Humanistic Mathematics Network Journal

Issue 2 Article 10

3-1-1988

Students Become Data, Statistics Comes Alive.

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STUDENTS BECOME DATA,
STATISTICS COMES ALIVE.

Every teacher looks for ways to convince students that course material is useful, interesting, capable of being mastered, and, well, relevant. I've found a neat strategy for doing this in statistics, as difficult as that may seem to those who have struggled with the subject.

Early in the introductory course -- during the first day or two, if possible -- I stage a short correlation exercise. I ask for several volunteers who are not overly sensitive about their height, weight or grade-point averages. (Six, nine or 12 are convenient numbers to work with because they simplify calculations, and a mix of women and men serves a useful purpose.)

I ask the volunteers to come forward and to arrange themselves in a line according to height. They do, and other students verify that the arrangement is reasonably accurate. I give each of the volunteers a small blue card on which is a number that indicates the rank in height, number one being the tallest.

Then I ask the volunteers to confer with each other and to rearrange themselves according to weight. They do, and I pass out green cards to indicate rank. I ask the observers whether they think there is any relationship between height and weight.

"Yes, it seems so," they say.

"How strong?" I ask.

"Well, moderate or pretty good," they might say.

I ask, "If someone wanted to grow taller in order to compete better in basketball, should they just eat more and more?"

They quickly point out the fallacy and venture that weight and height are not in a cause-effect relationship. By now, the more astute observers, scanning the group again, might point out that we could call the relationship stronger if there were not a mix of sexes.

Then the volunteers are asked to arrange themselves according to grade-point average. They do (amidst lots of chuckling). The observers might suggest that the relationship between height and GPA is weak or perhaps "sort of turned around a little." We recognize a need to quantify our statements.

That's when I pull out the short-cut formula for Spearman's rank-order correlation coefficient. I ask the volunteers to subtract their green number (rank in weight) from the blue number (rank in height), then square the difference. I add up the results, introducing the concept of summation and the symbol Σ as I do. We use the formula $r = 1 - \frac{6\Sigma d_i^2}{n(n^2 - 1)}$ (where d_i represents the differences whose squares are to be summed and n is the number of volunteers) to get an index. Perhaps it's about +.60 if the sexes are mixed, perhaps it's about +.75 if the volunteers are of one sex. We examine the formula and note that if there were a "perfect" positive relationship all the differences would be zero, giving r = +1.00.

Can we expect the same relationship in the population in general, based on our results? I project a simple table onto a screen and ask students to accept it on faith (a good thing to get used to early in

statistics, I find). We note that +.60 might not be statistically significant unless we have more data -- say, over nine volunteers.

We do similar calculations, using height and GPA ranks as shown by the blue and red cards. Often the correlation coefficient is about -.40 and we laugh about an unwarranted conclusion that eating less shortens students and thus improves grades. We speculate what a perfect negative relationship produces and we verify that it would be r = -.1.00.

Thus, in a matter of 15 minutes or so, a number of statistical concepts are introduced and worked with. Students are doing statistics and finding it's not too hard. Never mind that the topic of correlation doesn't really come until the end of the course, never mind that students might not yet know the distinction between mean and median or how to compute standard deviations. They are turned on, learning easily and enjoying it. Best of all, both volunteers and observers are actively involved in the subject from the start.

I have only one problem with the exercise: students want to experience something like this every day, and it's hard to meet that expectation! But I try.

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December 28, 1987