



Engineering a World without Light Pollution

You've heard about air and water pollution, what about light pollution? The consequences of light pollution are real, but so are the solutions.

Learn to engineer a world without light pollution through this hands-on, fun, interactive activity.

GBO suggestion - Introduce light pollution with one of these videos:

- Astronomy Ranger Minute <http://www.greatbasinobservatory.org/lesson-plans/engineering-world-without-light-pollution>
- The Solution is Easy <http://www.greatbasinobservatory.org/lesson-plans/engineering-world-without-light-pollution>
- Saving the Dark Trailer <http://www.greatbasinobservatory.org/lesson-plans/engineering-world-without-light-pollution>

Time

- 30 minutes prep time to darken room
- 30 minutes class time for activity

Grades

- 3– 8

Next Gen Science Standards

- (KESS2-2) ESS3.C: Human Impacts on Earth Systems
- 4-ESS3 Earth and Human Activity
- 5-ESS3 Earth and Human Activity
- MS-ESS3-3C Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Utah Core Science Standards

- 3.5.1c Provide examples of how sunlight affects people and animals.
- 6.3.2 Describe the use of technology to observe objects in the solar system and relate this to science's understanding of the solar system.
- 8.4.3 Design a solution to monitor or mitigate the potential effects of the use of natural resources.

Materials

- ◇ Small Maglites with light cover removed, one for each student group
- ◇ Small amount of Play-Doh, 1 for each student or group, to stick Maglite in
- ◇ Black sheet of paper, one for each student group
- ◇ A variety of classroom materials to engineer night friendly light shields
- ◇ Optional - Map of the neighborhood for each student group
- ◇ Optional - Small toy person to place under street light as a pedestrian
- ◇ Optional - Lab sheet for each student

Do Ahead

- This activity will work best if your classroom is completely darkened. You will need to cover all light from windows ahead of time.
- Watch darkskydemo <https://www.youtube.com/watch?v=XTjR4vef8JU> for a 2 min. demo of this activity.

Directions

- You will already have the room prepared, with little or no light.
- Discuss with students the harms of light pollution (wasted energy placing night-time lighting where you don't want it, losing the ability to view the Cosmos, animal's needs for darkness, and human health concerns). You may choose to introduce the concept of light pollution through videos suggested on the top of page 1.
- Discuss how communities can engineer light to go only where we want it.
- Each student group will need to have– 1 Maglite with top removed, leaving light bare, optional neighborhood map to place under street light, optional pedestrian, a small amount of Play-Doh to keep the Maglite upright, a variety of simple classroom materials to use in engineering night sky friendly lighting, and a sheet of black paper to simulate the night sky.
- Students will place the map in the center of their group, put the playdough in the center of the map, place the un-shielded Maglite into the playdough to construct their streetlight, place pedestrian if using under street light.
- Next students fill out the top of the Lab Sheet with a hypothesis for how the un-shielded light will project light onto the neighborhood and the black sheet of paper they will hold above to simulate the dark night sky. Turn off classroom lights to perform experiment. Fill out Lab Sheet with observations.
- Next students complete Lab Sheet sketches and hypotheses for how to eliminate light pollution through their own engineering. Students construct their light shields and test with the lights turned off. The goal is to have the most light on the pedestrian below the street light and the least light in the night sky (black paper held above) or in the other parts of the neighborhood.

Post lesson: After putting materials away, you may want to end the lesson with this one minute video:

What You Can Do - Help Protect Wildlife <https://www.youtube.com/watch?v=ooLYWwA43SE>



Example of unshielded Maglite and resulting glare from darkskydemo <https://www.youtube.com/watch?v=XTjR4vef8JU>

Name _____

Engineering a World without Light Pollution Lab Sheet

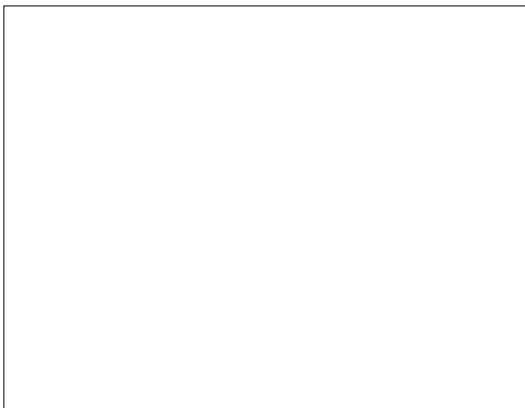
Write your hypothesis for what the neighborhood map below your uncovered street lamp will look like?

Write your hypothesis for what the dark night sky above your uncovered street lamp will look like?

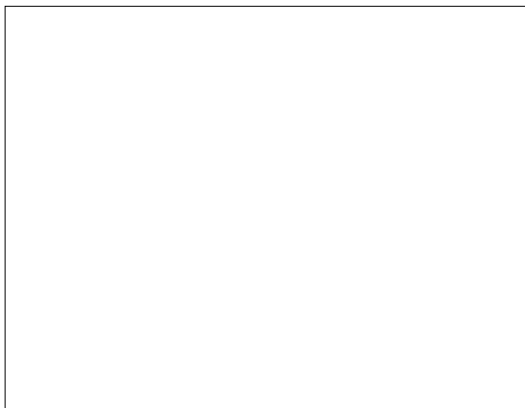
Now be an engineer!

With your team construct at least three light shields to test on your street light. Be sure to write a hypothesis before you test each one. Your goal is to aim light only where you want it.

Sketch your design



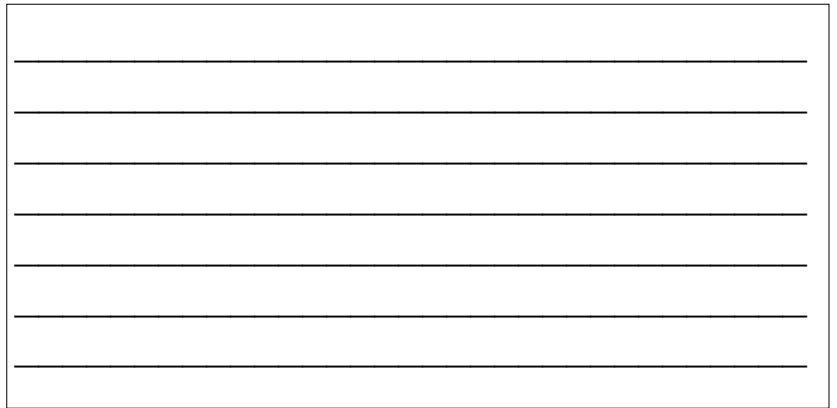
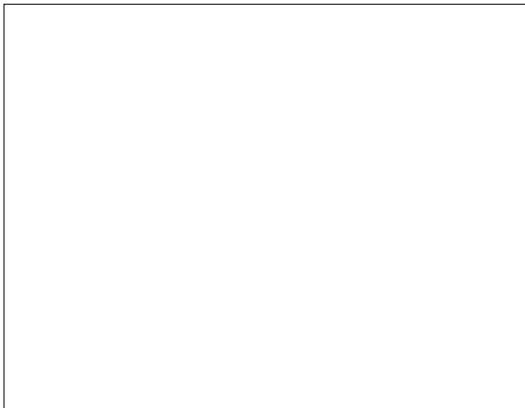
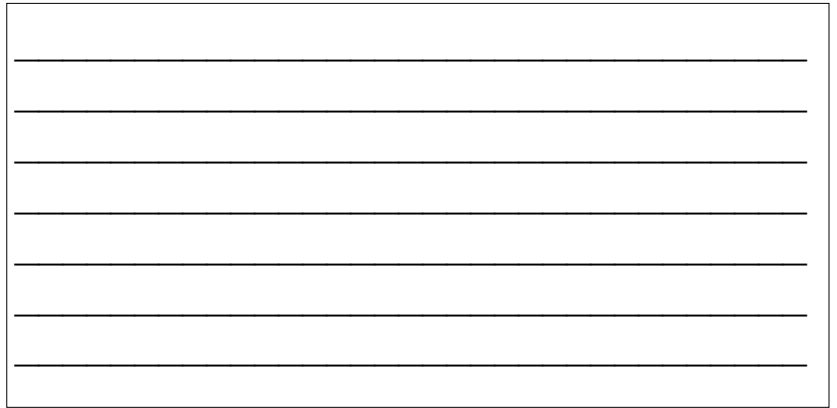
Make your hypothesis on how it will work



Sketch your design



Make your hypothesis on how it will work



Review your hypotheses

Hypothesis 1 was _____

Hypothesis 2 was _____

Hypothesis 3 was _____

Hypothesis 4 was _____

Hypothesis 5 was _____

Hypothesis 6 was _____

What most surprised me was

