deSTEMber
SCIENCE ★ TECHNOLOGY ★ ENGINEERING ★ MATH
PRESENTED BY: girlstart

Dancing Figure

Turn up the music to feel the vibrations! Learn about displacement, equilibrium, and acoustical engineering while building a figure that dances on top of a cup. Watch your wire person move as you discover the science behind sound waves.

TEKS:

SCI 3.6 B: The student is expected to demonstrate and observe how position and motion can be changed by pushing and pulling objects such as swings, balls, and wagons.
SCI 4.6 D: The student is expected to design a descriptive investigation to explore the effect of force on an object such as a push or a pull, gravity, friction, or magnetism.
SCI 6.8 B: The student is expected to identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces.

Materials:

- Ballpoint pen
- Craft wire (22 gauge)
- 1-inch diameter Styrofoam ball or bead
- Markers
- Paper cup
- Pipe cleaner
- Scissors
- Stapler with staples
- 1-inch straw piece

How To:

Part 1: Creating a line of staples on the paper cup

1. Place a dozen staples in a line on the side of the cup from bottom to top, ensuring that they are equidistant from one another and that each staple runs perpendicular to the vertical line on the cup.
2. Staple so the straight edge of the staple is on the outside of the cup.
3. Use markers to decorate your stapled cup.

Part 2: Assembling the wire figure

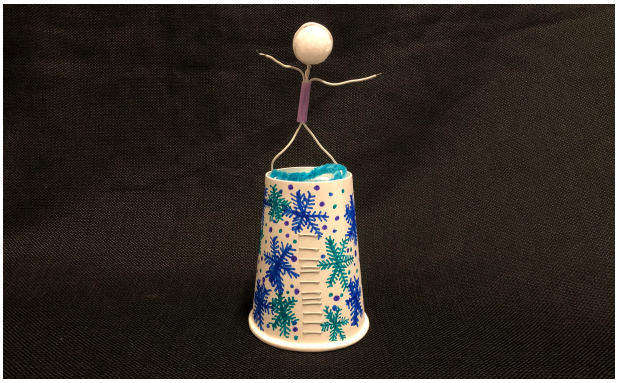
1. Using a pair of scissors, cut three 5-inch pieces of wire.
2. Slide two of the 5-inch pieces of wire through the 1-inch straw piece. Position two wires above the straw to generate arms and two pieces below to form legs.
3. Be sure that the wire below the straw for the two legs is slightly longer than the wire above the straw for the two arms.
4. To create the head, take the remaining 5-inch piece of wire and bend it in half, wedging the Styrofoam ball or bead into the crease of the wire.
5. Secure the head and neck portion of the wire figure by placing both ends of the 5-inch piece of wire into the straw body.

Part 3: Securing the wire figure onto the paper cup

1. Create a 2-inch diameter circle using the pipe cleaner by bending and twisting the ends of the pipe cleaner together.
2. Once the pipe cleaner ring has been formed, secure the wire figure onto the pipe cleaner by laying the ring flat on the table and twisting the ends of the feet around the ring.

Part 4: Watching the wire figure dance

1. Place the wire figure that is secured onto the pipe cleaner ring on top of the upside down paper cup.
2. While holding the very bottom rim of the upside down cup with the wire figure on top, use the tip of a ballpoint pen to rub the line of staples up and down. What happens?
3. Observe as the wire figure dances in response to the vibrations!



STEM Explanation:

All things wiggle, meaning they move back and forth. Objects can move in a variety of different ways, so it's important to study the science behind these movements, also called vibrations. Much of what we observe and experience in our physical world is due to vibrations and waves. Vibrations of an object occur when a force acts on that object to restore it to its original resting position after it has been displaced. In the wire figure example, the staples are displaced from their original position when a pen is rubbed along the line of staples. The resulting vibrations are what cause the wire figure to move and dance. Once the figure returns to a resting position, the vibrations will stop and the object is said to have returned to equilibrium, which is when all forces are balanced. The staples will remain in equilibrium until a force, such as the rubbing with a pen, acts upon the staples to displace them once again.

Career Connection:

Acoustical engineers deal with sound and vibrations. Their main concerns are focused around how they can manipulate, analyze, and control sound. In the field of acoustical engineering, professionals can work in fields such as architectural acoustics as well as noise or vibration control. These professionals can be found working in a multitude of places and fields, such as in health care to develop ultrasound technology, in the music industry to develop sound synthesizers, or even in large concert halls to maximize sound.

Resources:

http://www.arvindguptatoys.com/toys/Rubanddance.html
http://www.physicsclassroom.com/class/waves/Lesson-0/Vibrational-Motion