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| **Lesson Title** | Investigation of Polarized Light |
| **Length of Lesson** | 1 day |
| **Created By** | Jed Leggett, William Funderburk |
| **Subject** | Physics |
| **Grade Level** | 11-12 |
| **State Standards** | 4e; |
| **DOK Level** | 3 |
| **DOK Application** | Investigate |
| **National Standards** | NA |
| **Graduate Research Element** | Use of a polarizer to analyze a signal |

**Student Learning Goal:** Students will investigate the properties of plane polarized light, and examine the phenomenon of polarization by reflection.

Physics: 5. Describe and model the characteristics and properties of mechanical waves: (e) Investigate and draw conclusions about the characteristics and properties of electromagnetic waves.

**Materials Needed (supplies, hand-outs, resources):** Optics bench, polarizers, light sensor, computer with data logging software.

**Lesson Performance Task/Assessment:** In this lesson, students will use a polarizer to create plane polarized light. They will then use a second polarizer to analyze this light and plot the $\cos^2(\theta)$ relationship of the relative angle between the polarizers.

**Lesson Relevance to Performance Task and Students:** This lesson will introduce students to the concept of plane polarized light and demonstrate one way that polarized light is produced in nature. Polarized light has many practical applications, from sunglasses to the newest 3D movie technologies.

**Anticipatory Set/Capture Interest:** Every student will be given 2 polarizers with which to view light sources from around the room.

**Guided Practice:**
The teacher will demonstrate the setup and measurement process for the lab.

**Independent Practice:**
Students will set up their light source and sensor and record the initial reading on the sensor. They will then add one polarizer and record the light sensor reading. They will then add a second polarizer and record the light sensor reading for 10 degree increments of relative angle between polarizers. Students will plot their results and compare with a $\cos^2(\theta)$ distribution.

Students will then set up the curved acrylic lens on the ray table with the flat side normal to the incident ray. They will rotate the ray table until the transmitted and reflected rays emerge at a 90 degree angle from each other. The students will then analyze the reflected light using a polarizer.

**Remediation and/or Enrichment:**
R: individual IEP; partner help throughout lesson

E:

**Check(s) for Understanding:**
*****What does it mean for light to be polarized?
*Why is the reflected light in the second part of the lab polarized?

**Closure:**
Students will compare their data with other groups and discuss any differences.

**Possible Alternate Subject Integrations:**

**Teacher Notes:**