Including Construction in Quantitative Literacy

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Let me begin by saying that I have no idea what works in statistics instruction. I don't teach statistics. I really don't know much about complex statistics. I'm one of those sociologists who has to take tables in ASR (the American Sociological Review) pretty much on faith. I suspect that some of those tables are understood by only about eight people anyhow.

The reason I'm here is that I wrote a book a few years ago called Damned Lies and Statistics, and Milo Schield got in touch with me and explained to me that there was a "statistical literacy movement" about which I knew nothing. He assured me that I was part of that movement. I have since discovered that there's a statistical literacy movement, a quantitative literacy movement and, I think, a mathematical literacy movement. I did a little research that involved thinking of every term that came into my head, coupling it with literacy. And what you find is not only are people worrying about good old-fashioned, garden-variety reading-and-writing literacy, but you have web sites that are devoted to geographic literacy, political literacy, economic literacy; and on and on. (The one that I find particularly threatening is sexual literacy.) I am not sure we can imagine a type of literacy that does not have somebody advocating in its behalf.

What I know about quantitative literacy – and this comes from really reading a very small amount of material – is that quantitative literacy tends to focus on two things. I would call these "matters of calculation" and "matters of application."

- Calculation: Here, I'm thinking of the way we teach math: We think of math as a set of what I would call calculating skills: You learn to count. – You learn to add. – You need to learn to multiply fractions. – You need to learn to find the area of the triangle, and then to solve differential equations or whatever else we should include in upper math. I think that part of the complaint about quantitative literacy – when people say we need more quantitative literacy – is the argument that people ought to command more sophisticated mathematical skills than they now have
- Application: A second concern is that people may have skills but have trouble using them in practice. You get a lot of rather sad examples: People can't make change, or calculate a tip. I once had a dean who liked to talk about such applications as being able to figure out how many square feet of wall space you want to paint, so that you can figure out how much paint to buy. I suppose that mathematics instruction does some of that when they have word problems. I think that the purpose of word problems is to they get you to apply math skills. Nonetheless, critics argue, people aren't nearly good enough at applying math skills.

As a sociologist, it seems to me that the definition of quantitative literacy should be expanded to include "construction" – the social process by which numbers are created. I call it "construction" for particular sociological reasons that won't interest anybody who isn't a sociologist. But think about some examples of numbers that you'd expect people to encounter in real life. I'm going to pick three examples.

1. One is the number that you get when somebody is trying to get you to recognize that there's a social problem out there and they think it's an important problem. They want to argue it's a big problem, so they give you a big number. My favorite big number in recent years is that each year one billion birds die colliding into windows in the U.S. This is a number that you can find in the press or on NPR.
2. A second kind of number is one we get when the government gives us some sort of report about how we're doing, some social indicator. My favorite recent example is that, in 2006, the Secretary of Interior announced that the Fish and Wildlife Service had conducted a survey of wetlands in the United States and had found that wetlands acreage had increased between 1998 and 2004, and that this remarkably good news was evidence that the Bush administration's strong stance on environmental issues was having an effect.
3. The third example that I would pick is the surge of stories that you get on Wednesdays. On Wednesdays, the new issues of the Journal of the Medical Association and the New England Journal of Medicine come out, and you get news stories that say researchers have found that eating broccoli will either increase your life-span or make it more likely that you'll get some disease or whatever. The example that I'll use is a CNN.com study: "*One in five students practice self-injury*."

My point is that these are numbers that we encounter in the media and they come to us from more or less authoritative sources. We're not asked to calculate these numbers in any way or somehow apply them: We are asked to consume them, understand them, or at least recognize that our world is going to be shaped through other people's understandings of these numbers. As sociologists, one of the things that we can do is teach people how to think about the social process that produces those numbers, because numbers do not exist in nature. Every number means that someone has counted something; somebody has decided what to count; they have some reason for wanting to count it; they've decided how they're going to go about counting it, and so on and so forth. -- They're making choices and we need to examine that process.

Let's run through my three examples.

1. The "billion bird" statistic; how did that come about? An ornithologist first conducted the study of *two* houses to check how many birds ran into their windows over the course of a year and then estimated, based on that study, that each building has between one and ten bird deaths annually. He then located a government statistic for the number of buildings in the United States—about 97 million structures. If you multiply that number of buildings by 10 you get 970,000 bird deaths. This rounds-up to a billion! His lower estimate (assuming that buildings average one bird death per year produces a figure of 97 million deaths) just gets lost in the news coverage, because a billion is a more compelling figure. In news coverage, the billion is becoming the new million.
2. The wetlands story is interesting. The Fish and Wildlife Service has been measuring wetlands acreage since mid-century. The total acreage had gone down with every successive study. The last study from 1998 to 2004 showed the only increase in wetlands acreage in history. How did this come about? Well, they redefined what counts as "wet." Under the old definition, you had to have a natural wetland--a bog, or a swamp, or something like that. But in the new definition, man-made wetlands were also

counted. This broader definition included golf course water hazards, that ponding basin in your subdivision, and the run-off basins in large construction projects. While natural wetlands had again declined, adding man-made wetlands to the total produced an increase.

3. The study of self-mutilation involved an E-mail survey of eight thousand students at two Ivy League universities, maybe not the most random sample, of which about 35 percent responded. Seventeen percent of those respondents reported having practiced some sort of self-injury. Now the study's definition of self-injury was expansive. It included, for example, pinching yourself until you could see a mark, as well as serious self-injuries, which were things that the respondent said should have been treated by a medical professional. Reports of serious self injury were relatively uncommon, involving only 9.4 percent of those reporting self-injury, or less than two percent of the respondents. Remember, these data led to a headline that one in five students practice self-injury.

My point is that all of these numbers are products of somebody's counting practices. But really understanding these statistics involves more than thinking about the specific calculations that produced them. Understanding these statistics also requires thinking critically about the social process by which those numbers are brought into being.

Sociologists may not have much to say about teaching math skills, or even about teaching how to apply those skills, but I think we can contribute by helping people think critically about the social process by which numbers are constructed.