An Exciting Mathematical Reasoning Course – Quantway™

AMATYC 11/2/2013
The story is a familiar one:
A high-school dropout and single mother works the supermarket late shift. Motivated to earn a four-year degree so she can have a better life for herself and her 4-year-old daughter, she enrolls in a community college after earning a GED. Three years later, she still hasn’t completed the sequence of three remedial math courses required before she can take college-level math. Defeated, she says, "I just couldn’t do it anymore."
For this student and too many others, the dream stops here.
Presentation Goals

- Introduce you to:
  - the Quantway™ Initiative
  - the Quantway™ I course materials
The Problem: Developmental Math

60% of CC students taking the placement exam need at least 1 remedial course.  
Sinclair 80%

The remedial college math path can be 3-5 courses  
Sinclair 5 courses

More students drop out between courses than from an actual class

Only one remedial math pathway, regardless of major
Solution: Community College Pathways (CCP) program

CCP – an innovative, transformative strategy in undergraduate mathematics education.

Started in 2009 by The Carnegie Foundation for the Advancement of Teaching with
+ Bill and Melinda Gates Foundation
+ William and Flora Hewlett Foundation
+ Kresge Foundation
+ Carnegie Corporation of the New York
+ Lumina Foundation
Community College Pathways (CCP) program

To **develop** and **implement** CCP program, the Carnegie Foundation formed a network of

- Community colleges
- Professional association
- Educational researchers
Solution: New Mathematics Pathways

Two 1-year pathways for elementary algebra students

1. STATways®
   Through college-level statistics for non-STEM majors requiring introductory level stats

2. Quantways®
   “To-and-through” non-STEM college-level quantitative reasoning for Associate of Arts majors (AA)
Seeding the Network

8 Community colleges

3 States (NY, OH, GA)
Network Shared Aims

➢ To improve **mathematical literacy** and **quantitative reasoning** in the non-STEM student population

➢ To **increase** from 5% to 50% the number of nonSTEM students who achieve **college math credit** within one year of continuous enrollment
Quantway™ – 2 courses

- **Quantway™ I** – (1ˢᵗ term) fulfils the requirement for students’ developmental mathematics sequence

- **Quantway™ II** – (2ⁿᵈ term) results in college mathematics credit
Goal of Quantway™

• To help students learn things that they can actually use in life—not so they can memorize it for a test and then forget it.

• Students use numerical reasoning for decision making, argumentation and sense making about real-world questions, problems and contexts of personal, social and global importance.
Create a new course that challenges students using real world applications following these guiding principles:

- Student will **struggle** with important mathematics
- Make **explicit connections** to mathematical concepts
- Use **deliberate practice** by applying concepts and procedures in order to solve problems
Productive Struggle

“Solving problems that are within reach and grappling with key mathematical ideas that are comprehensible but not yet well formed”

(Schmidt & Bjork, 1992)
Fixed Mindset: “Being a 'math person' or not is something about you that you really can't change. Some people are good at math and other people aren't."
The Course - Three Main Parts

- **Productive Persistence**
- **Classroom Lessons**
- **Online Homework - MyQuantway**
Productive Persistence

What is Productive Persistence?
Productive Persistence

We’re defining “productive persistence” as:

tenacity + good strategies.

To help more students successfully complete the math pathways, we want them to both persist in their studying and attendance (tenacity) and to do so efficiently and effectively (good strategies).
Lessons

Each lesson begins with a rich problem that engages students’ thinking and requires productive struggle as a part of the learning process.

Lesson Themes: Citizenship
Medical Literacy
Personal Finance
Quantway Learning Outcomes

- Numerical Skills
- Proportional Reasoning
- Algebraic Reasoning
- Reasoning with Functions
Traditional Approach

- Theory, then applications if time
- Each strand done separately to completion
- Algebra is primary focus
- Skill based
- Examples of every possible variation of skill (problem recognition)
New Approach

- Applications to motivate, then theory as needed
- Strands addressed each unit in an integrated fashion going deeper each time
- Equal time on each strand
- Concepts-based
- Fewer skills, more connections

Undercurrent of geometry, statistics, student success, mathematical success
Comparative Concepts

**Algebraic Evaluation**
Evaluate:

\[ 3x - 5 \]

when

\[ x = 4 \]

**Quantway™ Evaluation**

The formula for the braking distance of a car is

\[
\frac{V_0^2}{2g(f + G)}
\]

1. Let \( f = 0.8 \) and \( G = 0.05 \). Write a simplified form of the formula using these values for the two variables.
2. How can you verify your predictions about the relationship between velocity and braking distance?
Comparative Concepts

Linear Equations

Find the equation of the line passing through the points (2,-4) and (-3,7).

Write the equation in slope-intercept form.

Quantway™ Linear

You want to have your own phone and need to decide which option costs less. Note that the descriptions of these options are examples of verbal representations of the mathematical relationships.

- Per-Minute Pricing: There is a monthly fee of $15.99 plus $0.13 per minute.
- Unlimited Plan: The plan costs $39.99 per month. The phone is free and unlimited minutes of talk time are included, but a two-year contract is required.

Find linear models to help you decide.
What is Average?

Lesson 2.6
Classroom Experience
Balancing Blood Alcohol

Lesson 3.6
Classroom Experience
Overview of the Platform and its Features

- Online assessments with built in Productive Persistence
  - Making Connections to the Lessons
  - Developing Skills and Understanding
  - Making Connections to the Course
  - Preparing for the Next Lesson

- Powerful Gradebook
- Announcements
- Attachments and handouts
- Forums for discussion
Time to Complete College Level Math Course:

**Quantway™ vs. Traditional Math**

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<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
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<tbody>
<tr>
<td>100%</td>
<td>17.8%</td>
<td>23.6%</td>
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- **Quantway™**
  - 42.9%
  - Graduation Cap

- **Traditional Math**
  - 70.0%
  - Stacked Books
Sinclair Assessment Specifics
Quantway™ I

- Success rate: 67% (56% nationally) of students successfully completed (n=315)
- Many students then moved on to our college-level course liberal-arts math course. This increased the number of AA students completing their **math requirements** at SCC by 60% over the previous year.
Have you been Quantified?

"Just a darn minute! — Yesterday you said that X equals two!"

Carnegie Foundation for the Advancement of Teaching
## Contact Information

### Sinclair Community College

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