Introduction to Active Learning in Optics and Photonics (ALOP)

a Mini-Workshop

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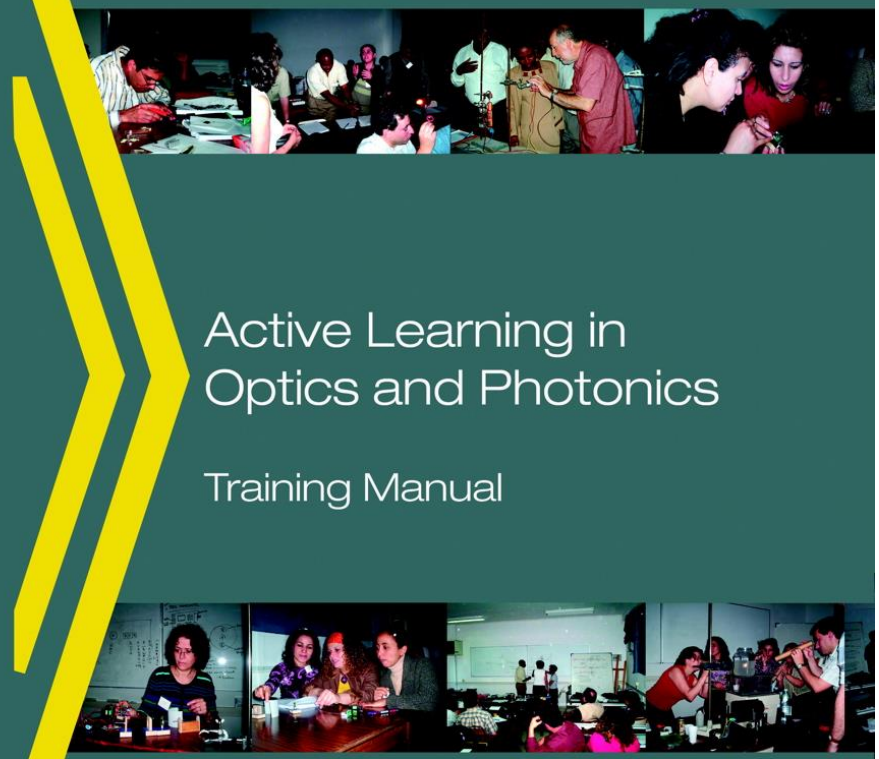
Workshop Booklet



Links for Information on ALOP and Active Learning:

Link for information on ALOP: https://pages.uoregon.edu/sokoloff/ALOPwebpage.html

Link to download ALOP Training Manual: https://pages.uoregon.edu/sokoloff/ALOPManual2ndPrint11616.pdf

Link to download *Physics Teacher* paper: https://pages.uoregon.edu/sokoloff/SokoloffTPTOptics116.pdf

Link to download *ILD* book: http://pages.uoregon.edu/sokoloff/ILDbook0116.pdf

Information on the development of active learning strategies: *The International Handbook of Physics Education Research: Learning Physics* (https://pubs.aip.org/books/monograph/148/The-International-Handbook-of-Physics-Education). Chapter 23: "Physics Education Research and the Development of Active Learning Strategies in Introductory Physics," by David R. Sokoloff and Tuğba Yüksel.

ALOP Module 1 Examples

Discussion Questions on Magic Trick

1. How do you think that the test tube was made to reappear?
2. Why can you see a test tube in air or in water, but not in the magic fluid? What is special about the magic fluid?
3. What property of transparent media determines whether reflection takes place at the boundary between them? What has to be true about this property for the two materials in order for reflection to take place?

Image Formation Interactive Lecture Demonstrations

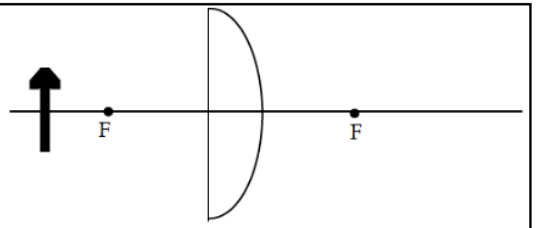
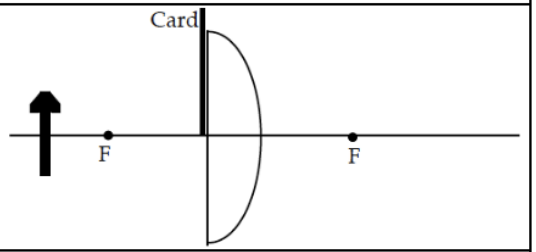
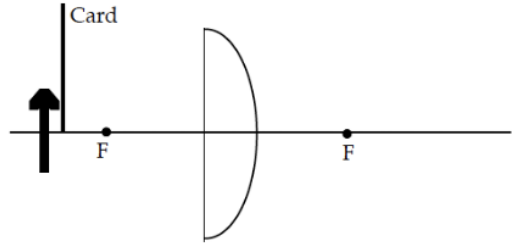
Name_____

SAMPLE INTERACTIVE LECTURE DEMONSTRATION
PREDICTION SHEET FOR ICPE ALOP WORKSHOP

Directions: Students would normally write their names at the top of this sheet, and the sheet would be collected at the end of class but not graded. Please behave as a student and write your predictions in the spaces provided when asked to.

Note: This is a sample of ILDs prepared for this workshop. They do not represent a complete, coherent sequence. Normally an ILD sequence consists of 6-7 related demonstrations in a single physics topic area. Actual ILD sequences can be found in the book *Interactive Lecture Demonstrations* a PDF of which you can download at: **https://pages.uoregon.edu/sokoloff/ILDbook0116.pdf.**

Activity from Module 1: Introduction to Geometrical Optics

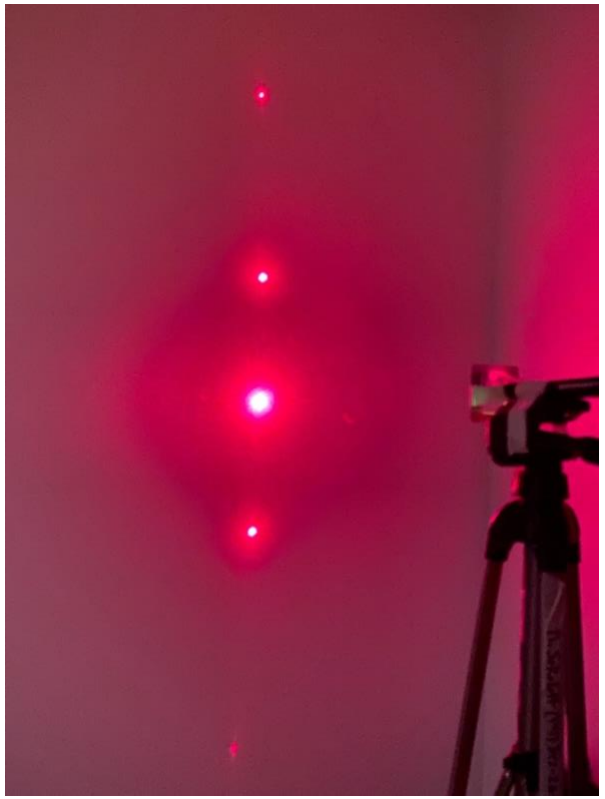
Image Formation Demonstration 1: You have a converging lens. An object in the shape of an arrow is positioned a distance larger than the focal length to the left of the lens, as shown on the right. Draw several rays from the head of the arrow and several rays from the foot of the arrow to show how the image of the candle is formed by the lens. Is this a real or a virtual image?	
Image Formation Demonstration 2: What will happen to the image if you block the top half of the lens with a card? Answer in words and show what happens on the diagram on the right by making any changes needed in the rays you drew above.	
Image Formation Demonstration 3: What will happen to the image if you block the top half of the object with a card? Answer in words and show what happens on the diagram on the right by making any changes needed in the rays you drew above for Demonstration 1.	

ALOP Module 2 Example

Activity from Module 2: Lenses and Optics of the Eye

Myopia Demonstration: Myopia or nearsighted-ness is caused by either (a) the eyeball length (distance from cornea to retina) being too long or (b) the power of the eye's optics being too strong. In both cases, the image of a distant object will no longer be sharply focused on the retina but rather in front of it. What kind of lens would you need to bring the image back into focus on the screen (retina)—positive or negative?

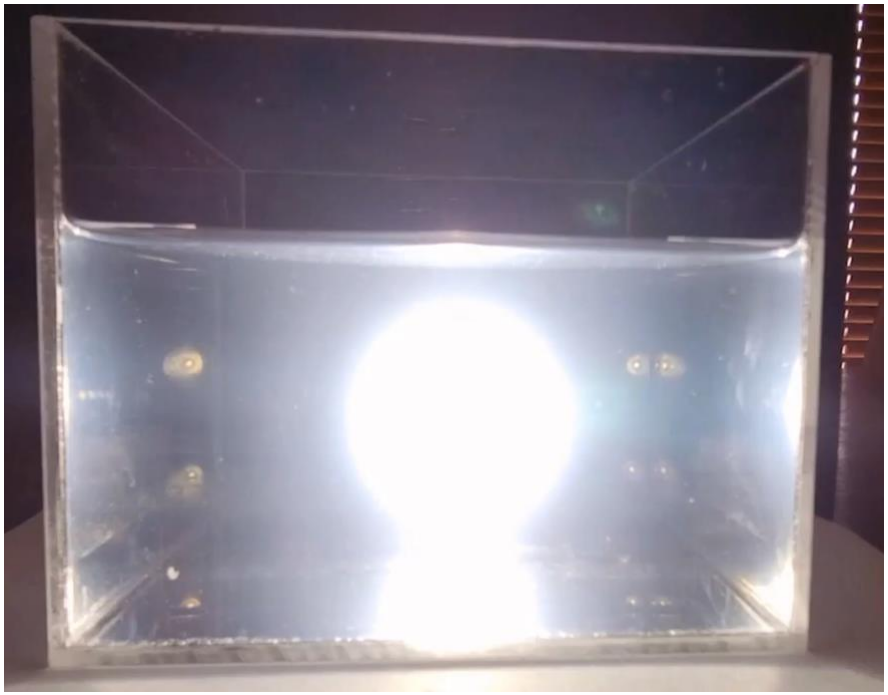
ALOP Module 3 Example



Activity from Module 3: Interference and Diffraction

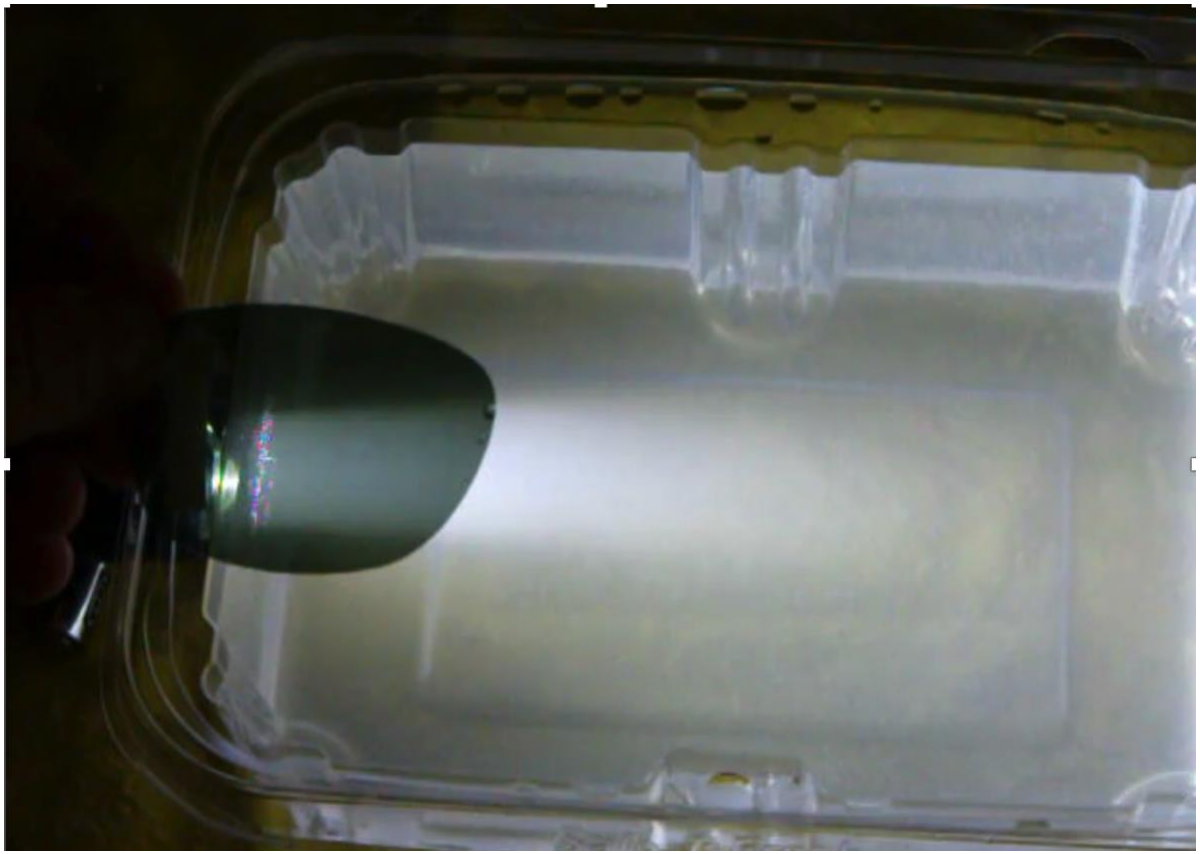
Diffraction Demonstration: Suppose that the red laser is replaced by a green one. Will the pattern on the wall be changed, and if so, how?

ALOP Module 4 Examples



Activity from Module 4: Atmospheric Optics

Scattering Demonstration 1: White light is shining through a tank of water. How will your observation change if milk is slowly added to cloud up the water?



Activity from Module 4: Atmospheric Optics

Scattering Demonstration 2: A polarizing filter is held above a tank containing water with a small amount of milk mixed in. White light is shined in from the left. What do you predict you will observe as the filter is rotated in front of the scattered light.

ALOP Module 5
Wavelength Division Multiplexing (WDM)