

# Implementing a Statistical Literacy Program

Thesis: Every college should implement a program in Statistical Literacy. A course may be taught by a single teacher. A program involves multiple sections of a catalog course taught by multiple teachers.

Why Statistical Literacy? The traditional course does a good job of preparing students in quantitative majors to be researchers or to read and interpret research studies. But most students will never do either. Most college graduates will use statistics to make decisions: organizational and personal.

What is Statistical Literacy? Statistical Literacy studies statistics as evidence in arguments.

Goal: Statistical literacy should emerge as a program that is respected and supported by the host department, taught by a range of faculty having different approaches, and appreciated by a wide-range of students. Most students should agree that statistical literacy should be required for all students.

Which students? These students should include:

- Those in STEM majors that deal with observational data (anthropology, geology, epidemiology, etc.)
- Those in the social sciences and professions who may use statistics to make social decisions
- Those in non-quantitative majors who may use statistics to make personal and civic decisions
- Those for whom English is a second language or for whom Algebra is a foreign language

What should they learn? These students should understand and appreciate that:

- Statistics are numbers in context where the context matters; statistics are sensitive to context
- Statistics can be influenced by confounding and assembly as well as by randomness and error/bias
- Assembly includes how things are defined, measured, compared and presented
- Most social statistics come from observational studies or quasi-experiments
- Statistical significance for observationally-based statistics can be influenced by the context
- Many of the statistics involving business and social policy involve quasi-experiments
- Ordinary English is used to express many of the devices used to control for confounding
- Statistical literacy is an important component of information literacy and data literacy.
- Statistics in big data can be influenced by confounding and coincidence.
- As a discipline, statistics has made several major contributions to human knowledge

Who will teach? Teacher training is essential for a successful statistical literacy program

- Since confounding and hypothetical thinking are not taught at the intro level, training is required
- STEM-trained teachers need to learn how to teach inductive (strength of evidence) reasoning
- Leading a class in critical thinking is a skill that takes time and practice to develop.
- Encouraging students to think hypothetically is radically different from solving a math problem.

What? This course should focus on the various ways to control confounding. It should focus on four major contributions of statistics to human knowledge: (1) sampling error for random samples does not depend on the size of the population, (2) random assignment blocks pre-existing confounding and is a basis for establishing causation, (3) the Cornfield conditions provide a necessary condition for an observational association to support causation, and (4) effect size is a measure of how able an observational association is to withstand nullification by an unknown confounder.

Where? A statistical Literacy program may be housed in a variety of departments provided the home department gives strong continuing support for it as providing a solid foundation for quantitative literacy and reasoning. It may be housed in a general education department provided the college gives strong continuing support for it as an essential component of general or liberal education.