

MATH MATTERS

CENTER FOR MATHEMATICS EDUCATION \subseteq COLLEGE OF EDUCATION

Center for Mathematics Education Launches *MathMatters*

by Lawrence Clark



Faculty and students from the Center for Mathematics Education during Kick Off Meeting 2010. Back row (l to r): Dan Chazan, Senfeng Liang, Beatriz Quintos, Penny Stradley, Toya Jones, Rick Hollenbeck, Jill NeuMayer DePiper, Pat Campbell, Matt Griffin, Ann Edwards, Chao Xie, and Sam Rebeard. Front row (l to r): Lawrence Clark, Amber Rust, Andrew Brantlinger, and Whitney Johnson.

researchers. The Center's mission is to engage in research, teaching and outreach designed to build the national capacity for improving the mathematical education of all students, especially those from ethnic and racial minorities in urban or under-resourced settings. In this issue, we provide a glimpse at the diversity of programs and people who comprise the Center, as well as showcasing the commitment we have to addressing the needs of the schools and communities that we study and serve.

As you will read in this newsletter, the 2009-2010 academic year was full of successes. Our faculty were awarded multiple research and mathematics teacher education grants, including funding from the U. S. Department of Education to start the Maryland Science Mathematics Resident Teacher Program (MSMaRT). MSMaRT is a program that prepares students to become math and science teachers while giving them teaching experience in Prince George's County. Our commitment to building inservice teacher capacity in local districts continued through our Prince George's and Montgomery County Public Schools middle grades math endorsement programs. Our collective research agenda flourished along numerous paths, including the completion of data collection of a large scale study that researched the relationship between teachers' mathematical knowledge, beliefs, and their students' mathematics achievement. In addition, as part of the Mid-Atlantic Center for Mathematics Teaching and Learning (MAC-MTL), over 50 faculty and students from three universities met to share results from ten years of research funded by National Science Foundation. Last year also saw the Center's faculty, students, and alumni create a state-level organization of mathematics educators called the Maryland Math Educators. And the list goes on.

The Center's strategic planning process that began in December 2005 (with the invaluable assistance of one of our esteemed alumni, Dr. Linda Rosen) has resulted in a center-wide research focus on urban mathematics teaching, the development of outreach initiatives with local schools, a set of innovations in mathematics teacher education, and national conferences related to high school mathematics education policies. The Center is grateful for all the support we receive in our effort to make a difference in the teaching and learning of mathematics every day.

On a personal note, it has been an honor to serve as Interim Director for the Center during the 2009-2010 academic year during Dr. Daniel Chazan's sabbatical. It was a wonderful experience, and I learned a great deal about managing the complexities of the numerous initiatives, programs, and projects at our Center.

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.

Mid-Atlantic Center for Mathematics Teaching and Learning (MAC-MTL)

Rebuilding the Nation's Research Basis and Capacity in Mathematics Education

The Center has received National Science Foundation (NSF) funding for the last 10 years to collaborate with other universities to rebuild the nation's research basis and personnel infrastructure for leadership in mathematics education. The mathematics education faculty at the University of Maryland, University of Delaware, and the Pennsylvania State University are partners in the Mid-Atlantic Center for Mathematics Teaching and Learning (MAC-MTL). The NSF grant supports an innovative doctoral and postdoctoral program in mathematics education that addresses teacher education, teacher professional development, educational policy and leadership, as well as reform. At the University of Maryland Center for Mathematics Education, doctoral students and faculty are currently engaged in two MAC-MTL funded research projects detailed below.

The Quantitative Study Project by Pat Campbell

The Quantitative Study Project is investigating the possible relationship between teacher knowledge of mathematics content and pedagogy, teacher beliefs about mathematics teaching, and student performance on high-stakes state mathematics achievement tests. The project spent over three years designing and piloting test items to measure teachers' knowledge of mathematics content as well as the understandings that a teacher might draw on to teach that content—such as knowledge of how students think about a mathematical topic. The project has also developed surveys about teachers' prior professional background and teaching experience as well as their perceptions of mathematics teaching and learning.



Since May 2009, the faculty and fellows in the Quantitative Study Project have administered these surveys and assessments to 458 early career upper-elementary and middle-school mathematics teachers across 23 school districts in Maryland, Delaware, and Pennsylvania. As you might guess this has been a lot of work. The graduate fellows can now

produce a proposal requesting approval for research on human subjects in their sleep! The project is now in the process of securing the promised demographic and mathematics achievement data of those teachers' students from the cooperating school districts.

The intent by next spring is to complete the statistical analyses. Papers describing this work will be presented in April 2011 at the Annual Meetings of the American Educational Research Association and the Research Pre-session of the National Council of Teachers of Mathematics.

The following faculty and fellows are engaged in this work: **Pat Campbell, Lawrence Clark, Masako Nishio, Matthew Griffin, Darcy Conant, Jill DePiper, Toya Jones and Amber Rust.** They are joined by **Toni Smith**, an alum of the Center who worked on the project as a graduate fellow and who is now an assistant professor at George Mason University.

For more information, please visit:

www.education.umd.edu/MathEd/qstudy.html

The Case Studies Project by Carolina Napp-Avelli



The **Case Studies of Urban Algebra 1 Teachers Project** has been a collaborative long-term research involving graduate students since 2004. The main purpose of the project was to analyze and learn from the practices and perspectives of 'well respected' teachers of Algebra 1 in urban schools populated predominantly by African American and Latino students. Over a three-year period, the project team conducted nine interviews and approximately 30 classroom observations (most of which were videotaped) for each of the six mathematics teachers in the study, all of whom are African American.

We systematically explored critical issues in the learning of mathematics in our local schools. For example:

1: How do African American mathematics teachers in a specific academic and social context assist their African American students in negotiating identities that have historically been constructed in isolation or in opposition to one another (i.e. the coming of age as an African American adolescent while simultaneously becoming a mathematics learner?)

2: What do African American mathematics teachers draw on as they engage their students in this particular academic and social context?

The Case Study Project has met regularly throughout the past academic year. Last fall, the team worked on a monograph that was submitted for a special issue of the *Teachers College Record*. The monograph has five pieces that are linked together:

- *Studying Mathematics Teaching in Urban Schools: Dominant Discourses, Issues of Selection, and Potential Benefits*
- *Departing from the Curriculum Guide in Search of Coherence and Meaning: Madison Morgan's Mathematics Instruction in an Urban High School*
- *Teaching with Speeches: Using the Mathematics Classroom to Prepare Students for Life*
- *African American Mathematics Teachers as Agents in their African American Students' Mathematics Identity Formation*
- *Conceptualizing the Role of the African American Mathematics Teacher*

In the spring, we shifted gears and worked on presentations for American Educational Research Association (AERA) and National Council of Teachers of Mathematics. The AERA poster session was a continuation of the work started in a Data Camp in which case study members and other guests participated for a week during the summer of 2009. These projects will each move forward individually toward subsequent publication.

Finally, the team is developing two ways to share data. We are beginning to develop "artifacts" of urban mathematics teaching so that these artifacts can be viewed as teaching resources by both pre-service and in-service teachers. Also, there is a corpus of data that we intend to use to start a long-term archive on urban mathematics teaching. Stay tuned!

For more information, please visit:

www.education.umd.edu/MathEd/case.html



Faculty Focus

Andrew Brantlinger



I just finished my second year as an assistant professor, and the old saying certainly holds true "time flies when you're having fun." I could not imagine a better department to be in with Linda Valli as interim chair. I am also fortunate to be in the mathematics education unit with smart colleagues and graduate students who share my interest in urban mathematics education.

This shared interest has led to a number of fruitful collaborations. As part of the MAC-MTL Case Studies project, Dan Chazan and I have worked on two papers that deal with important issues in urban mathematics education. In the winter of 2009, Lawrence Clark and I put together a grant proposal to the U. S. Department of Education to start an alternative teacher certification program. The proposal was funded and the result is the Maryland Science Mathematics Resident Teacher (MSMaRT) Program. MSMaRT is off and running thanks largely to Ann Nutter Coffman, Maria Hyler, and Wyletta Gamble.

I have been well protected in my first two years, teaching only secondary mathematics methods courses. This support has enabled me to have several manuscripts ready for publication on alternative teacher certification programs and critical mathematics. It has also steadily improved our methods courses and our secondary mathematics program. Next spring, I will teach my first doctorate-level course on mathematics education policy. I am looking forward to this opportunity.

Finally, an attractive feature of working at the University of Maryland is its proximity to our nation's capital. I currently live in Washington, D.C., which allows me to witness current education policy trends in action.

FACULTY +



LISA BOTÉ My research interests focus on pre-service teacher education. I am involved in a self-study of innovative pedagogy used to examine the assumptions of pre-service teachers and to help them develop their understanding of children's mathematical thinking. I have worked in international collaborative research with Dr. AislingLeavy of Mary Immaculate College at the University of Limerick.

LAWRENCE CLARK My recent research interests and projects have consisted of developing a framework of mathematics teacher knowledge that incorporates teachers' knowledge of students' experiences inside and outside of the mathematics classroom and the ways these experiences position students to see themselves as competent mathematics learners. I am using data from various research projects (including the Quantitative Study Project and Case Studies project) to build the teacher knowledge framework and develop artifacts of practice that can be used in teacher education and professional development.



Pat Campbell

PAT CAMPBELL Our work continues on an NSF-funded project addressing the impact of elementary mathematics specialists on student achievement in Virginia. After four years of struggling with school district firewalls that block the flow of data being sent on PDA's, we have finally finished collecting data. Not only that, with the able contributions of Nat Malkus (the graduate student who knows everything about Hierarchical Linear Modeling), the analysis has been completed. So what did we find?

ANN EDWARDS In addition to working on the *Case Studies of Urban Algebra 1 Teaching Project*—see page 2), I am collaborating with Dr. Janet Coffey in Science Education and Carla Finkelstein, a doctoral student in Teacher Education, on a study examining elementary pre-service teachers' practices of attending to student thinking across disciplines. I have been working with Jill Neumeyer DePiper, a doctoral student in Mathematics Education, on a project investigating the relation between aspects of elementary pre-service teachers' identities and how they engage in learning to teach mathematics, in particular, practices of attending to students' mathematical thinking. Finally, I am also working with Dr. Lawrence Clark and others on the Case Studies Project on the development and use of artifacts of practice in teacher education and professional development focused on issues surrounding teaching mathematics in urban contexts.



Lawrence Clark

There was a significant difference in student achievement on Virginia's high-stakes assessment for mathematics favoring the schools with elementary mathematics specialists, but this effect was not evident in the first year of placement of the specialist. The pattern of achievement was evident in an increase in scores in Year 1, followed by a greater increase in Year 2, followed by an even greater increase in Year 3. It was the size of the increases in Years 2 and 3 that drove the statistically significant effect. One caution must be emphasized. The specialists in this study had completed five courses addressing mathematics content and pedagogy and two courses on leadership/coaching prior to and during their first year of placement. These results should not be generalized to "anointed" coaches or specialists who have had minimal professional development to support their work.

RICK HOLLENBECK I strive to bridge the two very different worlds of the university and the public school and aim to maintain my credibility as a teacher by seeking opportunities to teach secondary school mathematics. Previous to joining the center as a full-time faculty member in 2008, I was



Ann Edwards

For more information, please visit:
www.education.umd.edu/MathEd/ElemSpec.html

RESEARCH

department chair and taught eighth grade mathematics at Harper's Choice Middle School in Columbia, Maryland.

In 2006, I received an award from the Maryland Council of Teachers of Mathematics (MCTM) as an outstanding middle school teacher. My responsibilities at Maryland include teaching secondary mathematics education courses. I am interested in studying challenges of implementing standards-based mathematics instruction in middle school classes with a history of low academic performance.

BEATRIZ QUINTOS Joining the Center for Mathematics Education has allowed me to study the teaching and learning methods at the local schools and imagine new possibilities for the mathematics education of those children who have been historically underserved. One imagined reality was to have a math methods course with an international focus. It would be a course in which pre-service teachers reflect on ways to create environments that involve children as agents of change and critical math world-citizens. I am still working on developing this course for pre-service teachers. Another imagined reality is elementary and middle grades math classrooms in which teachers draw on Latino and African-American children's cultural background to create empowering spaces. This year, I worked on a proposal to support teachers' professional development in mathematics education, including a focus on equity issues. I am very grateful for these opportunities to dream.

The Thought Experiments in Mathematics Education Project

Lead Researcher: Dan Chazan

The Thought Experiments in Mathematics Education Project just completed its first cycle of NSF funding and is beginning a second cycle. In the first cycle, the project developed a method for eliciting teachers'

understandings of the strategic decision making involved in teaching by created animations of algebra and geometry teaching, and using them to create conversations with secondary mathematics teachers. This method is illustrated in a paper to appear in *Cognition and Instruction*. Summer conferences around the animations have created interesting dialogue about representing teaching that have resulted in a double special issue currently in progress with the European journal *ZDM*. With the second round of funding, the project is exploring the use of the animations in an on-line environment for teacher preparation.

For more information, please visit:
www.education.umd.edu/MathEd/ThEMaT.html

Peer Educating, Engaging and Readiness Strategy Project

Lead Researcher: Whitney Johnson

I have submitted an I3, Investing in Innovation grant proposal to the Department of Education. The project's title is *Peer Educating, Engaging and Readiness Strategy Project*. The university will partner with the Baltimore Public School system and the National Algebra Project. We are proposing to study a model of teaching that places three "near-peers" in the classroom with the certified instructor to teach content to students. Our hypothesis is that students are not engaging in the teaching and learning process because they are disconnected from the teachers' of record. We believe that the "near-peers", students who have graduated from Baltimore City schools and are attending local colleges and universities, are better equipped to re-engage students in learning within the school context. We are proposing to start three cohorts in 2010; one in mathematics, one in English, and one in science. The cohort will remain together for four years and will take all classes within that subject together.



Rick Hollenbeck



Beatriz Quintos



Dan Chazan



Whitney Johnson



Teacher Education

On a regular basis, the Center participates in the preparation of four undergraduate cohorts of future elementary teachers and two masters cohorts, or roughly 100 future elementary school teachers a year. At the secondary level, the Center participates in the training of one cohort of undergraduates and one cohort of Masters students, roughly 20-25 secondary mathematics teachers per year. For the middle grades, MSMaRT, and a new undergrad certification program, will produce certified middle grades math and science teachers. The aim of all of these programs is to prepare teachers to teach in urban schools in our local area. In addition, another current initiative, in collaboration with the University of Maryland's Mathematics Department, involves the development of a concentration in mathematics for future middle grades mathematics teachers doing their preparation in the elementary program.

Internationalizing Our Programs

Dr. Lawrence Clark launches MaThCAP

Can Mathematics unite a global community? The Center is taking a role in shaping the Strategic Plan for the College of Education by connecting the College with the global community. There is hardly a richer partner to Maryland than Ethiopia.

Through funding by the GATE Fellowship Program within the College of Education, Dr. Clark launched the *Mathematics Teaching as a Cultural Activity Project* (MaThCAP). The overarching purpose of MaThCAP is to engage University of Maryland's secondary mathematics teacher candidates in experiences that support their capacity to view mathematics teaching and learning as a cultural activity. They can do this by comparing and contrasting the mathematics teaching and learning environments in different geographical locations, with a particular focus on the U.S. and Ethiopia. This effort allows our secondary mathematics teacher candidates to reflect on the ways mathematics teaching is embedded in a society's culture and history. It also includes a Facebook Group linking our candidates with teacher candidates at Axum University in northern Ethiopia.

Middle School Graduate Endorsement Program

by Beatriz Quintos

What do teachers in the Prince George's County Public School System like to do after school? At least 21 of them are interested

in starting a graduate program that focuses on middle grades mathematics with the support from Maryland Higher Education Commission, Teacher Quality Grant. Our research-based program, which involves coursework in mathematics content and mathematics education in middle grades. The structure of the program accommodates strands of work with a particular focus, such as mathematical inquiry, culturally relevant pedagogy, mathematics education for English Language Learners, Special Education and Middle Grades Mathematics. The school-based components to the program make clear connections between our program and local area classrooms. We include multiple activities such as teachers visiting each other's classrooms, support for mathematics enrichment activities in schools, and more. This program was developed with the support of two other Improving Teacher Quality grants. This degree program has been offered to five cohorts thus far and allows elementary-certified teachers to receive an add-on endorsement in middle grades mathematics teaching. This past year the second cohort from Montgomery County graduated, and we expect a cohort from Prince George's County to graduate this coming year. We extend our appreciation for the opportunity to work with committed teachers who are making a difference in our local schools.

For more information, contact Dr. Beatriz Quintos at bquintos@umd.edu.

ALUMNI

Spotlight

Farhaana Nyamekye '10

I recently graduated with a doctorate this past June. Overall, my experience as a doctoral student was positive. Coming in as a first year student, I had other students like Grace Benigno, Kadian Howell, and Kathy Clark, just to name a few, to support me in the process. They were not only colleagues, but more importantly, to this day, we are still friends. Some advice I would give for new students would be to take the number of years in which they want to graduate and add two. In addition, I strongly suggest reading the dissertations of other students, not just for content, but for structure, organization, and rhetoric. I encourage other graduate students to tackle difficult issues, choose topics they are very passionate about and continue to challenge the field of mathematics education.

My dissertation, and extension of the work of Danny Bernard Martin, explored adolescent African American students' construction and co-construction of racial identities and mathematics identities. In the future, I hope to use my skills to give back to my community in a positive way that will empower its members.

Christy Graybeal '08

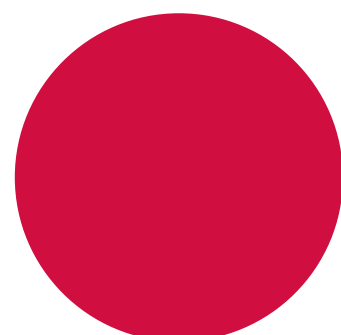
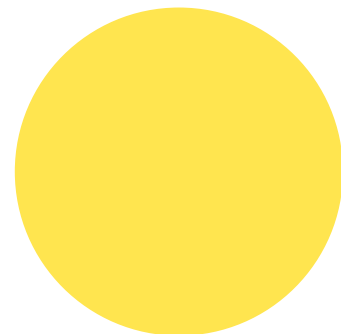
I am a former Mid-Atlantic Center for Mathematics Teaching and Learning Fellow, who graduated with a doctorate in Curriculum and Instruction in August 2008. While studying at the University of Maryland, I was involved in the initial planning of the *Case Studies of Urban Algebra 1 Teachers Project*. My dissertation focused on the ways in which middle school mathematics teachers interpreted curricular resources and how these interpretations compare to their beliefs and practices.

Since graduation, I have been an assistant professor of education at Hood College in Frederick, Maryland. I currently teach mathematics education courses, in addition to continuing to research teachers' interpretations of curricular resources.

Geoffrey Birky '07

I am a former Mid-Atlantic Center for Mathematics Teaching and Learning Fellow and completed his doctorate in 2007. His research interests centered around mathematical reasoning and problem solving at the secondary level. For his dissertation, he used the 1999 TIMSS video study to examine how teachers maintained, lowered, or raised cognitive levels in 8th grade mathematics classrooms by the ways they led discussion of problems assigned to students.

As a doctoral student, I enjoyed opportunities to write curriculum, assist in teaching a methods course, and engaging in stimulating discussions with colleagues about the improvement of methods courses. I am currently a Visiting Assistant Professor at Georgetown University in the Mathematics and Statistics Department, where I teach Calculus and *Introduction to Proof and Problem Solving*. The latter course is also the center of an NSF-funded study of which I am a part. With a team of mathematicians and mathematics educators, I am investigating how undergraduates develop both proof construction skills and meta-cognitive abilities through watching and discussing videotaped "think-alouds" of peers struggling with creation of a proof. The study has assisted in better understanding the stages students go through as they develop a proof. In addition, there will be a series of professional development videos for use by instructors.





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AT THE UNIVERSITY OF MARYLAND**

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EVENTS

State Meeting of Math Educators

The Center, with The University System of Maryland and The Mathematics Department at Towson University, held the first meeting of Maryland Math Educators. Despite snow forecasts, more than 50 mathematics educators across the state met on January 22, to share ideas for programs and courses and learn more about math curriculum standards. Also the seed was planted for a new organization of Maryland Math Educators affiliated to the Association of Mathematics Teacher Educators.

Maryland Mathematics Institute

Since the summer of 2008, 20 teachers spent a week at the Maryland Mathematics Institute offered by the Mathematics Department. Dr. Daniel Chazan from the Center was one of the lecturers in the course. Plans are underway to make this a regular event. For details see www.math.umd.edu/highschool/mmi/ or contact Dr. Mike Boyle at mmb@math.umd.edu

Maryland Science Mathematics Resident Teacher (MSMaRT) Program

The first cohort of approximately 15 MSMaRT candidates began their summer preparation program at the beginning of June. Program participants took a science or math teaching methods course in June and a content reading course in July. In July, they completed four weeks of clinical fieldwork in a Prince George's County Public middle school. Participants also had the opportunity to discuss their fieldwork experiences, develop a basic repertoire of skills, and prepare to teach in a middle school in the MSMaRT summer seminar which ran from June through the end of July. By the end of the summer, candidates were ready to begin teaching math or science as a half-time teacher of record in a Prince George's County middle school. Dr. Andrew Brantlinger and a number of others from the Center will either be co-teaching or supporting candidates and instructors in the MSMaRT summer program.