STANDARD DEVIATION OF SLOPE

Imagine you want to tack a stick to a board so it cannot rotate. One nail is not a good choice. Two nails very close together is a little better. Get your kids some sticks, nails and boards.

So I claim it makes sense that the error in estimating the slope gets smaller as the variance of x gets bigger. ($Sxx=(n-1)Var(X)$.) This has a big impact on designing studies. For maximum accuracy in estimating the slope, space your X's as widely as possible. Half at each end is optimal -- if you are SURE there is no curvature. Get some x's in the middle if you think there is a slight chance of curvature. No clue as to whether the relationship is linear? Spread the x's out more evenly.

Design matters…

I use Bob's idea even in Algebra II classes when we talk about linear models for real situations, even before we start trying to find equations for such data. One consideration for any model should be its sensitivity, and I want my students to understand that variability is a fact of life (and maybe they'll want to take Stats later).

You can make the point very visually in under 10 seconds.

Hold a meter stick in front of you, supported at two "points" very near each other. Move your hands up and down by about an inch, left moving up while right is moving down and vice versa. Be sure to call attention to just how much you are actually moving your hands. Watch the meter stick wiggle and observe the range of slopes so generated (no calculations, just watch).

Then move your hands to the ENDS of the meter stick and again move them up and down about an inch. Again, call attention to the amount of movement in your hands and again observe the amount of wiggle in the line. Point made.