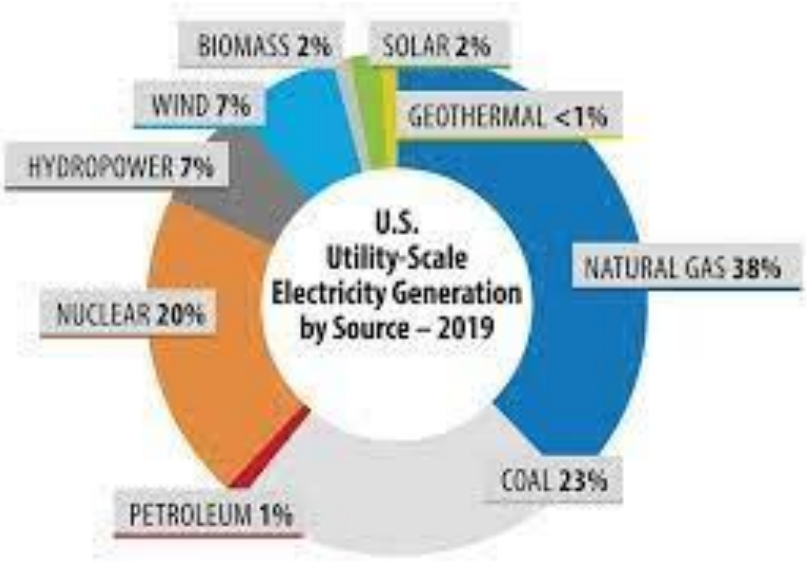
Round and Round We Go



Pinwheels and waterwheels have a lot in common, despite using a different source of power. Both are constructed to harness physical energy. Water and wind are both used in contemporary power plants - either through wind turbines or hydro-electric dams. Currently, 14% of the electricity used in the United States comes from these sources.

Ask your learners to think about the construction of waterwheels and pinwheels. Both of these structures are essentially a wheel or ring with buckets or depressions that catch the force of the water or wind while spinning on an axis.

- How do these structures work?
- Where is force applied?
- What does the force do?
- Have they ever seen a water wheel in person?
- Have they ever seen something like a giant pinwheel (a wind turbine or a windmill)?
- Are wind and water sources of physical or chemical energy?

Turn Turn Turn

There are instructions for making two types of physically powered wheels in this lesson plan, pinwheels and waterwheels. To make a pinwheel, it is easiest to follow a specific template/model. To make a water wheel, there are general design suggestions. In either case, feel free to explore and get creative. **Pinwheel:** Pinwheels are fun and easy to make. There are a couple steps which can be tricky but follow these directions and you should be spinning in no time.

- Print out the pinwheel template as a reference or to use as your actual pinwheel.
- Using a pair of scissors, trim a rectangular piece of paper into a square, or start with a square piece of paper.
- Using either the template or your ruler, mark a small dot in the center of the square.
- Cut diagonally in from each of the four points halfway to the center dot.
- Carefully fold back every other point so that they meet at the center, your paper will now look like a pinwheel.

    - Use a small piece of tape to hold the points in the center.
- Using a push pin, attach your pinwheel to the unused eraser of a pencil, a straw or a wooden dowel.
    - Make sure that there is enough space on the pin for the pinwheel to spin. You can test this out by blowing on it and seeing if it moves, and then cover any bit of pin sticking out with a bit of masking tape.
- You have a pinwheel!

Waterwheel

- Start by taking two paper plates and stacking them one on top of the other.
- Using the tip of a scissors or the point of a skewer, poke a hole through the center of both plates.
- On one of the plates, on the flat side, use your duct tape to attach at least 4 small plastic cups or used yogurt containers to the plate, so that the cups face outwards.
    - Attach your cups strongly and make sure the open sides face outwards.
    - Be careful with duct tape; it is very sticky.

- Tape the other plate to the opposite side of the cups, flat side facing inwards in the same way, so that the cups are sandwiched between the two plates.
    - The openings of the cups should be unobstructed.
- Insert the skewer through the two plates and give your wheel a spin.
    - If anything falls off, tape it back on!

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- Give your water wheel a test by turning on the tap and allowing the running water to flow over the wheel while you or your learner holds the two ends of the skewer.
    - If everything was done correctly, your water wheel should start spinning!

The best way to really explore both of these wheels is to take them outside. Waterwheels can be incorporated into any water play that you are engaging in with your learners. Pinwheels can be stuck into the ground and used to monitor wind patterns.

Questions to Extend the Activity

- What aspects of your design can be changed or altered to make the wheel move faster?
- What aspects of your design can be changed or altered to make the wheel move slower?
- Could you add more cups to the waterwheel?
- Could you cut the pinwheel differently so that it had more or less folds?
- Could you do something to measure the energy the wheels are releasing?
- If you add more force (wind or water), can your wheel handle the additional power?

Craft Project

Pinwheels provide an excellent opportunity to create flashy and expressive designs. After you and your learners have created your first pinwheels, think about how you can create your design on the paper before you cut it out.

- The pinwheel has an inside and an outside, so think about where you want to add color or patterns.
- Add stickers or glitter for an eye catching sparkly.
- Think about how colors and patterns will blend together when your pinwheel is moving.

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NGSS Performance Expectations

K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

K-PS2-2: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*

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.

K2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

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.*

3-PS2-2: Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.