

Index of Refraction Lesson Plan | Danielson Framework

Class: Mr. Bari's Regents Physics Class	Date: 05/09/23
Unit: Properties of Light	Lesson Title: Index of Refraction
<p>Content Standard Alignment: This lesson primarily targets New York State P-12 Science Learning Standard HS-PS4-1, under the topic of "Waves and Electromagnetic Radiation". Students will mathematically represent various properties of a wave (i.e., wavelength, frequency) and investigate how they transform by passing through a material.</p>	
<p>Lesson Objectives/Instructional Outcomes: (Framework Domain 1c: Setting Instructional Goals)</p> <p>Students will be able to measure the wavelength and amplitude of a wave, using a ruler.</p> <p>Students will be able to use Snell's Law to identify the index of refraction of a material.</p> <p>Students will be able to identify a mysterious material by using its index of refraction.</p> <p>Students should be able to answer the following questions at the end of the lesson:</p> <ul style="list-style-type: none"> - What relationship describes how light bends between two mediums? (Ans: Snell's Law) - What are the real-life applications of Snell's Law? (Ans: Archer Fish) - What is the material on the desks? (Ans: Lucite) 	
<p>Relationship to Unit Structure: (Framework Domain 1e: Designing Coherent Instruction)</p> <p>The overall unit goal is to introduce students to electromagnetic radiation (i.e., light) and its many properties – most prominently, reflection and refraction. Today's lesson is focuses on the latter: the refractive properties of light. Previous lessons discussed why light reflects such that $\theta_i = \theta_r$. Today's lesson builds on the wave properties of light by discussing how light obeys Snell's Law during refraction and how Snell's Law can be exploited to identify the index of refraction of a material.</p>	
<p>Instructional Materials/Resources: (Framework Domain 1d: Demonstrating Knowledge of Resources)</p> <p>Materials which will be used include a Lucite for each group and Ruler and Worksheet for each student.</p>	
<p>Methods and Instructional Strategies (Framework Domain 1a: Demonstrating Knowledge of Content and Pedagogy)</p>	
<p>Anticipated Student Misconceptions:</p> <p>It is a common misconception that the frequency of light changes once it changes mediums. To address this misconception, I will pose the question of whether the color of a pencil changes once it is placed in a jar of water.</p>	
<p>Concept Prerequisites:</p> <ul style="list-style-type: none"> - Snell's Law: The Law which describes how light bends from one medium to another - Index of Refraction: This is a property of a medium which describes how much light will bend or slow down in that material 	
Instructional Activities:	<ol style="list-style-type: none"> 1. Do Now: Measuring Wavelength & Amplitude of Waves using Rulers. 2. Big Idea: Students calculate Index of Refraction of Mystery Material in Groups 3. Presentations: Each group makes a two-minute presentation on one step of how they determined what material the mystery object was. 4. Exit Slip: Students watch video of an archer fish using Snell's Law to catch prey. 5. Homework: Students will use Snell's Law to calculate the distance d above which the archer fish must aim from the actual location of the prey?
Wrap Up-Synthesis/Closure:	<p>Students will be able to summarize the many applications of the refraction of light:</p> <ol style="list-style-type: none"> 1. It can be used to determine the properties of a material 2. Animals such as archer fish use it to survive
<p>Differentiation According to Student Needs: (Framework Domain 1b: Demonstrating Knowledge of Students)</p> <p>Students will be working in both groups and individually, thus meeting the needs of interpersonal and intrapersonal learners. In addition, by conducting a hands-on experiment (i.e., using the block of Lucite to draw the refracted ray of light), kinesthetic learners will also be engaged. Auditory learners will benefit from one-on-one guidance from the instructor, who will be making rounds while the class is in groups. Visual learners will be able to access flipped classroom materials to watch videos related to class discussion ahead of time. Thus, all types of learners will benefit from this lesson.</p>	
<p>Assessment (Formative and Summative): (Framework Domain 1f: Assessing Student Learning)</p> <p>Students will complete an exit slip in which they identify the location of an ant from the point of view of a fish under water, taking into account the fact that the light from the ant <i>refracts</i> once it hits the water.</p>	