Inverse-square intensity relationship for light from a point source

The intensity of light from a point light source drops off quickly with distance. A short geometric argument shows that the intensity falls off as the inverse square of the distance from the light source.

Performing this experiment can be challenging, because it can be hard to obtain a sufficiently small, or point-like, source, and it is hard to arrange the source and light sensor so that you can easily set the light sensor at a various distances.
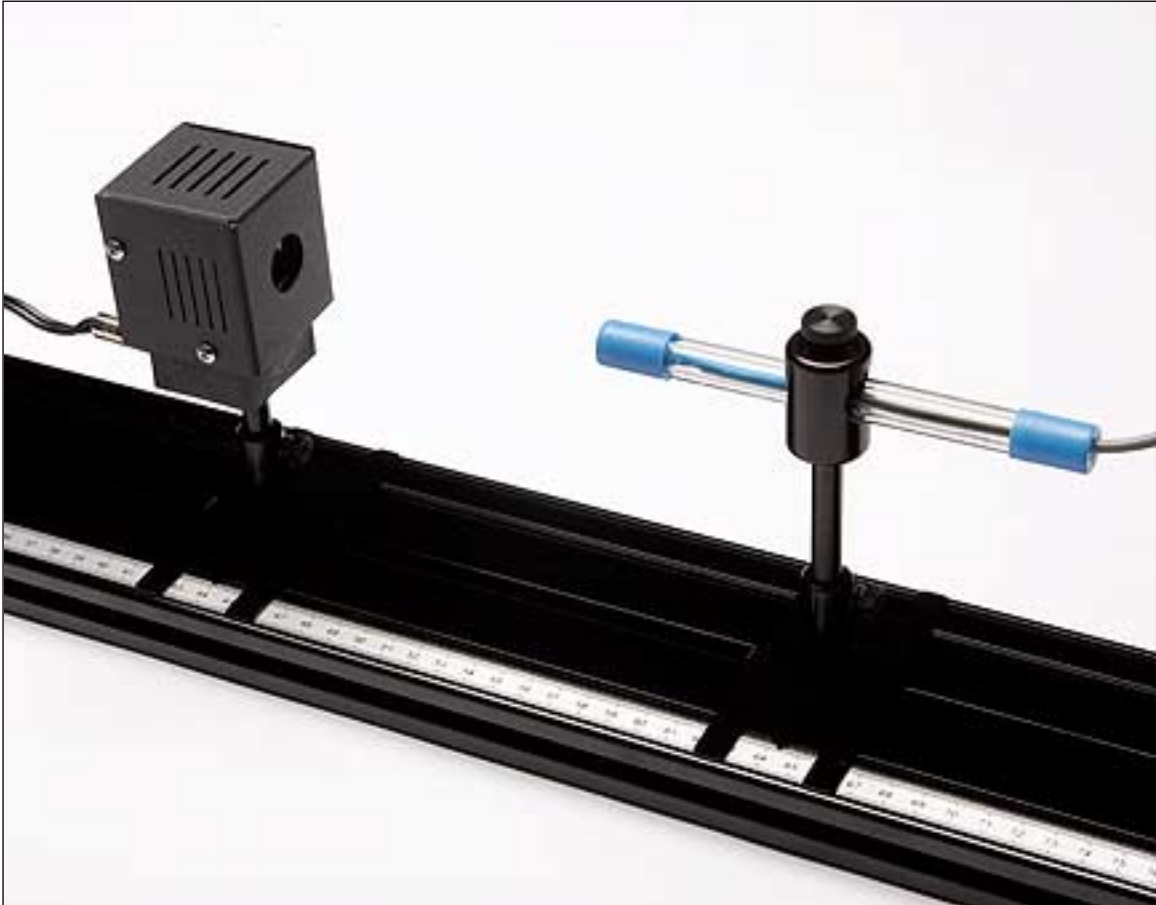
When the final version of the new Optics Expansion Kit (OEK) arrived, I checked it out by doing this inverse-square experiment. I used the supplied point light source, the light sensor holder, a Vernier Light Sensor and Vernier Track (not part of the OEK), and a LabPro with Logger Pro software. At a distance of 5 cm the light source saturated the 600 lux range of the light sensor, but at 6 cm the readings changed with distance, so I started data collection there. Using Events with Entry mode, I measured the light intensity every centimeter from 6 to 20 cm. Room lights were subdued, but it was not completely dark. Here is the result, with an inverse-square function fit to the data:
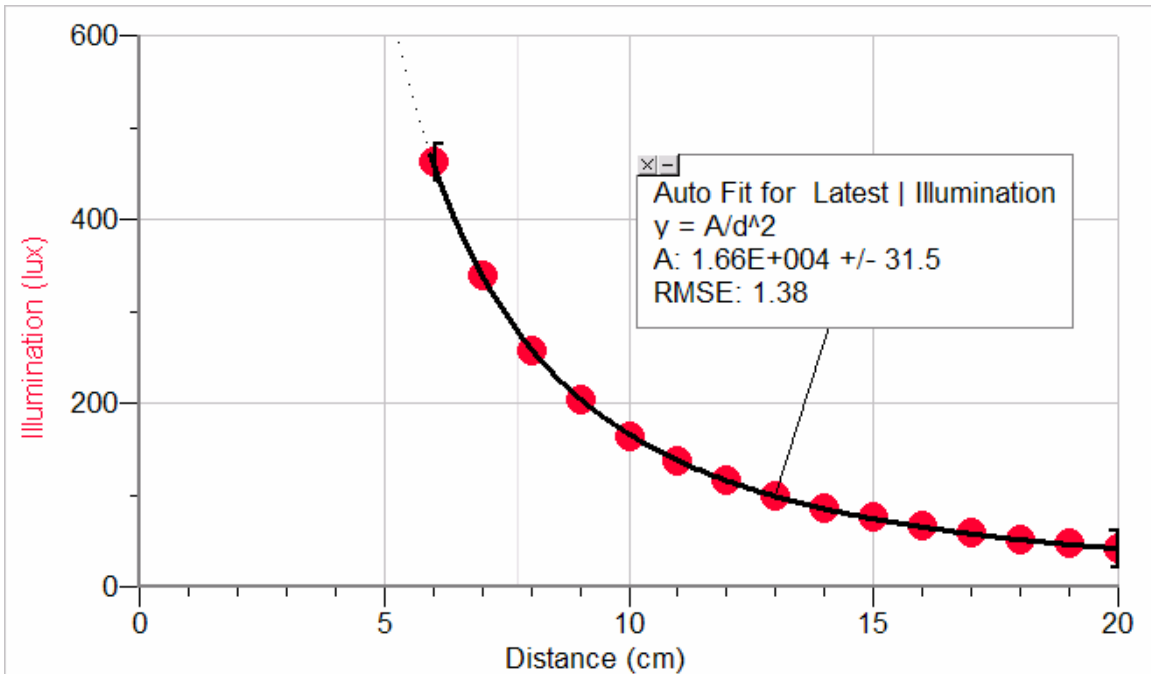
Not too bad! A more severe test is to plot the light intensity *vs.* the inverse of the square of the distance. If the light intensity does vary as the inverse square of the distance, the resulting graph will be a simple proportionality. Using Logger *Pro* you can easily make such a plot by making a calculated column of inverse distance squared. Here's the new graph, this time with a fit of a direct proportionality: