## Elena Hands-on laboratory experiment Snell's Law

I used a thick piece of plastic instead gelatin because I didn't find yellow Jello here:



I labeled the dots for each trial, I drew lines connecting the dots, and I measured the angles of incidence and refraction, using the protractor from the normal line. I used Snell's Law  $(n_1 \sin \theta_1 = n_2 \sin \theta_2)$  to calculate plastic's index of refraction, knowing that, for the air  $n_1=1$ .

Here are the results:

$\theta_1$	$\theta_2$	calculated refraction	index	of	average refraction	index	of
30°	18°	1.61			1.60		
45°	25°	1.67					
60°	34°	1.54					

With a triangle of plastic I made the beam of a laser turn around in the prism by multiple reflections and come out parallel to the direction it entered from:



I made a gelatin optical "fiber"(but I couldn't cut a block of gelatin) and I observed that the light transmitted to the other end. When I bent the "fiber", the light still follows the path (internal total reflection):



I couldn't cut a y- shaped fiber or gelatin lenses.

I set up the part with plastic lenses with my students. We used convex lens shape and concave lens shape and we determinated the location of the focus. For the convex lens shape we found the radius of curvature R=7 cm and the focal length f= 11.66 cm. For the concave lens shape we found the radius of curvature R=8 cm and the focal length f= -11.11 cm, using lensmakers equation. Here are some pictures:



Conclusions:

The beam of light bends when it goes from the air straight into the piece of plastic toward the horizontal line, and away from the normal line when it goes from the piece of plastic back into the air. As the angle of incidence  $\theta_1$  increases, the beam bends more (the angle of refraction  $\theta_2$  increases).

A converging lens gathers in one point all parallel rays of light by refraction. If the rays are away from the optical axis, we have more than one focus. A diverging lens scatters all parallel rays of light by refraction.

What is your opinion?