Quantitative Literacy and College Readiness

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January 2011

College (and career) readiness

***Preparing all students for*:**

- College

- Career

- Citizenship

What would it mean in terms of mathematics for a high school graduate to be ready for college, a career, and being a good citizen?

Some important elements of QL

- Mathematical thinking, reasoning, problem solving

- The clear presence of statistics and statistical thinking

- Lots of modeling and applications

- Connections to the real world (not all word problems are relevant applications)

- Connections among mathematical ideas

"[Adults] could not have learned quantitative literacy in the mathematics classroom because historically the mainstream mathematics curriculum has devoted extraordinarily little attention to the connections of mathematics with the real world."

Zal Usiskin, 2001

TX College & Career Readiness Standards

- Intellectual curiosity
- Reasoning
- Problem solving
- Academic behaviors
- Work habits
- Academic integrity
- Reading/writing/research across the curriculum
- Use of data
- Effective use of technology

Premise:

'College readiness' is at least as much about how students ***think*** as it is about what they ***know***, and helping students become 'college-ready' is at least as much about ***how*** we teach as about ***what*** we teach.

Classroom environment and instruction

- Accessible and rigorous

- Student engagement

- Students using/developing communication

- Expecting students to figure things out (not telling them what to do and doing the thinking for them)

- Less teacher-telling

- Asking more questions than answering

Why the CCSS give us a new opportunity and responsibility to address QL on a large scale

- The CCSS incorporate more statistics than we currently see in high school mathematics
(for all students)

- We are expecting **all** students to progress further into mathematics than ever before
(so now we have room for it)

- The mathematics designed 50 years ago to prepare **some** students well (those headed for calculus-intensive fields) does not serve this expanded population well (headed for many possible futures)

CCSS Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

*One example of
a capstone course addressing
quantitative literacy…*

utdanacenter.org/amdm

Advanced Mathematical Decision Making
aka Advanced Quantitative Reasoning

- Rigorous, relevant alternative to pre-calculus

- Follows Algebra II and Geometry

- 4th-year math for non-STEM majors; workforce programs

- Elective for calculus-intending students

- Preparing students for college, careers, and citizenship

- Statistics, finance, discrete math, modeling

- Reasoning, decision-making

- Students communicating and presenting

- Rigorous, relevant, AND accessible

Course Outline

1. Analyzing Numerical Data

2. Probability

3. Statistical Studies

4. Using Recursion in Models and Decision Making

5. Using Functions in Models and Decision Making

6. Decision Making in Finance

7. Networks and Graphs

8. Spatial and Geometric Modeling (planned)

9. Decision Making in Fair Division/Selection (planned)

"I'm finally teaching the way I thought I would teach when I graduated from college 20 years ago."

AMDM teacher

Teaching well toward quantitative literacy is exactly the kind of teaching we need for mathematics in general.

Thoughts and Recommendations: Curriculum/Standards

- Incorporate fundamental elements of QL into a coherent, continuous, integrated 12-year progression for school mathematics (K-11, possibly completed earlier by some students)

- Offer some type of rigorous, challenging, relevant, engaging 13th-year course focused primarily on QL among a few course options

Thoughts and Recommendations: Teaching

- Put an end to spoon feeding our students…

- As teachers, commit to fostering more student responsibility for their own learning
  (which means less teacher-telling)

- As teachers, ask more questions than we answer

- As teachers, focus on mental math

- As a system/community, invest in teacher professional learning about how to incorporate student-centered pedagogical approaches

Thoughts and Recommendations: Higher education programs

- Reevaluate higher education course offerings with respect to QL elements, courses, and programs of study (for STEM and non-STEM majors)

- Determine what your institution's priorities and goals are (for STEM and non-STEM majors)

"Indeed, as the twenty-first century unfolds, quantitative literacy will come to be seen not just as a minor variation in the way we functioned in the twentieth century but as a radically transformative van- tage point from which to view education, policy, and work."

"The Case for Quantitative Literacy"
Mathematics and Democracy, 2001

Your comments/ questions?

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Advanced Mathematical Decision Making web site

utdanacenter.org/amdm
(classroom video)