BEST PRACTICES FOR TEACHING QUANTITATIVE SKILLS

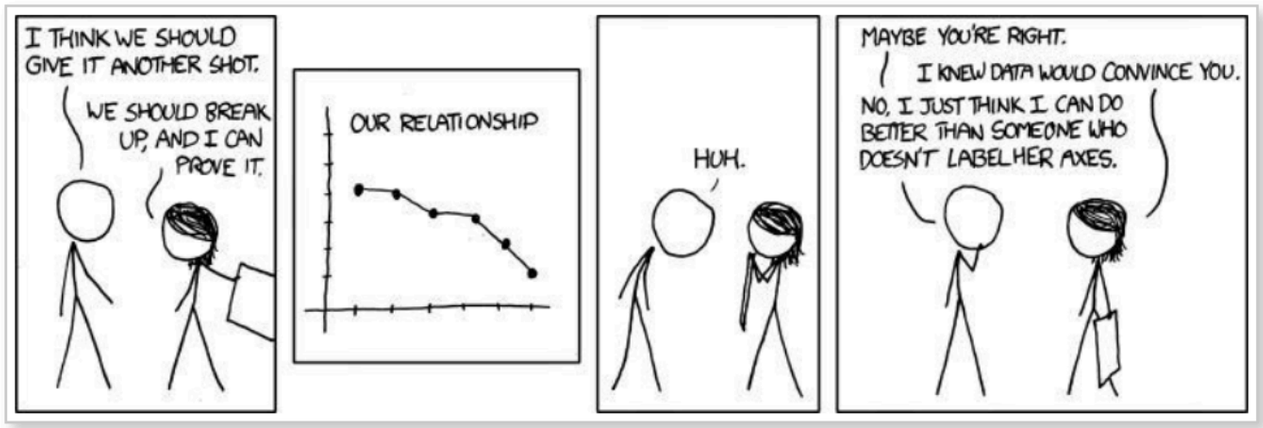
Lessons learned from workshops, work with students and development of math tutorials

FIVE GOOD IDEAS FROM MATH AND GEOLOGY

1. Use multiple representations
2. Use appropriate technology
3. Work in groups
4. Do in-depth problems that last more than one day
5. Place mathematical concepts in context

Best Practices for Quantitative Reasoning Instruction

In her book *Powerful Learning: What we Know about Teaching for Understanding*, Darling-Hammond (2008: 5) argues that meaningful learning is accomplished through a number of key approaches including: "(1) creating ambitious and meaningful tasks, (2) engaging students in active learning, (3) drawing connections to students, (4) scaffolding the learning process, (5) assessing student learning continuously, (6) providing clear standards and constant feedback, and (7) encouraging strategic and metacognitive thinking."



Source: xkcd.com

Several pedagogical approaches which are especially important for teaching QR are described in more detail on this page including:

1. real world applications and active learning, including discovery methods;
2. pairing QR instruction with writing and critical reading;
3. using technology, including computers;
4. collaborative instruction and group work;
5. pedagogy that is sensitive to differences in students' culture and learning styles; and
6. scaffolding the learning process and providing rich feedback and opportunities for revision.

Of course, these approaches are frequently overlapping.

The Math You Need, When You Need It

math tutorials for students in introductory geoscience

1. *Provide adequate instruction for students (influences motivation)*
2. *Make immediate and explicit connections between math concepts and course content (provides motivation)*
3. *Reinforce the notion that completing the exercises will help students to succeed in the course (self-efficacy)*
4. *Make math exercises have some value in the course but not too much (students give up if too high)*

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The Math You Need, When You Need It

Math tutorials for students in introductory geosciences

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Available quantitative topics

- Calculating density
- Graphing
- Hypsometric curve
- Rates
- Rearranging equations
- Slope and Topographic Maps
- Trigonometry
- Unit Conversions

What is *The Math You Need, When You Need It?*

You're probably here because you want help with math in your geoscience class. You've come to the right place!

If you've landed here, you were probably searching for something having to do with a mathematical topic, perhaps one in the geosciences. *The Math You Need, When You Need It* provides web modules to help students succeed with mathematics in introductory geoscience classes. Recent studies show that these tools help to "level the playing field" by supporting you in learning and reviewing mathematical skills. If you need some help with math in geology (or even other sciences), you've come to the right place!

The Math You Need, When You Need It modules give you the quantitative skills that you need, just before you will use them in your geoscience course. Each individual module addresses a single math topic in your geoscience course and is divided into three parts:

1. a page that introduces and explains the concept (*Why is it important? Where is it used*?) and provides a set of steps that you can use to solve mathematical problems in lab or class,
2. a set of practice problems in the context of geology with worked answers (using the steps provided on the introduction page), and