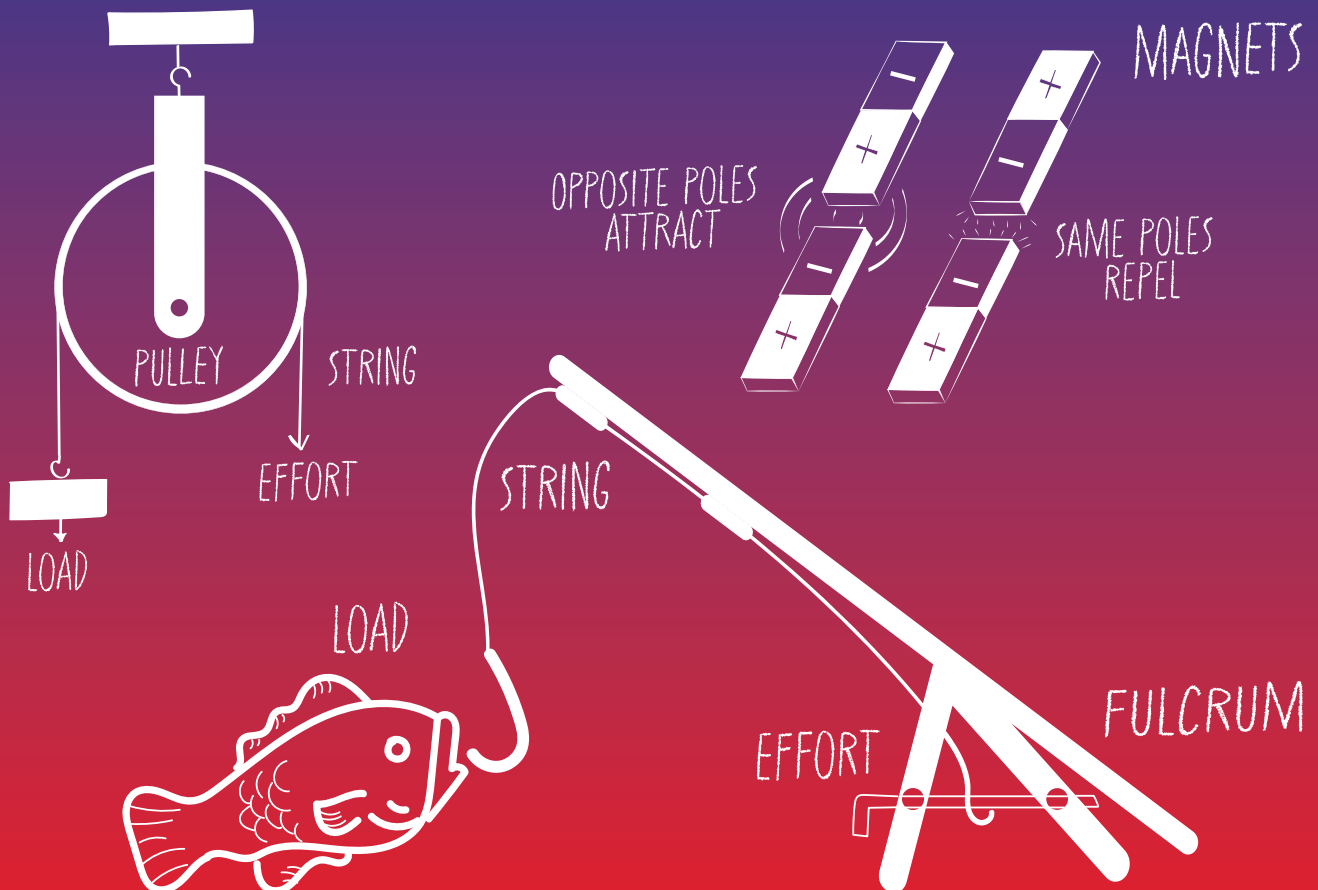


DREAM. BUILD. BECOME.

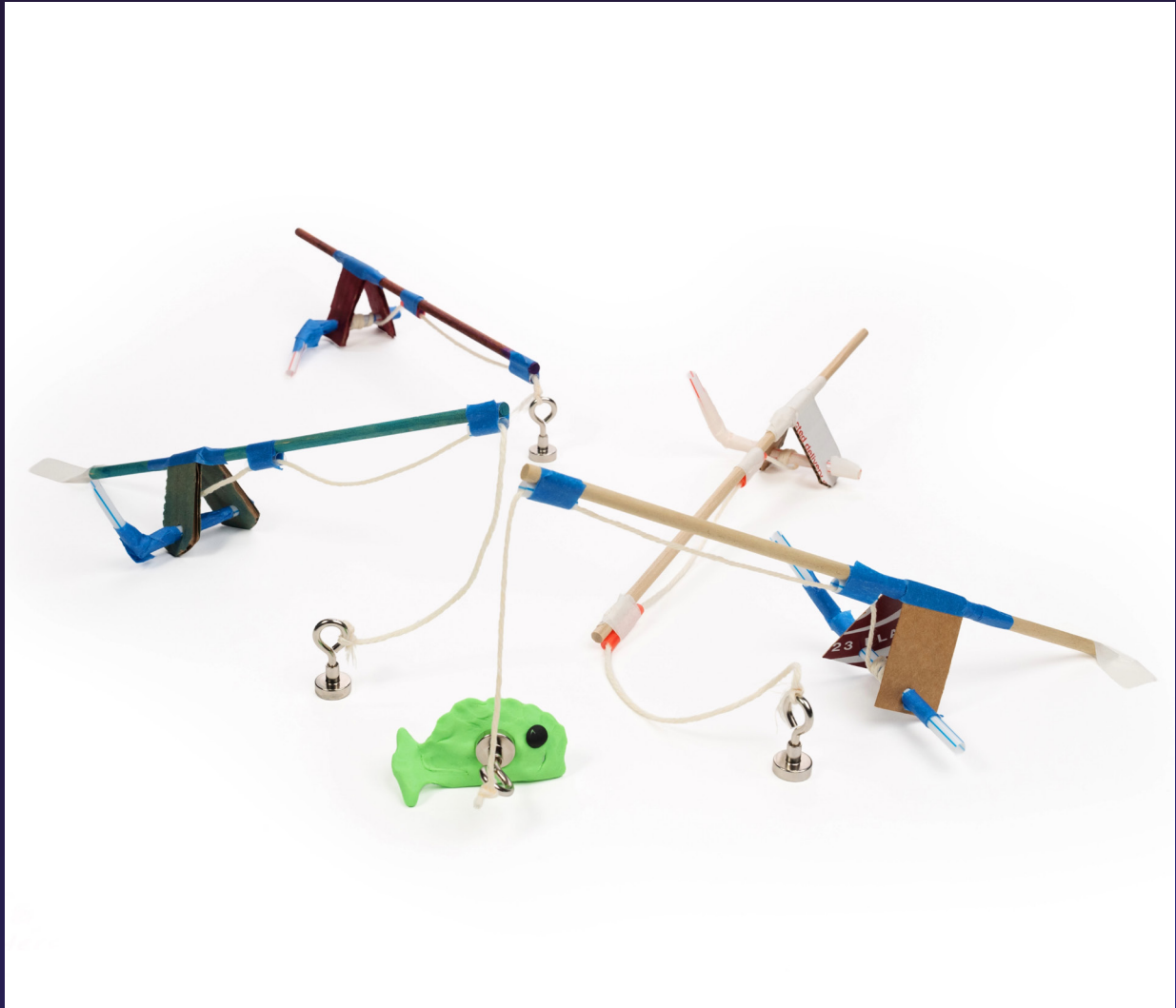
ACE METAL FOUNDATIONS

By IACMI

The Reel Machine



The Reel Machine



Prior Knowledge

Students should have experience turning objects with their hands, such as knobs, wheels, or handles. Students should be able to follow simple, multi-step directions and use classroom tools, such as scissors and tape, with guidance.

The Reel Machine

Lesson Overview

In this activity, students build a simple reel machine using everyday materials. The reel works like a fishing reel. When students turn a handle, the string winds around the reel and pulls an object closer.

Students construct their reel machine and test how turning motion causes the string to wrap and move. As they use the machine, students observe how changing the way they turn the handle affects how the object moves.

Students also use a magnet and paperclip as a hook to “catch” an object, allowing them to focus on how the reel pulls the object rather than how it is attached. Magnetism supports the activity but is not the focus of the lesson.

Through building, testing, and observing their reel machine, students explore how simple machines help people move objects in a controlled way by changing motion.

Vocabulary

Machine - Something people build to help them do work more easily.

Reel – A part of a machine that winds string or rope when it turns.

Parts – Pieces that are put together to make a machine.

Pull – To move something closer.

Turn – To move something in a circle.



Figure 1: A crane uses pulleys to lift heavy materials with less effort.



Figure 2: A fishing reel uses a wheel-and-axle system to make pulling in a fish easier.

The Reel Machine

The Foundations of Reel Machines

People build machines to help them do work more easily. Some machines help people move objects by changing how motion works. Instead of pulling something by hand, a machine can use turning motion to do the pulling.

A reel is one part of a machine that does this. When you turn a handle, the reel begins to spin. As it spins, string or rope wraps around it. As the string wraps up, it becomes shorter, which pulls an object closer. Turning slowly pulls gently, while turning more pulls the object farther.

Reels help people move things in a controlled way. Because the string wraps evenly around the reel, objects can be lifted, lowered, or pulled without slipping or jerking. This makes reels useful when people need to move things carefully or safely.

Reels are used in many real machines. Fishing poles use reels to pull in fishing line. Cranes use reels to lift heavy materials. Winches and tow trucks use reels to pull objects that are too heavy to move by hand. In each case, turning motion helps do the work.

To make these machines work properly, people carefully put the parts together so the reel can turn smoothly, and the string can wrap evenly. In this activity, you will build and test a reel machine and explore the same ideas people use to design and build machines that help them do work.

Materials

Materials Supplied in Kit

Per Student

- One $\frac{1}{4}$ " $\times$ 12" dowel rod
- One drinking straw
- Approximately 30 inches of kite string
- One magnetic hook
- One paperclip

Shared

- Play dough
- $\frac{3}{4}$ inch painter's (masking) tape

Materials Supplied by Teacher

- Sharpened #2 pencil
- Single hole punch
- Scissors
- Cardboard

The Reel Machine

Activity Directions

Materials



Step 1: Prepare the Cardboard Bracket

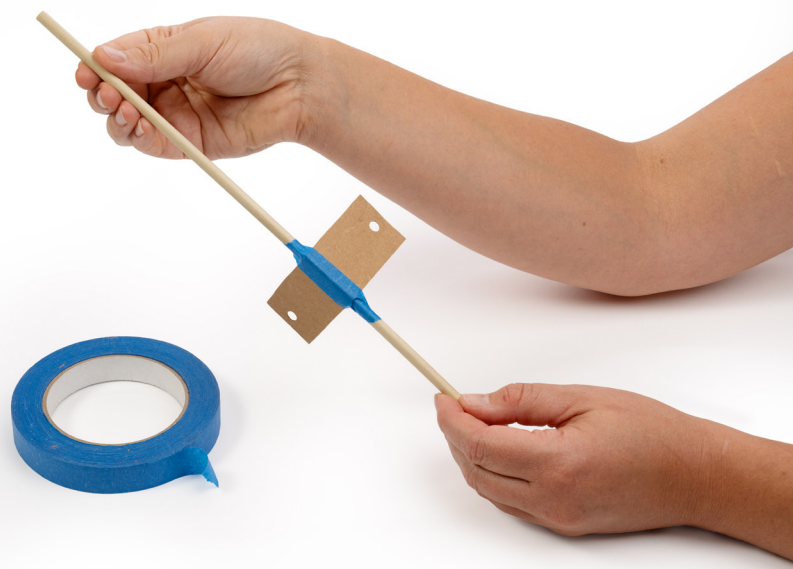


- Each reel machine uses a 1 inch x 4 inch cardboard strip as a bracket. This bracket may be prepared by the teacher ahead of time or made by students with guidance, depending on time and classroom needs
- Cut a 1 inch by 4 inch rectangle out of cardboard
- Punch one hole near one end of the cardboard strip. This can be done with a hole punch, or by pushing a sharpened pencil through the cardboard
- Fold the cardboard strip in half
- Use the first hole as a guide to punch a matching hole through the other side

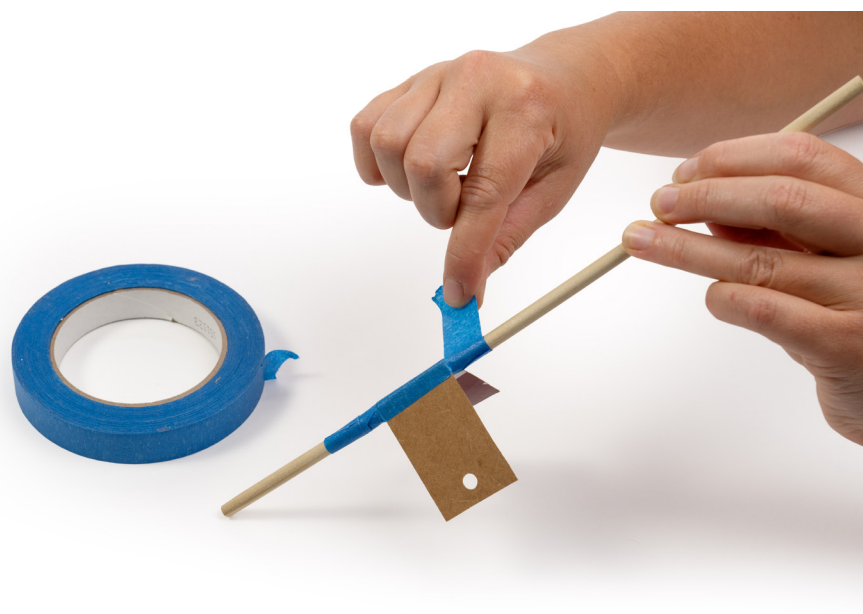
The Reel Machine

Activity Directions Continued

Step 2: Strengthen and Attach the Bracket



- Place a piece of tape along the folded edge of the cardboard to reinforce it
- Tape the folded bracket to the dowel rod about 2-3 inches from one end
- Use additional tape to secure the bracket firmly so it does not move



The Reel Machine

Activity Directions Continued

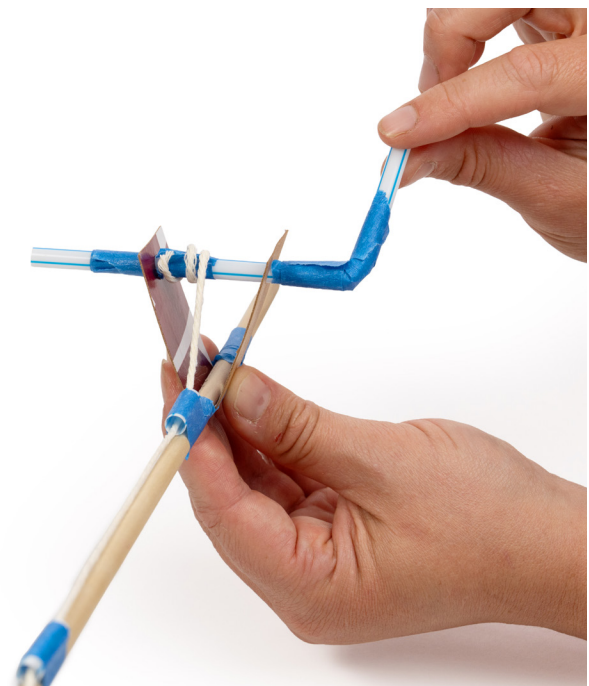
Step 3: Create the Reel Handle



- Cut a 6-inch section from the drinking straw
- Bend the straw about 1/3 from the end to form a right angle
- Tape the bend so the straw keeps its L-shape

Step 4: Install the Reel Axle

- Insert the straight end of the straw through the two holes in the cardboard bracket
- Position the bent handle on the left or right side, depending on student preference
- Spin the handle to check that it turns freely. If needed, widen the holes slightly using a pencil



The Reel Machine

Activity Directions Continued

Step 5: Secure the Reel

- Wrap a small piece of tape around the straw on the opposite side of the handle (this prevents the straw from sliding out while allowing it to spin)



Step 6: Add Line Guides

- Cut two 1-inch pieces from the remaining straw
- Tape one guide near the tip of the dowel rod and one close to the reel. These guides help keep the string aligned as it winds



The Reel Machine

Activity Directions Continued

Step 7: Add the Fishing Line and Hook

- Thread the string through the straw guides
- Tape one end of the string securely to the straw reel between the cardboard arms
- Tie the magnet to the free end of the string. *Note: the string shouldn't exceed the length of the reel. This prevents the reel from binding on one end of the reel.*



Step 8: Test and Adjust the Reel Machine

- Turn the handle and observe how the string wraps around the reel
- Adjust the string position if it begins to bunch up

Be aware that if students fish too close to each other, their magnets will stick to each other.



Step 9: Make the Fish

- Use just enough play dough to shape a fish around a large paper clip

The Reel Machine



Discussion Prompts or Reflection

- What happened to the string when you turned the handle?
- How did turning the handle make the fish move?
- What other machines might use a reel like this?
- Why might people use a machine like this instead of pulling by hand?

Foundation Exploration

- **Construction Workers** use machines with reels to lift and lower materials safely at building sites
- **Crane operators** use reels and cables to raise heavy objects by turning controls that wind the cable
- **Fishing and Marine Workers** use reels to pull in lines and nets in a controlled way
- **Manufacturing Technicians** assemble machines with moving parts, making sure reels, handles, and cables turn smoothly