The Role of QL in HS Math: Getting Students “College Ready”

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Drawing lessons from QR at colleges & universities
And from working with secondary school teachers in VA, MA
MAA’s QR Competencies

- Reading and understanding quantitative info in graphs, tables, etc.
- Interpreting quantitative info and drawing appropriate inferences
- Solving problems using logic, math, statistics
- Estimating answers and checking for reasonableness
- Communicating quantitative info – verbally, graphically, numerically
- Recognizing the limitations of mathematical or statistical models
At college students need to connect math & contexts

- In science and social science courses, esp.
- With math in real world contexts, the problem-solving process is authentic.
- It starts earlier with the framing of the question, spelling out key assumptions, assessing available data, etc.
- It also goes further than the basic “math textbook problem” requiring good interpretation and communication about the results.
- Several college-level QR programs (e.g., Wellesley, Hollins University) focus on authentic problems and on analysis of data.
...and from the other direction, they must connect contexts and math

- Instead of thinking of QR as math plus context and communication....

- We can think of QR as context and communication enhanced by quantitative evidence.

- Carleton College frames QR as it relates to *rhetoric*.... focuses on how QR is used in the construction and evaluation of *arguments*
NCTM’s 2009 Publications & CCSSM’s Math Practices

More of a QR approach present in mainstream K-12 math today than 10 years ago

- Reasoning – process of drawing conclusions on basis of evidence or stated assumptions
- Sense-making – developing understanding of a situation, context, or concept by connecting it with existing knowledge
- Constructing viable arguments
Secondary School Teachers Need Help Integrating a QR Approach

- At middle and h.s. levels, math is often compartmentalized, disconnected
- Math teachers show interest in QR but need professional development – guidance toward good resources; time to make assignments that are engaging to students at their level
“Only Connect…”

- Focus on connections offered by a QR approach
- Integrated learning
- Results: more motivated students, better conceptual understanding, better retention (of info and of students), college and career ready
Fostering a Conspiracy

- QR is important at all levels of education: elementary, secondary, college
- In all disciplines
- In school, work, life….  
- So let’s take up Deborah Hughes-Hallett’s 2007 challenge and "foster a conspiracy" in which faculty in all divisions repeatedly challenge students to apply QR in various contexts, develop QR as a “habit of mind”
- Let’s get more cooperation between K-12 and college/university faculty
How do we do this?
Corri’s 5 tips on QR pedagogy

- Go deep.
- See the forest for the trees.
- Keep it real.
- Let them get “stuck.”
- Break down walls.
1. Go Deep

- One theme, one good table, one problem can address multiple mathematical topics
- Examples: tables from Census, from Statistical Abstract; Fermi puzzles
- Take time to pursue!
2. See forest for the trees

- Focus on big picture:
- Example: relationship among fractions, decimals, percents, ratios
- Eric Gaze’s column on the NNN Web site
3. Keep it real

- At any level of education, there are real world examples of interest: data on the kids themselves; on personal finance...
- Real world is ALL word problems, so frame math questions authentically to start
4. Let them get stuck

- Not always, but sometimes
- Teach the math “just in time”
- Example: at what time do two exponentially growing towns have the same pop’n size?
- Avoids: When will I ever need this math?!
5. Break down walls

- Between math subject areas... e.g., between arithmetic & algebra
- Between math and quant. disciplines
- Use a team approach to best educate the student – to foster those connections
To help advance the conspiracy

AMS Sectional, April 9-10, Holy Cross, “New Trends in College & University Faculty Engagement in K-12 Education”

NNN – Web site for various resources; Journal *Numeracy* for articles. Join us – help w/ our efforts to expand PD on QR. We encourage your submissions to our journal, too!