SN EDUCATOR GUIDE

February 3, 2018

Smartphones Overshare

Activity Guide for Students: Smartphone Technologies

Purpose:

Smartphone Screen Polarization: To explore light polarization and the LCD technology used to illuminate cell phone screens.

Optional Sensor App Activity Outline**:** To collect and analyze smartphone sensor data through a selected app.

Procedural overview: Complete a few simple light polarization exercises to model the LCD technology used to illuminate smartphone screens. If instructed by your teacher, choose an app that collects sensor data and demonstrate how the app analyzes and utilizes the data to perform a specific function.

Materials:

- Smartphone
- Optical polarizer sheets
- Clear plastic fork or spoon
- Small flashlight
- Clear plastic CD cases, DVD cases, bottles and product packaging

Background information: Light is electromagnetic radiation that travels through space at a specific speed. An electric field oscillates exactly perpendicular to a magnetic field, and both are relative to the light's direction of travel. Which way the field moves is called the direction of polarization. Usually light is unpolarized, or a mixture of both polarizations.

An optical polarizer is a thin sheet of plastic in which all of the long plastic molecules are lined up in the same direction. Only light waves with a specific polarization pass through an optical polarizer and it blocks light of other polarizations. An optical polarizer converts light of mixed polarizations into a single direction of polarization.

Student questions and answers:

1. Hold a polarizer flat over a flashlight beam. Rotate the polarizer. What happens and why? Is the light coming from the flashlight polarized or unpolarized?

2. Hold one polarizer over a flashlight. Take a second polarizer and slowly rotate it, so it is eventually perpendicular to the other one. What happens and why?

3. With your smartphone screen illuminated, hold a polarizer flat over the screen. Rotate the polarizer. What happens and why? Is the light coming from the LCD polarized or unpolarized?

4. Hold one polarizer over a flashlight, and place a clear plastic utensil on top of the first polarizer. Hold a second polarizer over the utensil, and slowly rotate the top polarizer. Then, slowly rotate the fork or spoon. What happens in each instance and why?

5. Take away the polarizer sitting on top of the plastic utensil. Can you see the same effect with only one polarizer below the utensil? Why?

6. Place the plastic utensil directly on top of an illuminated smartphone screen and hold one polarizer above the utensil and smartphone screen. Can you see the same effect? Why?

7. Obtain other plastic items from your instructor and predict where the stress patterns are for those items. Use a viable method (one that you learned from above) to test your predictions. Explain whether your predictions were accurate and what testing method you used.

8. What does this experiment demonstrate or model about how smartphone screens work?