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deSTEMber

SCIENCE ★ TECHNOLOGY ★ ENGINEERING ★ MATH

Light Pollution

Would you like to see more stars in the night sky? Design a streetlight shield prototype to protect night sky observations from light pollution!

TEKS:

SCI 5.2 B: The student is expected to ask well defined questions, formulate testable hypotheses, and select and use appropriate equipment and technology.
SCI 5.6 A: The student is expected to explore the uses of energy, including mechanical, light, thermal, electrical, and sound energy.
SCI 5.6 C: The student is expected to demonstrate that light travels in a straight line until it strikes an object and is reflected or travels through one medium to another and is refracted.

Materials:

- Aluminum foil (6-inch square)
- Felt or fabric (6-inch square)
- Flashlight
- Scissors
- Tape
- Tissue paper (6-inch square)

How To:

1. Take a flashlight into the bathroom, living room, or somewhere in your house where it can get very dark.
2. Turn off all the lights, turn on the flashlight, and set the flashlight on its end so that it shines toward the ceiling. Take note of how bright the room is.
3. Turn the lights back on. Grab the aluminum foil square and fold it in half so that it makes a tent shape.

4. Put a small piece of tape on two opposite corners of the foil and attach it to the top of the flashlight. Angle the opposite two corners down.

5. Turn the lights off again and observe the light in the room. Is the room darker than before? Where is the light from the flashlight shining?
6. Remove the aluminum foil shield and repeat steps 3-5 using tissue paper on top of the flashlight and then run the test again using felt.

Now that you've tested the effects that different materials can have as a flashlight "shield," take some time to read the STEM Explanation below to learn more about light pollution. Then, use aluminum foil, tissue paper, felt, and any other household items you have available, to design a light shield prototype (a small-scale model) that could be used on street lights in your neighborhood to decrease the amount of light that spills into the sky. Attach your prototype to your finished flashlight and test its effectiveness in a dark room. Make modifications as needed.

STEM Explanation:

Are you able to see stars during the day? Probably only one star (the Sun). The Sun's bright light blocks our ability to see other stars! When light from the Sun goes away at night, light from distant stars becomes visible. Did you know that everyone on Earth has the potential to see over 4,500 stars every night? And that is without using a telescope! Most nights it seems like there are many fewer stars in the sky, though. Sometimes this is because clouds, buildings, or trees are covering the stars. However, even on a clear night, many stars are not visible to our eyes, especially in the middle of a neighborhood or city. This is because of light pollution.

Light pollution is a phenomenon caused by man-made sources of light which artificially brighten the night sky and affect our ability to see the stars. And light pollution doesn't just affect astronomers or people trying to stargaze. Exposure to artificial light at night can be bad for human health, and many animals rely on specific

day-night cycles, which can be disrupted by light pollution. Turning off all lights everywhere would technically take care of our light pollution problem, but this would also be incredibly dangerous because people need lighting to see at night! There is a way to help fix our light pollution problem, though. Quite a bit of outdoor lighting is not built very well and light spills into the sky rather than focusing its brightness on the areas that people actually want illuminated. Special outdoor lighting designs like streetlight shields make it much easier for us to see the stars at night!

Career Connection:

Astronomers study planets, moons, stars, galaxies, meteors, comets and their interactions with each other. They investigate the origin of the universe and observe how forces, such as gravity, change throughout space. Astronomers collaborate with their peers to better understand how the universe works at microscopic and macroscopic levels.

Resources:

https://nightsky.jpl.nasa.gov/news-display.cfm?News_ID=745
https://www.darksky.org/our-work/lighting/lighting-for-citizens/bad-streetlights/
https://letstalkscience.ca/educational-resources/stem-in-context/light-pollution