

Polarized Light

Teacher's Guide

Subject (Body of Knowledge): Science (Physical Science)

Big Idea (topics): Light waves; Polarizing Filters; Reflection

Summary: Students will observe how polarizing filters can eliminate light that is reflected off the water's surface.

Objective(s): After completing the field lab, students will be able to:

1. Describe light as waves
2. Describe how polarizing filters act like picket fences to block some waves
3. Explain how light reflection from the water surface can reduce visibility.

Ecosystem(s): Any

Equipment:

- 2 x Polarizing filters
- Multi-meters
- 6' of rope (to make waves)
- Wood/paper to act as picket fence

Background (Pre-field Classroom Activity):

- **Equipment Training:** none
- **Vocabulary:** Polarization, Reflection,
- **Reference material:** MagLab Online Interactive:
<http://micro.magnet.fsu.edu/primer/java/scienceopticsu/polarizedlight/filters/index.html>

Procedures (Engage; Explore; Explain; Elaborate; Evaluate):

1. **Engage.** Demonstrate with a rope how a parallel filter can prevent waves that are not parallel to the filter?
2. **Explore.**
 - a. Ask students to estimate elevation of sun in the sky and find a location where reflection off the surface of the water is high
 - b. Have students hold one polarizing filter up and rotate it until the reflection is eliminated
 - c. Have students hold the second polarizing filter up and rotate it until most light is filtered.
 - d. Use Multi-meters to measure how much light is being eliminated as you rotate the filters.
3. **Explain.** Complete the assessment questions

Sunshine State Standards:

Science:

Mathematics: Language Arts: Social Studies:

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Student Data Sheet

Full Name:		Date:	
School (teacher):		Time:	

Student Hypothesis and Rationale

If the sun is directly overhead I think the polarized filters will be (helpful/not helpful) in filtering the glare in calm waters because... _____

Field Observations/Measurements

Estimate and record the sun's altitude from the horizon in degrees. In the space below, draw your location relative to the sun and the water body. Show where reflection is the greatest and the least.

Hold both filters with yellow tabs facing up. While holding one filter still (yellow tab still facing up) slowly turn other filter clockwise so that yellow tab rotates the designated degrees.

Degrees	Lux: measure of light intensity	Descriptions: describe the changes observed when filter is rotated
90 Degrees		
180 Degrees		
270 Degrees		

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Assessment

1. Give a short description of how the appearance of the river water's surface changed when looking through one of the polarized filters

2. How can we as humans use polarized film/lenses to our benefit? Give an explanation.

3. Depending on the sun's altitude during your experiment, were the polarized filters helpful in limiting the sun's glare off the body of water? Why or why not?

4. Explain why you think polarized filters (sunglasses) are not as effective in choppy or turbulent waters.

5. At which location near the river did you observe the highest amount of glare reflecting off the water's surface and why?

6. Think about the observations you have just made. Did the activity raise new questions? Write a short question (start with "What, Why, Where, When, or How") about something you want to learn more about.
