so that their students can be successful as well. Eight semesters later, all of the college’s MAT010 students are taught using the conceptual approach with improved success rates.

Barbara’s journey began when she was looking for an alternative way to increase the 30-40% success rate of her MAT010 Fundamentals of Arithmetic course. She contacted publishers and began a textbook review only to discover that the textbooks were nearly identical—all used the same topical teaching approach. For example, students learn about how whole numbers are added, subtracted, multiplied, and divided. They move on to fractions and follow the same process. It was clear that many students have not experienced success with this approach. Barbara wondered what would happen if, instead of teaching topics, she taught by concepts. In a conceptual approach, students learn how to add whole numbers, fractions, and decimals and then move on to subtraction, followed by multiplication and division.

Barbara spent several months working on a new textbook to apply her conceptual approach—*Concepts of Numbers for Arithmetic and PreAlgebra*—published by Pearson. She piloted a single course in the Fall of 2008 with significant success.

At the Achieving the Dream conference in 2009, Barbara presented her teaching approach and positive results. This lead to recognition and an interest from variety of schools and organizations, such as AMATYC, where she has been a frequent presenter. In addition, Barbara’s project has also been the topic of articles in a variety of educational publications, such as *Community College Times*. Barbara also received Montgomery County Community College’s Innovation of the Year Award in 2010.

It’s not surprising that all of Barbara’s colleagues utilize the new textbook and teaching approach so that their students can be successful as well. Eight semesters later, all of the college’s MAT010 students are taught using the conceptual approach with improved success rates.

**Project Overview**

Barbara Lontz, Assistant Professor of Math at Montgomery County Community College, was awarded a Hewlett Grant for $270,000 from the CCRC (Community College Research Center) of Columbia University who chose 3 projects in the U.S. with the intention to “improve and replicate”.

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**Concepts of Numbers—A New Approach to Teaching Math**

“While this approach does not represent a revolution in teaching math, it is an attempt to create active learners. So, instead of presenting definitions, providing examples, and then practice problems, students are asked to figure out problems first. While attempting to complete a problem before a rule is given, students usually find a way to solve the problem.”

- Barbara Lontz, Assistant Professor of Math, Montgomery County Community College
Course Redesign

The course begins with an historical perspective which gives students some background to better understand the evolution of our present system of numbers. The contributions of many cultures, including Egyptian, Babylonian, African, Roman, and Mayan are presented. The discussion of the Real Number System follows. This places all of the concepts that follow into the context that fractions, decimals, percents, etc., are all just numbers. The operation concepts are then introduced and the course finishes with a combination unit.

⇒ Unit 1: History of Numbers
⇒ Unit 2: The Real Number System
⇒ Unit 3: Comparisons
⇒ Unit 4: Addition
⇒ Unit 5: Subtraction
⇒ Unit 6: Multiplication
⇒ Unit 7: Division
⇒ Unit 8: Combinations

Pilot Results

“Teach me, and I will forget. Show me, and I will remember. Involve me, and I will understand.”
A Chinese Proverb

| MAT010 Concepts of Numbers versus MAT010 Traditional Course |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|                          | Fall 2008 | Spring 2009 | Fall 2009 | Spring 2010 | Fall 2010 | Spring 2011 | Fall 2011 |
| Concepts of Numbers       |           |             |           |             |           |             |           |
| N=19                     | 74%       | 63%         | 68%       | 60%         | 58%       | 57.4%       | 57.7%     |
| Traditional Arithmetic   |           |             |           |             |           |             |           |
| N=664                    | 45%       | 34%         | 41%       | 40%         | 40%       | 37.8%       |           |
| N                          | 429       | 567         | 236       | 284         | 150       | N=704       |           |

Success Rates: Success is a grade of C or better. Withdraws count as non-success.

Student Reactions

“I finally understand math. I will never be able to thank her enough for giving me the thrill of that.”

“The teacher explained math to us in a way I have never experienced. I thought it was taught to us to make sense.”

“I felt like I was not taught math but that I learned math.”

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“Planning and plodding wins the race”
The Tortoise and the Hare, Aesop