An Imperfect Storm

What will it take to transform high school mathematics in the United States?

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Our work is part of a complex system

- Parents, communities
- Rising expectations
- Moral imperative to offer real opportunities
- Accountability systems
- Teachers and teaching: “That’s where the magic happens”
- Assessment
- What we teach
- What we teach with
- Rapidly changing world
- Politics
- More...
1. Core Subjects
   • English language arts; **mathematics**; science; languages; arts; civics; government; economics; history; geography

2. 21st Century Content
   • Global awareness; civic literacy
   • Financial, economic, business and entrepreneurial literacy
   • Health and wellness awareness

3. Learning and Thinking Skills

4. Critical Thinking and Problem Solving Skills
   • Communication; creativity/innovation skills; collaboration skills
   • Information and media literacy skills; contextual learning skills

5. ICT (Computer/Tech) Literacy

6. Life Skills
Two goals

- More workers in math- and science-based fields (STEM)
- Every student quantitatively and scientifically literate to much more sophisticated levels than in the past, regardless of their field of interest
Some students and groups of students continue to have limited opportunities to reach their potential.

Many (most?) high school programs have a history of preparing students for calculus or for some version of ‘the basics,’ rather than for today’s needs for college and the workplace.

Courses and content once designed to prepare a portion of students for pursuing calculus are now being retrofitted for all students.
Whether planning to enter college or workforce training programs, students need to be educated to a comparable level of readiness in reading and mathematics… if they are to succeed in college-level courses without remediation and to enter workforce training programs ready to learn job-specific skills.

ACT, 2006
Issues: Integrated* Math

- Over the years, there has developed a rough de facto agreement on which major ideas are addressed in Algebra 1/Geometry/Algebra 2, but non-traditional/integrated* courses tend to be unique.

- We continue to take an accept-all-options approach to course organization.

- State standards and tests cannot be written to accommodate existing non-traditional* mathematics materials/programs.

- Without strong, specific leadership from the profession, the growing emphasis on End-of-Course tests and the zealousness of policy makers and funders have real potential to entrench the status quo.
Teachers who know their course content well may be reluctant to change how they teach in significant ways without a very strong reason/motivation to do so.
Issues: HS/College Continuity

- Higher education mathematics departments can enable, enhance, or constrain advances, reform efforts, and change at the high school level.

- There is sometimes little agreement within higher education mathematics department about what is expected of incoming students, how technology should be used in mathematics, and the role of mathematics and statistics in preparing students for different paths.
Issue: Those who want to ‘fix’ it...

- Policy makers, business people, community leaders, and philanthropists are ready to do something drastic to ‘fix’ high school math.

- Standards, tests, and the accountability system are their primary vehicles.

- They are looking for key leverage points and they may not be up to date with the current best thinking about effective high school mathematics.

- Are WE going to help them target their efforts most effectively?
A Gathering Storm?
The Story of Bayside H.S.
National Curriculum
Decades of agreement on the direction of the (9-12) vision

- Agenda for Action, 1980
- Zal Usiskin’s call on what to omit, 1980
- Everybody Counts, 1989
- Curriculum and Evaluation Standards for School Mathematics, 1989
- Principles and Standards for School Mathematics, 2000
- Adding It Up, 2001 (PK-8)
What do we need to do?

1. Define a zero-based math core for all students, first by graduation, and then grade by grade.
Common Core for All Students

- Decide what major mathematical priorities ALL students need to know by high school graduation.
  - By grade 11* (or???)
  - Grade by grade

- Start from the ground up, not from what is now.

- This can provide guidance for states in developing standards/tests; increases usefulness of materials.

- Program developers can choose (or not choose) to use these goals in future revisions.

*All high school students should study a common core of broadly useful mathematics. Everybody Counts, 1989*
What do we need to do?

1. Define a zero-based math core for all students, first by graduation, and then grade by grade.

2. Determine a few high-quality math options to follow the core.
“[We] should consider equally the needs of all disciplines and careers in which mathematical tools are used, as well as quantitative aspects of general education. Preparing all students to squeeze through the calculus filter is neither appropriate nor effective as a way to meet the mathematical expectations of higher education.”

Lynn Steen, 2007
Good Options After the Core

• Build consensus on a vision of a small number of relevant, appropriate, challenging options that follow the common foundation.

• Precalculus leading to calculus

• Settle on a very few other options for students moving toward the workplace or non-STEM majors (statistics, discrete math, quantitative literacy/reasoning, financial literacy, engineering,...).

• More options does not necessarily lead to better preparation.
Proposed Suite of TX H.S. Math Courses

• Algebra I / Geometry / Algebra II
  (or Integrated Math I / II / III)

• Mathematical Models (Alg. I pre-req; before Alg. II)

• Pre-Calculus (Alg. II pre-req)

• Proposed course (Alg. II pre-req): Advanced Mathematical Decision Making
  (utdanacenter.org/amdm)

• AP Calculus (or IB)

• AP Statistics

• Concurrent / dual enrollment
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2. Determine a few high-quality math options to follow the core.

3. Continue to encourage innovation.
Support Innovation

• Common goals and more consistency around topics should not preclude the creation of the next great idea, program, direction.

• Our rapidly changing world demands that we keep our eye on tomorrow while we work on what needs to change today.

• “Continual change is a natural and essential characteristic of mathematics education.”

  Everybody Counts, 1989
What do we need to do?

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4. Call for higher education *Truth in Advertising*.
Truth in Advertising

- Call for colleges and universities to (agree on and) publish their philosophy of mathematics:
  - what they expect of incoming students
  - how they connect to/work with PK-12
  - their view of the role of technology
  - how they will prepare students to use mathematics and statistics (STEM majors, other majors, general education, teacher education)
What do we need to do?

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4. Call for higher education *Truth in Advertising*.

5. Lead, inspire, and motivate the national will toward improving high school mathematics through all dimensions of the system.
Leadership and Commitment

• Commit to Suzanne Wilson’s vision of “Sustained Joint Work” across PK-16 and throughout society toward the shared vision of high-quality mathematics knowledge for every student.

• We need to be smart about implementation timelines, targets, plans, and support structures (target big goals first; later for grade-level goals)
Failure is not an option.

Their future is in our hands.