

Quantitative Literacy

From the annotated legislation:

"Q-courses are those courses that teach students to understand and evaluate quantitative arguments, and that help them develop the ability to apply quantitative skills to solve problems in multiple contexts. Quantitative literacy is not the same as knowledge of mathematics.. Quantitative literacy is anchored in context and is data-based. Mathematics is less context-specific and is symbol-based. Quantitative literacy is a habit of mind usable in and across many fields. "

The Checklist

Arithmetic

- 1. Having facility with simple mental arithmetic
- 2. Estimating arithmetic calculations
- 3. Reasoning with proportions

Data

- 4. Using information conveyed as quantitative data, graphs, and charts
- 5. Drawing inferences from quantitative data
- 6. Recognizing sources of error in collected quantitative data

Computers

- 7. Using spreadsheets to record data
- 8. Using spreadsheets to perform calculations
- 9. Fitting lines or curves to data, or creating graphic displays of data
- 10. Extrapolating from data

Modeling

- 11. Formulating quantitative problems, seeking patterns, and drawing conclusions
- 12. Recognizing interactions in complex systems
- 13. Understanding linear, exponential, multivariate, and simulation models
- 14. Understanding the impact of different rates of growth

Statistics

- 15. Understanding the importance of variability
- 16. Recognizing the difference between correlation and causation
- 17. Recognizing the difference between randomized experiments and observational studies
- 18. Recognizing the difference between finding no effect and finding no statistically significant effect (especially with small samples)
- 19. Recognizing the difference between statistical significance and practical importance (especially with large samples)

Chance

- 20. Recognizing that seemingly improbable coincidences are not uncommon
- 21. Evaluating risks from available evidence
- 22. Understanding the value of random samples

Intended Outcomes for Students

- 23. Comfortable with quantitative ideas and at ease applying quantitative methods
- 24. Routine use of mental estimates to quantify, interpret, and check other information
- 25. Understanding the role of mathematics and statistics in scientific inquiry and technological progress
- 26. Understanding the role of mathematics and statistics in comprehending issues in the public realm
- 27. Analyzing quantitative evidence and reasoning carefully
- 28. Questioning assumptions and recognizing quantitative fallacies
- 29. Using mathematical tools in context-based settings
- 30. Adapting to changes in notation, problem-solving strategies, and performance standards, depending on the specific context
- 31. Having accurate intuition about the meaning of numbers and common sense about employing numbers as a measure of things
- 32. Knowing how to solve quantitative problems they are likely to encounter at home and at work

(Source: *Mathematics and Democracy: The Case for Quantitative Literacy*, prepared by The National Council on Education and Disciplines. Lynn Arthur Steen, executive editor. 2001.)

To designate Q-courses, fill out the checklist.

The SLQ committee expects that courses satisfying *eight* or more items on the checklist will easily qualify as Q-courses.

There will also be a comment box.

This is one possible place for questions.

If you check fewer than eight items yet think your course should qualify as a Q-course, you can use the comment box to explain your reasoning to the SLQ committee.

If more than one instructor will be teaching the proposed course, all must agree on the Q-course designation.

Quantitative Examples

- Understanding how sampling and statistical estimates can improve the accuracy of a census
- Understanding how different voting procedures can influence the results of elections
- Comparing magnitudes of risk and the significance of very small numbers (e.g. 10 ppm or 25 ppb)
- Understanding that unusual events (such as cancer clusters) can occur by chance alone
- Analyzing economic or demographic data to support or oppose policy proposals
- Understanding the difference between rates and changes in rates, e.g. a decline in prices compared with a decline in the growth of prices
- Understanding the behavior of weighted average used in ranking colleges, cities, products, and investments
- Appreciating common sources of bias in surveys such as poor wording of questions, volunteer response, and socially desirable answers
- Understanding how small samples can accurately predict public opinion, how sampling errors can limit reliability, and how sampling bias can influence results
- Understanding quantitative arguments made in voter information pamphlets
- Understanding student test results given in percentages and percentiles and interpreting what these data mean with respect to the quality of schools
- Understanding that mathematics is a deductive discipline in which conclusions are true only if assumptions are satisfied
- Understanding the difference between deductive, scientific, and statistical inference
- Recognizing the power (and danger) of numbers in shaping policy in contemporary society
- Knowing how the history of mathematics relates to the development of culture and society
- Understanding how assumptions influence the behavior of mathematical models and how to use models to make decisions
- Understanding depreciation and its effect on purchases, such as of cars or computer equipment
- Understanding the relation of risk to return in long-term (e.g. retirement) investments
- Understanding that there are no schemes for winning lotteries
- Comparing insurance plans, retirement plans, or finance plans for buying a house
- Looking for patterns in data to identify trends in costs, sales, and demand
- Gathering and analyzing data to improve profits
- Understanding the limitations of extrapolating from data in a fixed range
- Reviewing the budget of a small nonprofit organization and understanding relevant trends
- Researching, interpreting, and using appropriate formulas for the work at hand
- Understanding and using exponential notation and logarithmic scales of measurement