

Mathematical Association of America's Quantitative Reasoning for College Graduates: A Complement to the Standards*

Summary:

Conclusion 1. Colleges and universities should treat quantitative literacy as a thoroughly legitimate and even necessary goal for baccalaureate graduates.

Conclusion 2. Colleges and universities should expect every college graduate to be able to apply simple mathematical methods to the solution of real world problems.

Conclusion 3. Colleges and universities should devise and establish quantitative literacy programs each consisting of foundation experience and a continuation experience, and mathematics departments should provide leadership in the development of such programs.

Conclusion 4. Colleges and universities should accept responsibility for overseeing their quantitative literacy programs through regular assessments.

Quantitative Literacy: GOALS

Any effective attack on the problem of quantitative literacy must recognize that not all mathematical roads are narrow, algebraic ones that lead to calculus. Today's routes must offer glimpses of a broad mathematical landscape with applications prominent in the foreground. To achieve some depth along the way, college students must be taught to view landmarks from a variety of perspectives-- numerical, visual, verbal and symbolic. They must learn that understanding, explanation and prediction are the real mathematical destinations, not the answers in the backs of textbooks. Unless we repeatedly immerse students in interesting quantitative settings that require drawing inferences from data, interpreting models, estimating results, assessing risks, suggesting alternatives, and even making reasonable, testable guesses, students will never see the forest for the trees.

In short, every college graduate should be able to apply simple mathematical methods to the solution of real-world problems. A quantitatively literate college graduate should be able to:

1. Interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them.
2. Represent mathematical information symbolically, visually, numerically, and verbally. Use arithmetical, algebraic, geometric and statistical methods to solve problems.
3. Estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results.
4. Recognize that mathematical and statistical methods have limits.

A quantitatively literate college graduate should be expected to have deeper and broader experiences than those who only graduate from high school. The level of sophistication and maturity of

*Condensed from MAA Report (1998) accessed at http://www.maa.org/past/ql/ql_toc.html on Oct. 4, 2006

thinking expected of a college student should extend to a capability for quantitative reasoning which is commensurate with the college experience.

The Dynamics of Quantitative Literacy

According to Alan Schoenfeld, mathematics educators feel they now have "a well-established theoretical frame for the characterization of intellectual competencies in problem-solving domains." (See *Entry-Level Undergraduate Courses in Science, Mathematics and Engineering: An Investment in Human Resources*, a workshop report published by Sigma Xi in 1990.) For this frame he lists five aspects of intellectual competency:

- resources; problem-solving strategies or heuristics; control; beliefs about mathematics and problem solving; and practices.

Stages of Quantitative Literacy and Outline of a Program

The starting point for any program in quantitative literacy will ordinarily be the college entrance requirements. These requirements and an appropriate related placement test established on both the goals of quantitative literacy and background needs for courses for various majors and degree programs should determine the foundation experience to which the student is directed. In many colleges there will be multiple tracks in the quantitative literacy program, but each will normally have the following components:

1. Explicit requirements of quantitative experience for college entry or for entry into courses or experiences which can be credited towards the baccalaureate degree;
2. Placement testing intended to help determine appropriate entry into the quantitative literacy program;
3. Foundation experience(s) to be accomplished ordinarily within the first year of the student's college work;
4. Further quantitative experiences in diverse contexts to be accomplished during a student's sophomore, junior, and senior college years so as to be interspersed throughout the work of these years.

The components will take on a variety of expressions.