

Teaching Statistical Literacy

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More people have to read and understand others' statistics than have to carry out their own statistical research. A first course in statistics should therefore concentrate on statistics as a language.

The key to the development of a first course in statistics is deciding what statistics is. Statistics has, since the Publication of R. A. Fisher's *Statistical Methods for Research Workers* in 1925; been thought of as a set of research tools. Statistics provides a set of tools which are required by an investigator for the design of a research project and the analysis and interpretation of the data generated by the study.

But statistics has become more than a tool of the researcher. Listen to the news this evening, or read a newspaper or a newsmagazine Listen to public officials and advertisers. Statistics has become a language in its own right This language pervades the media making it nearly impossible to understand a newscast without being quite familiar with the language of statistics, What are these words we hear; "estimates", "significance", "projections", "averages", etc.? We are bombarded by numbers. But what do the numbers mean?

This is what statistics is to most: a language which is very often used and too often misused. Statisticians have, for the most part, not taught about the language of statistics. Even students who have completed a traditional course in statistics cannot usually understand this language

A first course in statistics should not try to teach statistics as a research tool. There are two main reasons for this. First, the study of statistics, a research tool, requires students to memorise the use of formulae, if not to memorise the formulae themselves. Students become so involved with learning to calculate statistics that

they fail to learn what the statistics mean. Retention of the manipulative skills is minimal, causing students to have little, if any, knowledge of statistics after a course of this type is completed.

A second reason why a first course in statistics should not teach statistics as a research tool is that students, after taking a traditional statistics course, are no better able to understand the statistics they'll encounter in the media than they were before the course started. The most we can hope of a student is that he or she will become a manipulative "whiz". A student might become quite good at plugging and chugging": plugging numbers into a formula and chugging until a number results. Yet our students are not likely to be able to interpret the statistics they might have learned to calculate. A first course in statistics should teach statistics as a language rather than as a research tool. Emphasis should be on interpreting statistics rather than on calculating statistics.

Statistics is being taught as a language at the University of Kentucky, see Haack (1976). The idea behind the course is to downplay the calculation of statistics while concentrating on how to interpret statistics. In fact, students do not calculate any statistics in the course. There is, therefore, no need for mathematical formulae. The course is conducted in a strictly verbal, nonsymbolic manner. Examples used in the course come from the media. Ideally, students will be able to apply the principles they learn to statistics they will encounter, or have encountered in other areas.

One of the major drawbacks with a nonsymbolic statistics course has been the lack of a text, requiring a large amount of work of the teacher. Texts are now becoming available (see, for example, Haack (1979)).

One of the more interesting aspects of teaching statistics as a language is that students become genuinely excited about being able to detect misuses of statistics. When I started this experiment in teaching a few years ago, I did not look forward to trying to find examples of the misuse of statistics. Such examples are, of course, very instructive. As I began looking for cases of the misuse of statistics, I became awed by how easy examples were to find. I became more and more convinced that a course of this type was needed. Students also relish catching advertisers and public officials misusing statistics; that is, detecting double-speak.

Doublespeak is the "involved, inflated, and often deliberately ambiguous use of language" (*Webster's New Collegiate Dictionary*), see Rank (1974) and Dieterich (1976). The misuse of the language of statistics is statistical doublespeak. Statistical doublespeak can be avoided if statistics are properly understood, see Haack (1977). This is the objective of the course I propose.

It is possible to teach statistics as a language. It is a challenging, yet rewarding undertaking. As you contemplate offering a course of this type, you might want to look at some of the books which can be used as reference material. There are a few good, readable books which may help you teach about statistics, the language.

With emphasis on sample surveys there are:

- i. Gallup, G. (1972). *The Sophisticated Poll-Watchers Guide*. Princeton Opinion Press.

- ii. Roll, C. W., Jr. and Cantrill, A. H. (1972). *Polls: Their Use and Misuse in Politics*. Basic Books, and
- iii. Wheeler, M. (1976). *Lies, Damn Lies, and Statistics*. Liveright.

These books lack adequate discussion of the science of studying an existing population but do give a good discussion of the “art” of sample surveying.

On the general topic of statistics and statistical doublespeak consider:

- i. Bross, I. D. J. (1957). *Scientific Strategies in Human Affairs: To Tell the Truth*. Exposition Press.
- ii. Campbell, S. (1974). *Flaws and Fallacies in Statistical Thinking*. Prentice Hall.
- iii. Federer, W. T. (1973). *Statistics and Society*. Dekker.
- iv. Hauser, P. M. (1975). *Social Statistics in Use*. Russell-Sage Foundation.
- v. Huff, D. (1954). *How to Lie with Statistics*. Norton.
- vi. Messick, B. M. (1968). *Mathematical Thinking in Behavioral Sciences*. Readings from *Scientific American*. Freeman.
- vu. Mosteller, F. (editor) (1973). *Statistics by Example*. Addison-Wesley.
- viii. Reichard, R. (1974). *The Figure Finaglers*. McGraw-Hill, and
- ix. Tanur, J. (editor) (1972). *Statistics: A Guide to the Unknown*. Holden-Day.

You will find these books interesting. Tanur’s collection of essays is an excellent source for the statistics course I propose. The essays are on the application of statistics in just about any area that students might have an interest.

References

- Dieterich, D. (editor) (1976). *Teaching Public Doublespeak*. National Council of Teachers of English/Citation Press: Urbana, IL. 61801.
- Haack, D. G. (1976). “Nonsymbolic Statistics Course”. *Communications in Statistics A(5)* 10: pp. 943-7.
- Haack, D. G. (1977). “Statistical Doublespeak”. *Kentucky Council of Teachers of English Bulletin* 27: 1, Fall 1977.
- Haack, D. G. (1979). *Statistical Literacy: A Guide to Interpretation*. Duxbury Press.
- Rank, H. (editor) (1974). *Language and Public Policy*. National Council of Teachers of English/Citation Press: Urbana, IL. 61801.