

Integrating Mathematics and English

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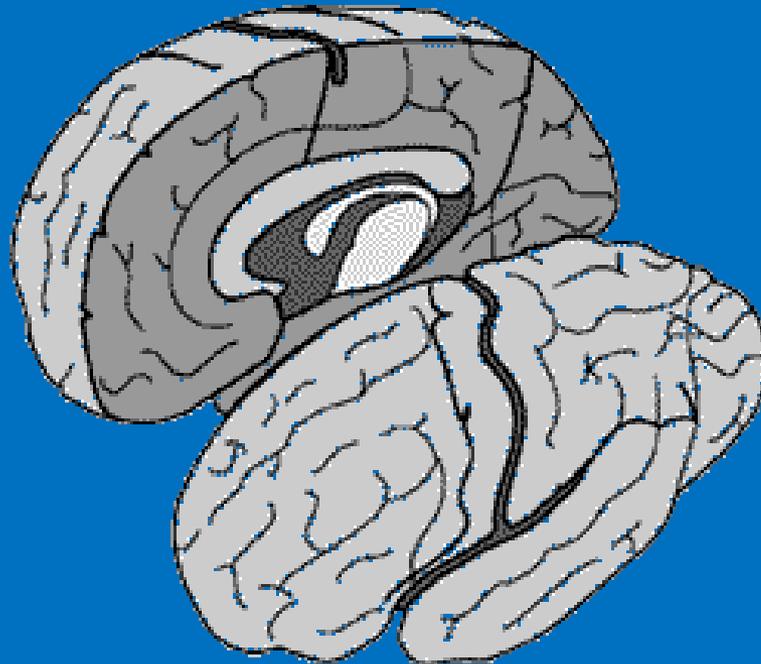
Math and English?

Mathematicians today have paid too much attention to their beloved specialties and not enough to good writing, good exposition, incisive judgment, and the overall health of the discipline.

Steven Krantz, from *"See no evil, hear no evil, speak no evil"* in *Notices of the American Mathematical Society*, vol. 45, no. 9, October 1998.



A little background:



Common Core

English Language Arts and Literacy in
Science and Technical Subjects

- Mathematical Practices: Construct viable arguments and critique the reasoning of others

Reading Comprehension

6-8.RST.1: Cite specific textual evidence to support analysis of science and technical texts.

6-8.RST.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or ideas



Reading Mathematics

- Dense- can't just skim
- Every word and symbol matters
- Words used in regular English are often either more precise or have different meanings entirely (prime, power, function, radical)

Helping Students Read

Talk to kids:

How do you read?

- Newspapers
- Magazines
- Fiction
- Non-fiction
- texts

Environment

- Supportive
- Be a role model

Reader

- Prior knowledge
- Metacognition
- Attitude
- Aloud and with others

Resources

- Newspapers
- Non-Fiction books
- Journals
- Government Websites
- Magazines

Side note: Availability of Fiction

Using Media

Find examples of:

- A number greater than a million
- A number between zero and one
- A decimal, fraction or negative number
- Central tendency
- Graph
- Margin of error
- Prediction based on a math model

Context: Make it meaningful

“The value of (Gates’) stock ... reached an incredible \$81.4 billion. To put that in perspective: That’s 209,357,326 14-ounce tins of Beluga caviar or 513 Boeing 747s, or nearly the gross domestic product of Israel. In other words, it’s a lot more money than most people can fathom.”

-- USA Today

Thrill of a trill ...

Say you had the chance to blow about \$2 trillion. You could:

- Buy 26,317,520 Jaguar XK8 convertibles – - nearly three for everyone in Michigan.
- Pay off credit card debt for EVERYONE in the United States -- four times!
- Give \$7,272 to each of the 275 million people in the United States.

Reading Media Critically

- Not always explicit or correct
- Misleading
- Survey sampling misrepresentations
- Causality vs. Association
- Average vs. mean, median, mode

Writing

- Clear
- Concise
- Appropriate use of vocabulary
- Short or long
- Daily or occasional
- Cognitive or affective

Benefits

- Saves time because they need less instruction
- Promotes higher order thinking

Writing

- Strengthens understanding
- Gives teacher a window into student thinking
- Increases retention
- Develops reasoning
- Shows growth
- Helps quiet students

Writing

- Starting with thought
- Recalling words to express it
- Organizing logically

Good Writing

- Well-organized
- Concise
- Clear
- Correct use of language and symbols
- Demonstrates logical reasoning

Writing

- Focus on providing worthwhile tasks
- Once students are comfortable, stress clarity

Journaling

- Think time-write time
- 5-minute timer
- 2-3 times a week
- Teacher participates

Journaling

- Start small
- Content, process, affective
- Use good verbs: explain, describe, compare, summarize
- Relate to lesson
- Be flexible

Tips

- Patience
- Start with affective
- Encouraging and regular feedback
- Grading not necessary, comments are
- Show samples

R.A.F.T.

- Role, Audience, Format, Topic
- Higher on Bloom's Taxonomy
- Standard or Creative
- Not just regurgitation

writingfix.com

Formal Sample

Role: lawyer

Audience: enemy

Format: news story

Topic: probability

Creative Sample

Role: zero

Audience: whole numbers

Format: campaign speech

Topic: the importance of zero

Role

- Grant writer
- Business manager
- Economist
- Designer
- Teacher
- Casino owner

Audience

- Governor of the state
- IRS
- Conference of mathematicians
- His/her boss
- student

Format

- Magazine commentary article
- Classified ad
- How-to manual
- Resume
- Song
- 10-minute speech
- Book or film review

Topic

- Mean, median, mode
- Estimation
- Mixed numbers
- Measurement
- Mental ways to calculate percents
- Laws of exponents
- Importance of functions

Other Writing Assignments

- Write instructions
- Error analysis
- Open response
- Comparison of methods
- Word problems
- Proofs
- Arguments
- Math analogies

Creative Writing

- Poem
- Riddle
- Story for a line graph
- Imaginative stories: What would it be like to be a square?
- Fairy tales

Longer Assignments

- Pre-writing
- Drafting
- Revising
- Peer and self editing
- Sharing

Longer Assignments

- Math autobiography
- Biography of a mathematician
- Research and report on an area of math (functions, Pascal's Triangle, the history of zero)
- Report on an application of mathematics

Vocabulary

6-8.RST.4: Craft and Structure

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics



Teaching Vocabulary

- Introduce concepts, then language
- Learn in context, make connections
- Compare and contrast English and math use
- Teach prefixes and root words

What Students Can Do

- Write the definition in their own words as well as with the formal definition
- Use the vocabulary in sentences
- Prefix and root word charts
- Student-constructed glossaries or alphabet books
- Word sorting

Frayer Model

Definition

A whole number with more than two factors.

Facts

- 4 is the lowest composite.
- 0 and 1 are not composites.
- Square numbers have an odd number of factors.
- 2 is the only even number that is not a composite.

Composite
Numbers

Examples

4, 6, 8, 9, 10, 12, 14, 15, 16

Nonexamples

0, 1, 2, 3, 5, 7, 11, 13, 17

Vocabulary

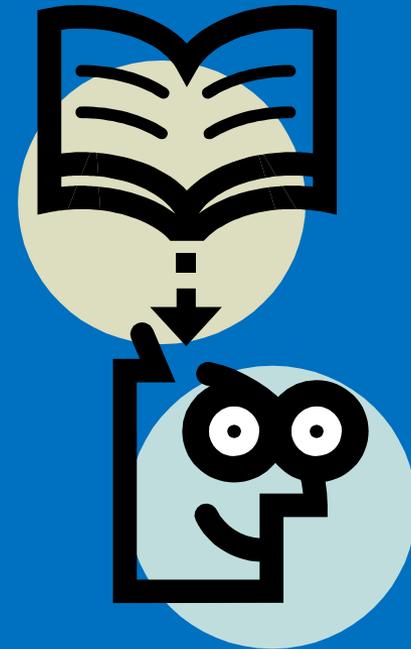
- 3-column guess
- Magic Square (words & definitions have numbers assigned)
- Graphic organizer
- Visual Word Wall

Symbol Story

**Without music
life would B^b**

Other thoughts.....

- Starting small
- Team approach
- Resources
- Brainstorming
- Other



Pure mathematics is, in its way, the poetry of logical ideas.

Albert Einstein

Questions?????



Comments?????