FEATURE // BY MARTHA MERSON AND DONNA CURRY

Adult Numeracy: A Champion's Legacy

The importance of adult literacy is well understood, but adult numeracy remains one of the most marginalized areas of education. The persistent need for adults to improve their math skills outpaces the funding and the academic support available.

Language barriers, economic hardships, and a history of interrupted school experiences can make returning to school a daunting prospect. Adults who seek out classes to improve their math skills demonstrate courage and deserve respect. Mary Jane Schmitt (1947-2015) was dedicated to the adults returning for a second chance at learning mathematics. The Adult Numeracy Center at TERC (ANC) was her brainchild; the culmination of her life's work supporting these adult learners.

Mary Jane joined TERC in 2000, excited to learn about reform math from the *Investigations in Number, Data and Space®* curriculum (TERC's K-5 inquiry-based hands-on math program), to find out about analyzing classroom discourse and collaborative research from TERC's Chèche Konnen Center, and to bring the work of Kliman, Mokros, Nemirovsky, Rubin, and Tierney on data and graphs to adult math learners. While at TERC, Mary Jane co-authored the *EMPower™* series, led professional development in states across the country, wrote about the differences between mathematics and numeracy, made the case for teaching algebra to students who hadn't mastered their times tables, and contributed to international assessments of adults' numeracy.

Mary Jane was an inspiration to many adult educators. With characteristic energy, she recruited teachers to the Massachusetts adult education Math Team, helped publish their research stories, crafted a volunteer training component called VolUME (Volunteers for the Ultimate Math Experience), and more. She advocated tirelessly for including adults in K-12 math reform initiatives and worked with colleagues to have the Adult Numeracy Network (ANN) acknowledged as an affiliate of the National Council of Teachers of Mathematics.

EMPower has impact

Mary Jane's work on the *EMPower* series (along with co-authors Steinback, Donovan, Merson and Curry) was groundbreaking. The *EMPower* series offers over 100 investigations, bringing opportunities for mathematical reasoning and connections to adults who typically experienced math learning as the process of silently finding one right answer. The teacher books offer support for instructors who are new to math teaching. Well over a decade after it was first published, *EMPower* has fans all over the country. One admitted:

"At first,* EMPower *was not something I wanted to do but after the first TABE test, I saw all their scores went up. It didn't matter that I didn't want to do it, what mattered was that my students retained the information that they learned and were able to look at other problems and see patterns that would help them solve new problems."

—NY adult ed teacher

In response to the increased mathematical rigor of the College and Career Readiness Standards for Adult Education and the new high school equivalency tests, three of the *EMPower* titles were revised and released in 2015-16. The updated *EMPower Plus* titles—Everyday Number Sense, Using Benchmarks, and Split It Up—help students build a foundation of number and operation sense for algebraic thinking. Mary Jane was keen to revisit operations with whole numbers, fractions, and decimals. By examining sets of equations and articulating patterns, adults can more readily connect ideas across math content strands, find more efficient solution strategies, and justify their approaches.

EMPower Plus lessons give students an opportunity to examine statements like the ones below. They investigate whether they are true, both by generating their own examples or by referring to a set of equations or expressions that is provided and testing their generalizations. The goal is for students to revise their beliefs and refine their expectations about the effect of operations on pairs or groups of numbers.

Mary Jane found that adult thinking was like that of the schoolchildren that Russell, Bastable, and Schifter examined:

... Adults with limited operation sense tend to apply their understandings of operations with whole numbers to non-whole rational numbers. This leads to generalizations such as:

- ***Multiplication makes things bigger.***
- ***You cannot divide a small number by a larger number. So, dividing 5 by 39 can't be.***
- ***You line up whole numbers in a right-justified column before adding and subtracting, so you must treat decimals the same way.***

Some ideas people have about operations on whole numbers hold up when working with decimals or fractions, but others do not.

In 2016-17, the Kentucky Adult Education (KYAE) Skills U, an organization that helps adult students attain high school equivalency diplomas and prepare for college and career success, conducted its own pilot test using the *EMPower Plus* titles. Anecdotal data show that *EMPower* lessons help students to reason using math. Instructors agreed that if students participated in even one lesson, they come away with a better foundational understanding of math.

"With EMPower, students see math as related to their lives." —Gayle Box, Senior Associate of KYAE Skills U

Due to the success of the 2016-17 *EMPower* pilot, KYAE Skills U is working to expand the program as a professional development opportunity across the state.

The California Department of Corrections and Rehabilitation adopted *EMPower* for similar reasons. Now math instructors in minimum, medium, and maximum security facilities have instructional resources that promote strategic problem solving as well as examining alternate solution pathways.

Over the years, the ANC has grown beyond the development and support of *EMPower* and is now a hub of activity and resources for adult education math instructors, with the goal of helping adults and young adults understand how math is present and relevant in everyday life. ANC staff and consultants are active on the national stage. The ANC's current director, Donna Curry, edited the Adult Numeracy Network's newsletter for 12 years and mentored recent office-holders and recipients of the Network's practitioner research grants.

Figure 1: Mary Jane at a professional development workshop

Adult Numeracy: A Champion's *legacy*

SABES PD Center for Mathematics and Adult Numeracy Comes to TERC

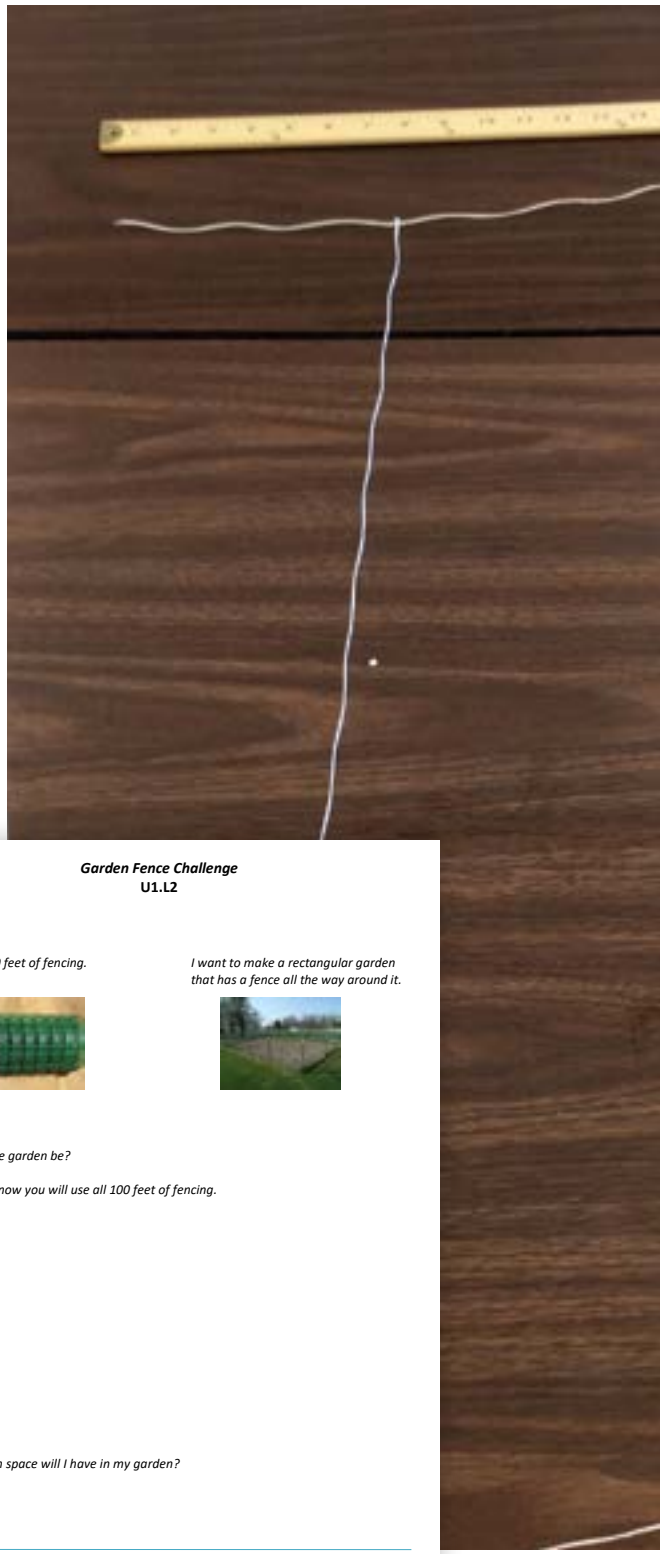
Just four years ago in Massachusetts, the Adult and Community Learning Services division of the Department of Elementary and Secondary Education solicited proposals for centers that would be responsible for delivering professional development to its adult basic education workforce in content areas such as math, reading, and English language learning. Under the leadership of Donna Curry, TERC bid for and was selected as the new SABES PD Center for Mathematics and Adult Numeracy. In its first few years, the Center and its team of curriculum specialists have developed and run several new courses (including face-to-face, online and blended options), reaching teachers in all corners of the state. Among its successes, in 2016-2017, 362 instructors attended adult numeracy center offerings. An impressive number given that the number of full-time teachers whose jobs offer paid professional development hours is estimated to be about 320.

With no state university-based program offering courses on math instruction for adults, the Center aims to fill in as many gaps as possible. Among the 20 offerings provided in 2017, the ANC staff led *Analyzing Student Work to Inform Math Instruction*, the *Mathematizing ESOL* (English for Speakers of Other Languages) series, and *Exploring Exponents*.

In 2017, the ANC also received support from the Massachusetts Department of Elementary and Secondary Education to create a Curriculum for Accelerated Mathematics (CAM) that advances conceptual understanding with the purpose of easing the transition for learners enrolled in adult basic education to successful performance on tests for high school equivalency and credit-bearing college courses.

In launching this work, Curry and ANC staff have set out to answer three questions:

1. **Does CAM help students move to a higher math level?**
2. **Does CAM help teachers (and students) think differently about what math is?**
3. **Does CAM help teachers teach more conceptually (and value doing so)?**



Garden Fence Challenge
U1.L2

I have 100 feet of fencing.

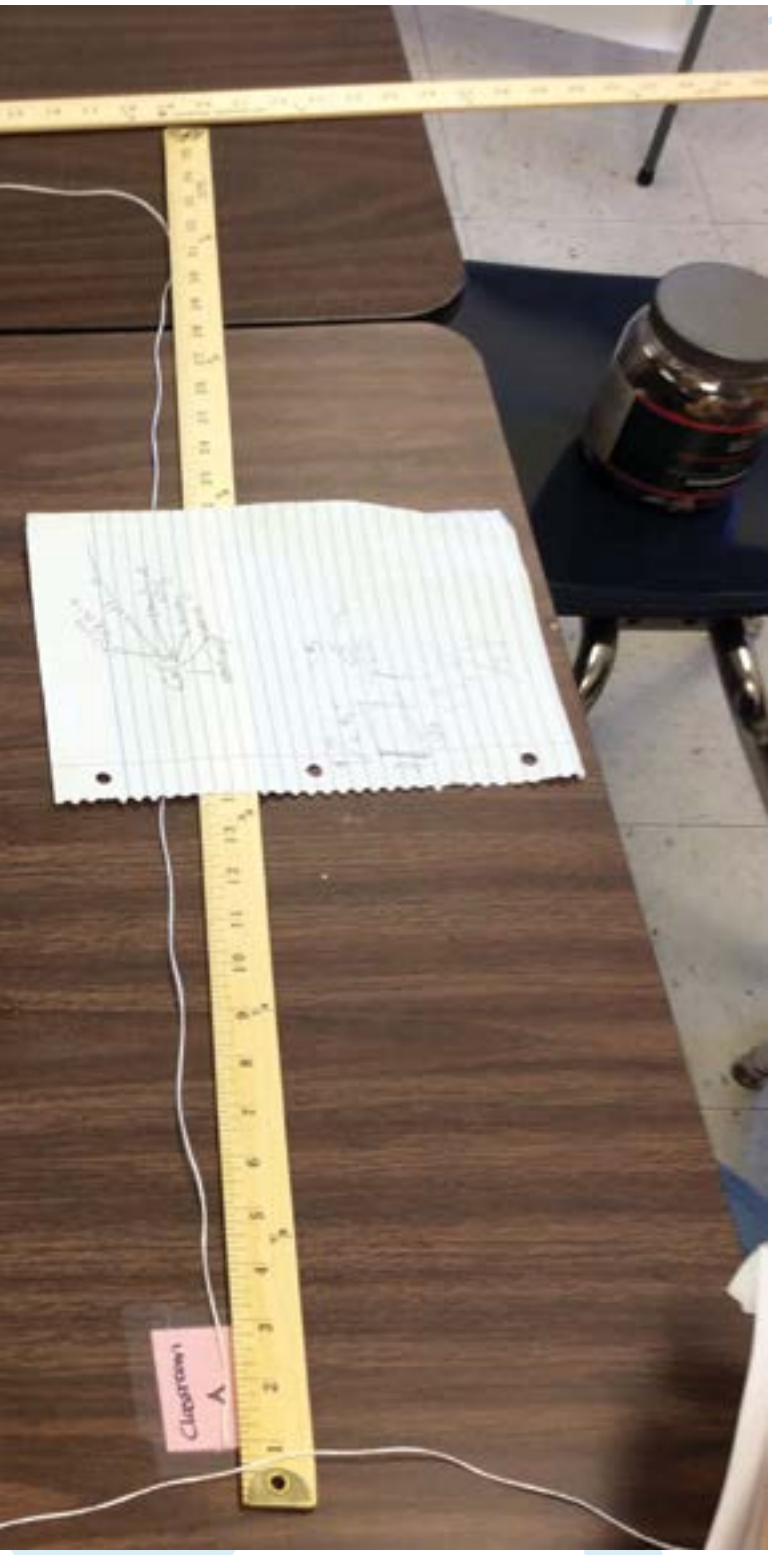
I want to make a rectangular garden that has a fence all the way around it.

What size will the garden be?

Show how you know you will use all 100 feet of fencing.

Extra: How much space will I have in my garden?

Figure 2: Adult education students in South Boston, MA, solve the Garden Fence Challenge (a perimeter and area problem). They explain their reasoning for why 100 feet of fencing would be needed by using string and yardsticks to show the dimensions of the garden space.



The CAM units provide instructors with a variety of hands-on, real-world lessons and activities designed to demonstrate and reinforce the connections between math content areas. They begin to integrate algebraic thinking and proportional reasoning in Unit 1 which also illustrates the application of those ideas through geometry and data tasks.

Several units are built on *EMPower*'s strong focus on conceptual understanding. These units differ from typical curricula in that multiple math concepts are taught at the same time with one essential topic anchoring the lessons. Concepts from algebra, geometry, number, and data are woven together. Each unit closes with a common workplace dilemma that requires students to demonstrate their ability to reason their way through problems and scenarios.

When Curry and her team observe pilot sites, they see that the math is far from easy, yet students seem to be welcoming the challenge. Mary Jane would be proud. She insisted that a first-rate education be accessible for everyone—teachers and students—particularly for those who didn't get a fair shot at math learning the first time around.

For more information:

EMPower Plus
extending mathematical power
EMPower.terc.edu

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