Surveying a Fixed Route – Teacher Guide

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Preparation

1. The only important preparation in this lab is having a good route for the students to map. It does not have to be very long, but it has to have some variation in slope. It could include a section of a staircase, take turns, it could even be partially indoors, as long as the students can survey 10 steps (more or less, depending on time and speed) that will have different slopes.
2. Most tape measures will not be long enough (depending on the slope it should be at least 15 meters), so if you do not have an extra long one, it is easy enough to take a spool of string and have the students use a meter stick and marker to mark the string every meter for 15 meters and use that to measure the horizontal distance to within the nearest meter, then use a meter stick for the centimeters.
3. The lab is designed for students to work in groups of 3. A pair could handle it, but it will be awkward for the person handling the meter stick, plumb line, and scope.

Discussion

1. This is a pretty simple lab that was used as part of a larger course on mapping for the Yerkes Summer Institute in 2007. (http://kicp.uchicago.edu/education/explorers/2007summer-YERKES/index.html) It could work as part of a curriculum on graphing, or as a companion to the Contour Map lab.
2. One appropriate topic of class discussion is what sort of variables work for a graph of this nature, and when a graph like this would be used. An airplane pilot might like a graph like this for a flight plan, with the graph showing wind speed or wind direction, for instance.
3. Here are some thoughts about the questions at the end of the lab:
    a. Question 1: If your students do not know trigonometry and would not be familiar with taking the arctangent(vertical/horizontal) to find the angle, you can have them just calculate the slope by taking rise over run.
    b. Question 2: Similar to above, this question can be adjusted based on the students knowledge of geometry and trigonometry. Also, depending on the path, the slope of the path and hill might be quite different because the path may be going up the hill at an angle.