

MATH MATTERS

CENTER FOR MATHEMATICS EDUCATION + COLLEGE OF EDUCATION



PREPARING MATH TEACHERS TO WORK WITH ENGLISH LANGUAGE LEARNERS

Education is a societal endeavor. As a result, our efforts as educators are shaped by the society around us. This is why the Center for Mathematics Education establishes strong relationships between our research and the communities in which we live and work, including the large, majority-minority school districts in our area. It is also why we are committed to equity and access in the mathematics education of all students.

Changing demographics have implications for mathematics education, teacher preparation, and professional development. Hispanics now make up eight percent of the population of Maryland. According to census data analyzed by the Pew Research Center, Prince George's County, which is home to one of the nation's 25 largest school districts and the second largest in Maryland, has had a 132% increase in Hispanic students from 2000 to 2011, while nearby Montgomery County Public Schools has had a 72% increase in the same time frame. Almost 30% of the PGCPSS students are Hispanic. These trends have led PGCPSS to create two new high schools focused on the education of newcomers to the nation.

Local districts are seeking effective ways to prepare mathematics teachers to work with English Language Learners. To this end, CfME's Drs. Rodrigo Gutiérrez, Beatriz Quintos, and Carolina Napp-Avelli have been working closely with PGCPSS colleagues such as Melissa Kochanowski and Halla Jmourko. Since 2008, CfME has received funding from the Maryland Higher Education Commission to strengthen the capacity of PGCPSS elementary and middle school math teachers. For the last four years, our outreach programs have focused on helping math teachers learn to work with English Language Learners. One such effort, ELLMath, has focused teachers' attention on listening to students in the context of the math classroom. Teachers in the first cohort praised this program for helping them recognize and cope with the language barrier, understand the experiences of English Language Learners in an English-speaking classroom, and see the shortcomings of the "I do, we do, you do" approach that often typifies the teaching of math processes.

With new MHEC funding, this year a second cohort will join ELLMath, in which they will learn both how to expand students' mathematical understanding and promote their mathematical communication. PGCPSS teachers are excited about it: more than sixty teachers applied for the 25 available slots. Teachers will receive tuition support from the grant for six credits of graduate level work with CfME faculty and doctoral students. As we explore ways to help local districts respond to changing circumstances, we hope that with future funding we can enlarge the PGCPSS offering and perhaps bring ELLMath to other districts.

Daniel Chazan, Ed.D.
 Director, Center for Mathematics Education

For nearly 50 years, the **CENTER FOR MATHEMATICS EDUCATION** in the College of Education has served as a scholarly voice for excellence and innovation in mathematics education, while nurturing the next generation of mathematics educators and researchers.

A Retiring Pat Campbell?

by Jim Fey and Anna O. Graeber



Pat Campbell and Lawrence Clark at Pat's retirement party

EVERYONE WHO CHOOSES A CAREER IN EDUCATION aspires to make a difference in the lives of young people. But few educators produce a record of teaching, research, and institutional leadership that matches the accomplishments of Professor Patricia F. Campbell. For 34 years, our colleague and friend has been a dynamic force in the University of Maryland,

the state, and the broader national community of mathematics education. Those of you who have worked with Pat know that the adjective retiring does not describe her style. But, please join the Center For Mathematics Education in extending best wishes to her as she retires from the University on July 1, 2016.

During her tenure at Maryland, Pat has advised over 50 masters degree students, served as major advisor on the dissertations of 15 doctoral students, and mentored countless others as they participated in research and professional development projects she led. Students have always found Pat exacting with respect to their work, yet generous in giving her time and advice to guide their growth as teachers, researchers, and scholars.

Mathematics education has benefited both locally and nationally as a result of Pat's work. The titles of her major research and development projects capture the consistent themes in her work: improving the mathematical experiences of students through innovative instructional materials and the professional development of their teachers, with special attention to the challenges of diverse urban schools. These projects have included:

- Improving the Mathematical Understanding of Minority Students
- Project IMPACT: Increasing the Mathematical Power of All Children and Teachers
- Mathematics: Application and Reasoning Skills (MARS)
- Mid-Atlantic Center for Mathematics Teaching and Learning
- Mathematics Specialists in K-5 Schools: Research and Policy

The theory and findings of these projects have been reported in nearly two hundred talks at professional meetings as well as in publications, including 19 book chapters and 30 articles in leading journals of the field such as the *Journal for Research in Mathematics Education*, *ZDM: The International Journal on Mathematics Education*, *Urban Education*, and *Teaching Children Mathematics*.

Research and teaching are not the only arenas of Pat's outstanding contributions to mathematics education. She has also served on the Board of Directors for NCTM and as chair and program chair for AERA's Special Interest Group for Research in Mathematics Education. Rarely hesitant to speak truth to power,

Pat served several terms on the University and College Senates and on numerous university, college, and department committees.

Given Pat's achievements in teaching, research, and service, it is not surprising that her efforts have been recognized by a variety of prestigious awards, including the College of Education's Excellence in Faculty Mentoring Award, the University of Maryland's Presidential Award for Service to Schools, the USM Board of Regents Faculty Award for Excellence in Public Service, the Urban Impact Award from the Council of the Great City Schools, AERA's Presidential Citation for Research and Development, and the Louise Hay Award for Contributions to Mathematics Education from the Association for Women in Mathematics.

Professor Campbell will be missed at the University.

Those who have worked with Pat know that, many a night and weekend, she would be in her office until the wee hours working on student papers, research projects, or grant proposals. While she demanded much of her students and colleagues, she also expected much of herself. For colleagues, she was willing to advise, share resources, teach for them when they were ill, or host a party. And Pat knows how to dance and party!



Pat Campbell and Anna Graeber

Professor Campbell will be missed at the University. We can only hope that, in retirement, she continues the program of influential work that has improved the mathematical education of so many students and teachers. Of course, we also wish that she will do more traveling with her husband and spend more time with the children and grandchildren she loves so much.

CFME Announcements

We are excited to welcome three new Fey-Graeber fellows to our doctoral program: **Monica Dunsworth, William Viviani, and Joshua Himmelsbach**. We also are celebrating **Dana Grosser-Clarkson's** completion of her Ph.D. and thrilled she will stay as a Post-Doctoral fellow in the coming year. Finally, we welcome **Imani Goffney** as a faculty member in the Fall 2016.

EXAMINING CAREER TRAJECTORIES OF URBAN MATH TEACHERS

from a Selective Alternative Certification Program

by Barbie Dunnan



Andrew Brantlinger

LAST FALL, DR. ANDREW BRANTLINGER BEGAN a new project with Dr. Laurel Cooley of Brooklyn College to examine the features of academically selective alternative teacher certification programs (ATCPs) that affect mathematics teachers' retention and career trajectories in, through, and out of urban public school systems. Their work is sponsored by a three-year Core Research grant from the National Science Foundation's Directorate for Education & Human Resources, administered through the Robert Noyce Teacher Scholarship Program.

Although Dr. Brantlinger and Dr. Cooley have collaborated for years – their co-authored papers, including journal articles, book chapters, and conference presentations, go back at least to 2007 – this was their first attempt at an NSF grant. “We’re very happy about it,” Dr. Brantlinger says. “It will provide us the time to collect good data, get immersed in the analysis, and write up and present the results.”

This project examines the career trajectories of four hundred math teachers who began the New York City Teaching Fellows (NYCTF) Program, a selective ATCP, in 2006 and 2007. Data on these teachers from a previous project, which inquired about school placement and roles,

is being integrated into the project. The study uses a multi-methodological, longitudinal design including both quantitative and qualitative components.

Quantitatively, the study includes logistic regression and survival analyses to answer questions about the features of selective ATCPs – such as preparation, school placements, and mentoring – that affect the math teachers' school and district retention at the two-year and five-year marks. The qualitative component consists of interviews conducted with a representative sample of these selective-route teachers, taking a closer look at the types of careers, both in and outside of education, that such teachers build for themselves after completing the required two years of teaching in high-needs urban schools.

The project kicked off in fall 2015 with a meeting between the research group and the project advisory board at Brooklyn College, where they discussed and planned their work, priorities, and timelines. Dr. Cooley is in charge of the qualitative side of the project, while Dr. Brantlinger and his graduate assistants, Caroline Titan and Barbie Dunnan, handle the quantitative side. While funding is limited, College of Education graduate students are welcome to join the research group, which will recommence regular meetings in fall 2016.

DR. ANDREW BRANTLINGER studies secondary mathematics education, urban schooling, alternative certification, critical pedagogy, and the sociology of education. From 2009-2014, he was the principal investigator, with Dr. Lawrence Clark, for a \$2 million U.S. Department of Education Transition to Teaching grant that fostered the Maryland Science Mathematics Resident Teacher (MSMaRT) program, an alternative teacher certification program created in partnership between Prince George's County Public Schools and the University of Maryland, College Park. He holds a Ph.D. in Learning Sciences from Northwestern University.



Taking a Closer Look at Solving Equations

by Elizabeth Fleming



Elizabeth Fleming and Dana Grosser-Clarkson

Suppose you were asked to solve the equation $8 + 2x = 10$. What would you do first? Would you divide both sides by two? Probably not. Many of us would say the first step is to subtract eight from both sides.

But where did this idea for a set of steps come from? Have we always taught solving linear equations this way? And how common is it—do most teachers teach solving equations this way? Questions like these motivated Dr. Orly Buchbinder, Dr. Dan Chazan, and me to write “Insights into the School Mathematics Tradition from Solving Linear Equations,” an article published in a recent issue of *For the Learning of Mathematics*.

To answer the first two questions, regarding history, I examined old algebra textbooks. I found that, starting in the

nineteenth century, textbooks tended to include a method for solving equations that looks quite similar to the one we use today (see image). To answer the third question, we examined results from a survey of current teachers conducted by Dr. Buchbinder, asking them about different solution methods for solving linear equations. We found a striking agreement across teachers’ responses – a shared expectation that all students master this canonical method. Drawing from both the textbook analysis and survey results, we suggest it may be helpful to conceptualize the solving of equations as an institutional practice of schools.

As a doctoral student, I really appreciated the opportunity to work with Orly and Dan on this article. I have a strong interest in the history of mathematics and mathematics education, and I had a wonderful time digging up and combing through old textbooks for presentations of linear equations. Bringing Orly’s work with teachers, Dan’s expertise on the institutionalization of schooling, and my historical work together was a thought-provoking and exciting endeavor.

57. To Solve a Simple Numerical Equation in x , therefore:

Transpose all the terms that contain x to the left side, and all the other terms to the right side. Combine similar terms, and divide both sides by the coefficient of x .

Presentation of a solution method. From Wentworth, G. A. (1898). *New School Algebra*. Boston, MA: Ginn & Co.



UMD Math Education graduate students, alumni, and faculty at a recent meeting of the Association of Maryland Mathematics Teacher Educators (AMMTE).



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