Refraction

Equipment

- Light boxes with power supply and various optics components

Objective

Physics Concepts

- Refraction (Snell's Law)

Experimental analysis

- Linearize equations
- Fit curves to data to determine mathematical relationships
- Recognizing the uncertainty in measurements

Conceptual (C-Level)

Light travels in a straight line except when it encounters an interface (don't worry about curved space right now).

Write down in words and mathematically Snell's law.

Draw a picture of light traveling through a rectangular block (glass or plastic)

Draw a picture showing the refraction of light for the following situations. Clearly indicate where the actual object is located and also where the image is located. Determine apparent depth and actual depth as well as what assumptions you make.

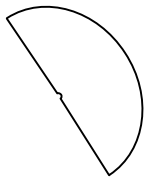
- You are looking at a fish under water ($n_{water} > n_{air}$).
- You are looking up at a bird while swimming under water.

EXPLORATIONS:

- Using a rectangular object exam a single ray of light as it enters and leaves the object. When is the offset greatest?
- Try other objects (an equilateral triangle is interesting). What do you notice?

Basic Lab (B-Level)

- Using Snell's Law, determine the index of refraction for one of the plastic objects.
    - Any object is fine to use; however, the half-moon object simplifies the procedure.



Advanced/Extended Lab Ideas (A-Level)

- Explore refraction in other objects.
- Determine and demonstrate the critical angle for a plastic object.
- Investigate a topic of your choosing.