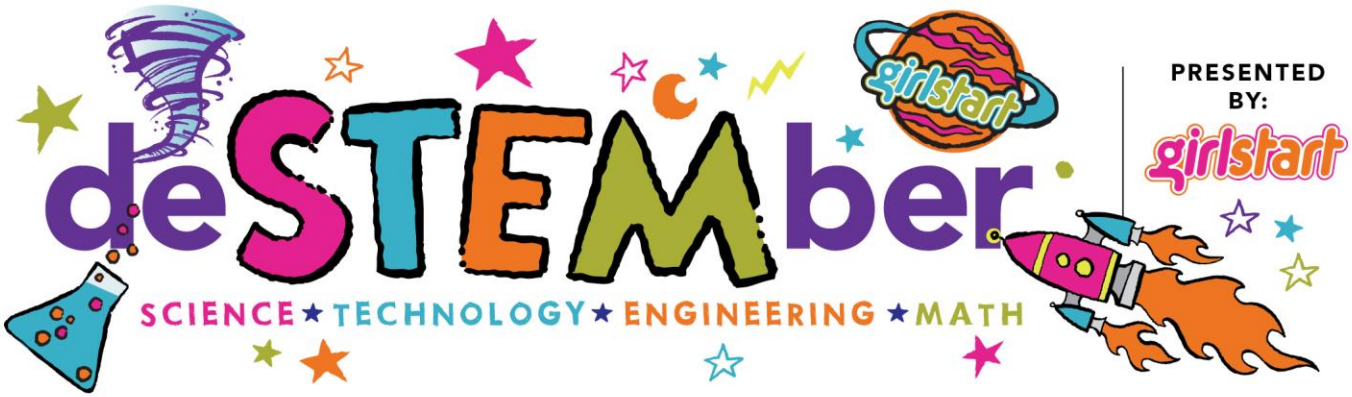

Laser Show

Have you ever seen a laser show and wanted to create one of your own? Use some fairly common items to learn about how sound waves travel to create your own laser show!

TEKS:

5.6A: Explore the uses of energy, including mechanical, light, thermal, electrical, and sound energy.
5.6C: Demonstrate that light travels in a straight line until it strikes an object or travels through one medium to another, and demonstrate that light can be reflected, such as the use of mirrors or other shiny surfaces, and refracted, such as the appearance of an object when observed through water.

Materials:

- Coffee can, or similar container, with approximately 4-6” round opening
- Laser pointer (WARNING: Lasers can be very dangerous. Do not point them into anyone’s eyes!)
- Latex glove
- Old CD (or other small reflective material)
- Rubber band
- Stand-alone speaker that fits inside the coffee can
- Super glue
- Metal straight edge
- Permanent marker
- Ruler
- Scissors
- X-Acto knife or box cutter

How To:

1. Remove the lid of the coffee can.
2. Clean and dry out your coffee can to make sure nothing will damage the speaker.
3. If your speaker requires a cable, cut a small hole in the side of the coffee can as close to the bottom as possible. Try to make the hole only big enough to allow the cable to pass through.

4. Place your speaker, facing up, inside the coffee can. Center it on the bottom of the can. Make sure the speaker is turned on. If using a Bluetooth speaker, don't forget to pair it with your sound source.
5. If the speaker has a cable, thread the cable through the hole you made. (You can cover the hole with tape if the hole is too large.)
6. You may choose to attach your speaker to the bottom of the can using tape or other means, but be careful not to damage the working components of the speaker.
7. The glove will provide the latex needed to cover the opening of the coffee can. First, use scissors to cut off the fingers of your glove. Then, cut the glove in half along the thumb side. Finally, cut any remaining pieces that are preventing the glove from opening up into a rectangle.
8. Stretch the rectangular piece of latex (from the glove) over the opening of the coffee can. (Make sure the speaker is already inside the can before you do this!) Try to stretch the latex as evenly as possibly in all directions over the top of the can. It should be tight enough that if you flick it, it will vibrate, but not so tight that it will easily rip.
9. Use the rubber band to hold the latex in place by wrapping it around the outside of the can.
10. Trim away any large, excess pieces of latex that are hanging over the side of the can.
11. **With adult supervision**, cut an approximately 1 inch by 1 inch square out of the CD using large scissors or an X-Acto blade and a metal straight edge. This will be the reflective surface for the laser beam. Be very careful when cutting! The knife can easily slip across the smooth surface of the CD; the cut edges of the CD will be very sharp.
12. Attach the mirror (CD square) to the center of the piece of latex covering the can. To do this, use the ruler to find the exact center of the latex covering. With the permanent marker, make a small dot in the center of the latex.
13. Place 1 drop of super glue over the dot in the middle of the latex covering, and center the CD square, **reflective side up**, onto this. Let dry for approximately 1 minute.
14. Before you power up your laser show, an important warning. **Lasers can be very dangerous. Do not point them in anyone's eyes or let your laser show hit anyone in the eyes!** The safest place to display your laser show is on a wall or ceiling.
15. Choose a song for your laser show. Connect the speaker and push play.
16. Point your laser at the center of the CD square, and watch it dance to the music. Experiment with pointing the laser from different angles, but be very careful to avoid your own eyes and others' eyes. Does your laser show look best on the wall? On the ceiling? From close up or far away?
17. OPTIONAL: Build a stand for your laser by bending a wire coat hanger (or another means) to make a base and secure your laser pointer to it. Your stand should steadily aim the laser at the CD square. Be sure the laser pointer is securely fastened to prevent it from slipping and accidentally pointing into someone's eyes.

STEM Explanation:

Sound travels in waves made up of compressions (high pressure) and rarefactions (low pressure). The speaker makes sound by pulsing forwards (creating a compression) and backwards (creating a rarefaction). With the speaker inside the coffee can, the can directs all of the sound upward to the latex covering. The sound waves cause the latex covering with the attached mirror to vibrate. The small vibrations result in large differences in the laser's reflection over a distance.

Career Connection:

Lighting designers work with many people (the director, choreographer, set designer, costume designer, and sound designer) to create the lighting, atmosphere, and time of day for a theater production. When creating a lighting design, the lighting designer has to consider not just the story line, but also things like safety, visibility, and cost. In addition to theater, lighting designers can work in areas as diverse as rock and pop tours, corporate launches, art installations, and massive spectacular celebrations like the opening and closing ceremonies for the Olympics.

Resource:

Courtesy of Topher Stumreiter

