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



Corri Taylor, Wellesley College Joint Mathematics Meetings: QL Special Session New Orleans, January 7, 2011

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 problemsolving 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 OUT OF 2 PEOPLE HAVE TROUBLE WITH FRACTIONS

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!