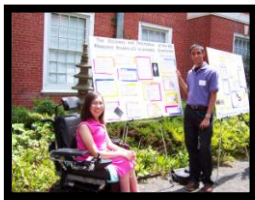


Rutgers University

Center for Mathematics, Science
and Computer Education

<http://cmsce.rutgers.edu>



ANNUAL REPORT



2009-2010

*CMSCE...the
excitement of
learning*

Executive Summary

Yakov Epstein, Director of CMSCE, has served in this role since 1998. The following letter from Dr. Epstein outlines his vision for the future directions of the Center.

For the second straight year, the past year, 2009-2010 has been economically challenging. Despite the extremely difficult economic climate we continued to move forward keeping in mind our commitment to continue to fulfill our core mission – to contribute to the improvement of mathematics, science, and computer education programs in New Jersey schools and in schools throughout the nation. This report describes the new initiatives we have launched even as we face a most challenging climate.

Our NSF-funded MetroMath Center, a partnership of 3 universities - Rutgers (New Brunswick and Newark), the City University of New York, and the University of Pennsylvania – and school district partners - the cities of Philadelphia, Plainfield, Newark, and New York, completed its sixth and final year of programming. This final year was made possible by our successful application for supplemental funding for the MetroMath Center to continue our activities for one additional year. We also continued and expanded several major research programs - interactions between urban families and communities, and the mathematics addressed in urban classrooms, the role of affect, influenced by urban environments and contexts, in relation to initiating and maintaining classroom environments where conceptually challenging mathematics is taught and learned, and “micro” and “macro” outcomes of policies aimed toward recruitment, education, and retention of qualified urban mathematics teachers, particularly with regard to conceptually challenging mathematics in the classroom. We have disseminated research findings at national and international meetings. Our research on affect and engagement has led the development of instruments to explore the measurement of affect and engagement in urban classrooms. Based on this work we submitted a proposal together with the Stanford Research Institute (SRI) to further develop and validate the questionnaire instrument to measure engagement when learning mathematics. As of June 2010, we learned that the proposal was very favorably reviewed and our answers to panelists questions were also found to be satisfactory. We have high hopes that this project will be funded and will enable us to continue the pursuit of our research on urban students’ engagement when learning mathematics. We have also developed professional development activities to help teachers learn about the role of affect and the ways in which it can be harnessed to enhance student engagement in learning mathematics at the middle school level.

Several teachers in MetroMath partner districts have become doctoral fellows and have developed doctoral thesis proposals which carry out aspects of the MetroMath research agenda..

A major need in our state and in our nation is the improvement of students’ knowledge and understanding of mathematics and science. CMSCE makes meaningful contributions to Rutgers’ efforts to fulfill this need. Two new activities have begun this year help to make this possible by enhancing teacher knowledge and expertise in teaching.

The first activity is the result of a major accomplishment this past year - our successful application to the National Science Foundation to launch a Mathematics and Science Partnership (MSP) program. At the end of August, 2009, we were informed that our application to create the New Jersey Partnership for Excellence in Middle School Mathematics (NJPEMSM) was approved and funded for \$5 million for the next 5 years. Under the leadership of Professor Amy Cohen of the SAS Department of Mathematics, the program began in September 2009. The initial partnership is between Rutgers and the school districts of Carteret, Long Branch, Old Bridge, Orange, Plainfield, Sayreville, and Toms River, seven districts that span the entire socioeconomic spectrum. Over five years, we expect that four cohorts of middle school teachers from partner districts, 25-30 per cohort, will participate in Institute activity leading to the Master of Education in Mathematics degree from Rutgers University. During the fall of 2009 We successfully recruited 26 outstanding Teacher Fellows who participated enthusiastically in a new course, Seminar in Mathematical Ideas taught by Professor Gerald Goldin in the Spring of 2010. During the Fall and Spring semester teams of SAS Mathematics professors and Mathematics Education doctoral students developed and planned a Summer Institute that included one course in algebra and a second course in geometry. The goals of the upcoming 2010 Summer Institute are to help teachers acquire deeper and more flexible mathematical content knowledge, focusing on concepts fundamental to New Jersey’s middle grades curriculum standards. This includes the mathematical content taught, and the pedagogical content knowledge essential to effectively teaching conceptually challenging mathematics. Areas include integers, rational numbers and operations; algebra; geometry

and measurement. Also, as a result of their participation, the Institute expects that teachers will be able to base their teaching practices on thorough understandings of children's learning and reasoning processes in mathematics. We further expect that in the Institute teachers will acquire strategies for enhancing students' motivation, affect, engagement, and self-concept in mathematics, including motivating both girls and boys to pursue advanced mathematical and scientific studies. Finally, teachers will acquire a better understanding of effective strategies for working with special education students, including partnership and co-teaching relationships between special education teachers and mathematics teachers. NJPEMSM is an exciting venture and a key element in our collection of projects aimed at improving the teaching of mathematics and science in New Jersey.

The second activity is our successful application for a grant from the New Jersey Department of Education to conduct the Improving Partnerships and Active Collaboration for Teaching (IMPACT) program. The Center for Mathematics, Science, and Computer Education received \$300,000 from the New Jersey Department of Education (NJDOE) to implement a three year IMPAC) grant. The overall goal of the grant is to improve students' learning of mathematics by increasing the number of highly qualified special education, middle school mathematics teachers in four public schools and one non-public school in Bergen County, New Jersey.

In addition to these two new partnership projects, CMSCE continues numerous active partnerships with numerous school districts where we conduct on-site ongoing Professional Development programs to improve the effectiveness of teaching with particular emphasis on the use of technology in the classroom to increase student excitement and engagement.

We look forward to an exciting year of important activities for the center.

*Sincerely,
Yakov M. Epstein Ph.D.
Center Director*

“Mathematics, science, and technology are keys that will unlock the doors of understanding and opportunity in the next millennium.”

About the Center

The Center fosters collaboration among educators and business leaders, practitioners and researchers to enhance the learning and teaching of mathematics and science, and to demonstrate how technology can contribute to these goals. Rutgers University, other colleges and universities, industry, and local school systems join together as partners in a mutually beneficial relationship. Each partner makes an important contribution and each reaps significant benefits from the collaborative relationship. School systems support their teachers' efforts throughout the academic year. Companies encourage their scientists to contribute technical expertise to Center-sponsored activities. The University contributes faculty expertise to the Center. In return, school districts gain well-trained highly motivated practitioners and become models to other districts. Corporations and their participating scientists gain visibility, recognition, and good will for their contributions to their communities. The University, in turn, fulfills its public outreach and research mission. Over the past twenty-five years, teachers and students from every legislative district in New Jersey and from two-thirds of all NJ school districts have benefited from participation in Center-sponsored projects. The leadership cadre spawned by these programs is improving the teaching and learning of mathematics, science, and technology statewide and even nationally.

The Center culls ideas from the best research, thinking and practice to forge new directions in mathematics and science education. It infuses these practices with technology and evaluates their impact in our partner schools' classrooms. Center institutes and programs use strong mathematical and scientific content and offer powerful learning strategies. Mathematics programs present strategies and problem solving approaches to improve student mathematics learning. Science programs stress hands-on activities and the importance of developing processes of scientific reasoning. Technology programs are held at the Center's Digital Teaching and Learning Lab. The lab, which houses state-of-the-art technology equipment, including room-size and desktop videoconferencing capability, gives teachers the tools to bring their students into the 21st century. All Center programs incorporate an inquiry-based approach to learning, emphasizing problem solving and guiding students toward higher levels of thinking -- the skills our business partners are demanding.

CMSCE acts as a broker-facilitator in the service of furthering its goal of improving mathematics and science education. The center is organized as an umbrella unit that encompasses a group of projects who each share this goal. For example, the CMSCE umbrella includes within it such projects as The MetroMath Center for Learning and Teaching, the Center for Family Involvement in the Schools, the ESTEEMS project, and many other projects. The pages that follow contain diagrams of the overall umbrella structure of the CMSCE as well as a more detailed diagram of one of the individual projects that fall under this umbrella. Each of these projects has its own leadership structure and functions independently. The CMSCE Center Director and Associate Director meet periodically with the leaders of each of the CMSCE projects to stay current with the progress of these projects and identify areas for future growth and expansion. When we identify such needs, we initiate a process of forming a group of interested individuals to develop a program and seek funding to meet these needs.

The two examples which follow illustrate how CMSCE acts as a broker facilitator to create projects. When CMSCE was first launched, it held discussions with the New Brunswick Schools Superintendent to identify needs of the New Brunswick School System. One need that was identified was for enhanced science teaching and learning. In response, CMSCE launched a program called "Science Residents." This program provided elementary school teachers in New Brunswick with Rutgers graduate students who were involved in some field of science and who showed an interest in education. The graduate students led classes and provided examples and exercises and worked individually with students. This program continued with funding supplied jointly by CMSCE and by New Brunswick schools. Years later, NSF created an RFP for a GK-12 program which had goals similar to our science residents program. In our role as broker facilitators, we approached the Rutgers Vice President for Academic Affairs and requested that he convene a group of University faculty from STEM disciplines to plan collaboratively for the submission of a GK-12 proposal. Under the leadership of CMSCE, that group met, developed a proposal which resulted in the funding of a track I GK-12 grant. The resulting GK-12 program then became one of the

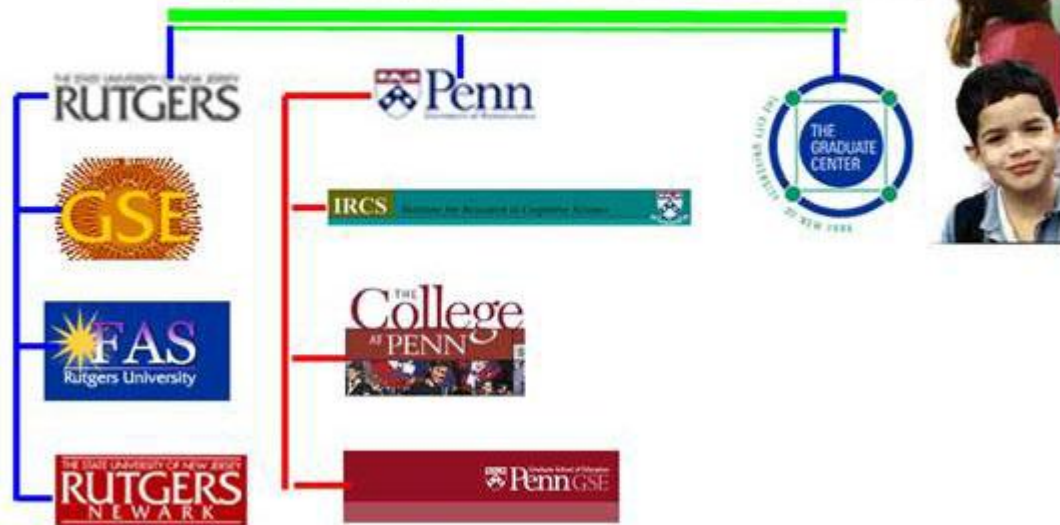
projects of CMSCE – a unit involving STEM faculty, graduate and undergraduate students working with teachers and middle school students to enhance the teaching and learning of stem disciplines.

A second example of how CMSCE functioned as a broker facilitator involved the NSF CLT program. Again, working through the office of the Vice President for Academic Affairs, CMSCE convened a working group to prepare a proposal to establish a Center for Learning and Teaching. The result of this effort was the creation of the MetroMath Center involving collaboration between Rutgers, the City University of New York, and the University of Pennsylvania and associated school districts in New York City, Philadelphia, Newark, and Plainfield.

**CMSCE is an “Umbrella” Organization That Acts as a Broker-Facilitator for New Programs.
Many of These New Programs then Become Independently Functioning Projects of CMSCE**



The NSF MetroMath Center for Learning and Teaching is an Independent Project of CMSCE





CMSCE Programs 2009-2010:

Mathematics and Science (MSP)/ESTEEMS Project

In 2007, NJ SSI applied for and received additional funding through the NJ Department of Education for the second phase of the Mathematics and Science Partnership (MSP). The overall goal of the ESTEEMS (Establishing Excellence in Education for Mathematics and Science) project is to provide standards-based, content-related professional development in mathematics and science for regular and special education elementary school classroom teachers. Phase II focuses on teachers in elementary grades 3-5, and is funded from July 1, 2007-June 30, 2010. The NJ Department of Education approved a first year grant award of \$675,000. The integrated mathematics and science program targeted physics (electricity, magnetism and sound) and mathematics in the first year, chemistry and mathematics in year two, and earth science and mathematics in year three.

In the first year, 46 teachers participated in two summer academies, one hosted at Rutgers and one at Middlesex County College. The project worked with 16 public school districts and 5 non-public schools. These districts included: Carteret, East Brunswick, Edison, Franklin, Hamilton, Highland Park, Iselin, Long Branch, Middlesex, New Brunswick, North Brunswick, Old Bridge, Piscataway, Plainfield, Sayreville, South Amboy, South Bound Brook, South Plainfield, and Woodbridge. These teachers also participated in three follow-up days on campus and received four days of coaching/mentoring on-site in their districts.

In 2008, NJ SSI applied for and received funding in an amount of \$510,000 for the second year of ESTEEMS II. For Year 2, 23 teachers in grades 3-5 were recruited for a two-week Summer Academy in chemistry with related mathematics hosted at Rutgers. The teachers were recruited from Carteret, Franklin Township (Somerset), Hamilton Township (Mercer), Highland Park, Long Branch, New Brunswick, Old Bridge, Piscataway, Woodbridge, and Sacred Heart School (South Amboy). These teachers received three follow-up days of professional development on campus and four days of coaching and mentoring on-site in their districts. Teachers also completed a capstone project that incorporated content and pedagogical strategies from the Summer Academy.

In the third year, NJ SSI received a grant award of \$525,000 for the final year of ESTEEMS II. For Year 3, 43 teachers in grades 3-5 were recruited for a two-week Summer Academy in earth science with related mathematics hosted at Rutgers. The teachers were recruited from Carteret, Franklin Township (Somerset), Hamilton Township, Highland Park, Long Branch, Old Bridge, Piscataway, Plainfield, Sayreville, South Bound Brook, The Center School, Saint Francis Cathedral School, Saint John Vainey School, Saint Mary and Saint Peter Catholic Academy, and Saints Philip and James School. These teachers completed three follow-up days of professional development on campus, four-six days of coaching and mentoring on-site in their districts, and will participate in a Culminating Showcase on June 2, 2010. Teachers will also complete a Project-Based Learning Scenario/Capstone project that incorporates content and pedagogical strategies from the Summer Academy.

MetroMath Center

MetroMath: The Center for Mathematics in America's Cities was a collaborative effort of three universities, Rutgers - The State University of New Jersey (lead institution), The City University of New York (CUNY) / Graduate Center, and the University of Pennsylvania, with other institutions, and school districts in New York City, Philadelphia, Newark, and Plainfield (NJ). This Center was funded by the National Science Foundation, beginning

on January 1, 2004 and continuing through June 30, 2010. The total award over 5.5 years was \$10,500,000. The PI of the MetroMath project was Dr. Gerald Goldin.

The primary aim of the MetroMath Center was to obtain knowledge that, put into practice, enables students in urban schools in their learning of conceptually challenging mathematics. We addressed this aim at the level of classrooms situated in urban environments. Thus, our approach was not to examine schools, school districts, or communities as units. Rather we studied certain key factors emerging in research at the classroom level, where students and teachers interact in ways we see as profoundly affected by the urban contexts in which they are situated. This offered the potential for research with substantial future impact.

Management

The Center Management Team that included faculty and staff from our partner universities. The management team included

- Rutgers University:
 - PI Gerald Goldin
 - Co-PI Roberta Schorr, Rutgers-Newark
 - Alice Alston
 - Norman Glickman
 - Yakov Epstein
 - Lynda Ginsburg
 - Karen Murray
- The University of Pennsylvania
 - Co-PI Janine Remillard
 - Christine Massey
- The CUNY Graduate Center
 - Co-PI Laurel Cooley
 - Eileen Donoghue

The MetroMath Center focused intensely on key issues. The research goals addressed critical questions in urban mathematics education, whose answers have important consequences influencing policy and practice. Moreover, the Center developed a community of leaders with the expertise to develop and implement changes based on particulars of the urban context, and informed by research. All Center activities, including the MU seminar and teacher leader programs, have been aligned with this framework.

- We identified three key issues in urban mathematics education, aligned with our focus, around which we have organized our research agenda:
 - Interactions between urban families and communities, and the mathematics addressed in urban classrooms;
 - The role of affect, influenced by urban environments and contexts, in relation to initiating and maintaining classroom environments where conceptually challenging mathematics is taught and learned;
 - “Micro” and “macro” outcomes of policies aimed toward recruitment, education, and retention of qualified urban mathematics teachers, particularly with regard to conceptually challenging mathematics in the classroom.

The MU Seminar

The MU Seminar (Mathematics/Urban and Multi-University) is a four-semester, interdisciplinary seminar carrying graduate credit (3 hrs. per semester), spanning the disciplines of mathematics and mathematics education, psychology and cognitive science, urban education and urban studies. It addresses carefully selected topics embodying the research and leadership missions of the MetroMath Center.

The MU seminar has been conducted for four years, with cohorts at Rutgers University, the City University of New York Graduate Center (CUNY), and the University of Pennsylvania.

- Each year, the MU Seminar has been updated. Each Seminar:
 - incorporates the knowledge base to address our focus and our key issues in depth, together with other, carefully-selected essential topics
 - is designed with content that is sufficiently independent of the others, to allow students the flexibility to enroll in any of the three semesters in any order, prior to a capstone semester
 - has been scheduled with simultaneous sections based on the same content at each of three university sites, allowing for cross-linkages through video-conferencing

MetroMath Fellow Program

We awarded MetroMath fellowships to forty-seven doctoral students, twenty eight at Rutgers; nine at CUNY; and ten at the University of Pennsylvania. These are one-year awards that can be renewed for a second year. The fields of the doctoral students reflect the multi-disciplinary nature of the Center. In addition to participating in the four-semester MU Seminar, the fellows will be involved in the Center's research programs.

Teacher Fellow Program

The Center is committed to developing a robust pipeline of teachers qualified to participate in the MU seminar. Towards this end, the Center runs Teacher Fellow programs in all three universities.

We have replaced our earlier MILE (Mathematics Institute for Leadership in Education) institutes for teachers, that had been primarily based on past work, with smaller-scale, individually-tailored programs for selected teacher leaders, aligned with our focus, emphasizing conceptually challenging mathematics, planned in partnership with each of our four urban partner school districts, and preparing the teachers to participate in the MU seminar.

Center for Family Involvement in Schools

Housed at CMSCE since July 2000, the Center for Family Involvement in Schools currently offers three programs, Family Math, Rutgers Family Science, and Middle School Family Math.

Family Math. The three-day FAMILY MATH training workshop trains teachers to conduct six evening sessions that engage parents and children in fun, hands-on math activities, develop problem-solving skills, and build students' competence and confidence in doing mathematics. This program is offered throughout the year.

Family Math II training provides 6 (or 12 if you attend both days) hours of professional development. The Center for Family Involvement in Schools (NJDOE Provider #1660) and the Rutgers Center for Mathematics, Science, and Computer Education (NJDOE Provider #2), which sponsor the training workshops, are registered as professional development providers with the New Jersey Department of Education. This workshop offers an opportunity to those presenters who wish to update their sessions with new and exciting activities or for those who want to participate in a follow-up training. Each day of training will include 3-5 new activities from the Family Math II book. Participants may register for one or two days of training;

Rutgers Family Science. The four-day FAMILY SCIENCE training workshop trains teachers to conduct six evening sessions that engage parents and children in fun, hands-on science activities, develop problem-solving skills, and build students' competence and confidence in doing science. This program is during the school year.

Middle School Family Math. Like the FAMILY MATH training workshop, the three-day MIDDLE SCHOOL FAMILY MATH training workshop trains middle school teachers to conduct six evening sessions that engage parents and children in fun, hands-on math activities, develop problem-solving skills, and build students' competence and confidence in doing mathematics.

Math and Science Initiatives: Building a Learning Community in Science & Mathematics through Educational Partnerships – Track II (<http://mslc.rutgers.edu/nsfgk12>)

With the conclusion of this program in the spring of 2009, the graduate students shifted their efforts from working in middle school classrooms to working on the Rutgers Science Explorer Bus (see below). A total of four graduate students received Graduate Assistantship support from Rutgers University. Two of the graduate students were from the Department of Ecology and Evolution, one student was studying in the Geology Department and another student was working in the Food Science Department.

The Rutgers Science Explorer

In December 2005, the project director, Dr. Kathleen Scott, officially launched the Rutgers Science Explorer (RSE), a 40 foot, state of the art, custom designed mobile laboratory and science demonstration center that brought innovative hands on activities to middle school students. The Rutgers Science Explorer extended the Rutgers science community beyond the New Brunswick/Piscataway campus and brought a “Rutgers Science Day” to schools and communities around the state of New Jersey. Since its inauguration, the RSE has visited more than 90 different New Jersey schools and over 12,000 middle school students have participated in explorations on the RSE. A total of twenty-five Rutgers graduate students studying in the fields of science, engineering or mathematics (STEM) have served as teaching fellows on the RSE. Some of these teaching fellows have worked with University faculty, educators and middle school teachers to help develop innovative activities that reflect their own research and reinforce core concepts. When they present these activities on the RSE, they serve as role models for middle school students and share the excitement of their studies with them. The activities that were offered on the Bus were suitable for middle school students and encompassed areas most frequently covered in middle school curricula: the life sciences, earth sciences and physical sciences. Many of the activities also incorporated mathematics and technology. The Rutgers Science Explorer currently offers the following hands-on activities: *DNA Detectives*; *Volcanoes*; *Skeleton Detectives*; *One Fish, Two Fish*; *Drilling Into Science*; *Matter Matters*; and *Marvelous Microbes*.

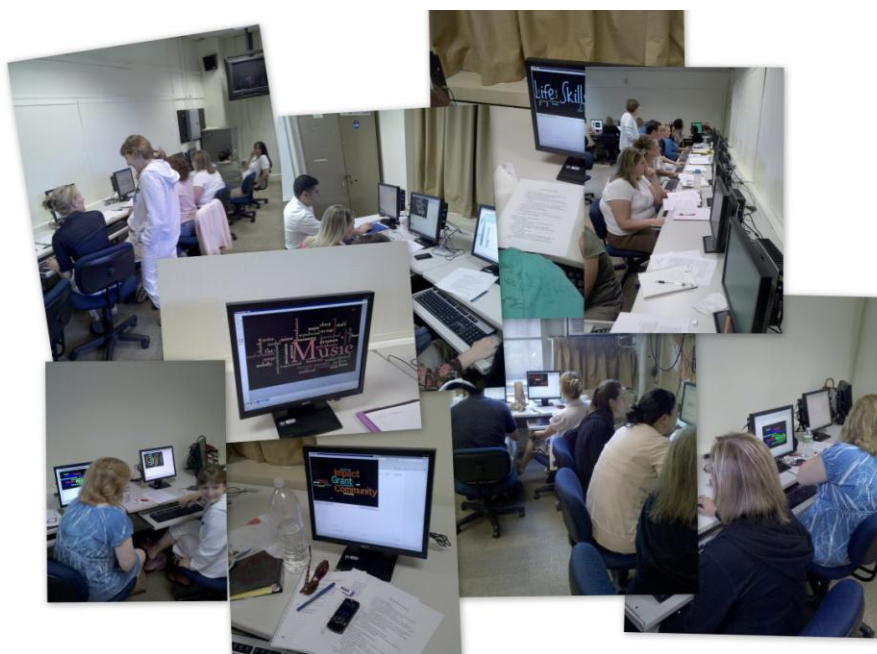
STEM Faculty

Dr. Kathleen M. Scott, Professor, Department of Cell Biology & Neuroscience; director of the Math and Science Learning Center; and Assistant Vice President for Instructional Support at Rutgers University is Project Director.

IMPACT Program

The Center for Mathematics, Science, and Computer Education (the Center) received \$300,000 from the New Jersey Department of Education (NJDOE) to implement a three year Improving Partnerships and Active Collaboration for Teaching (IMPACT) grant. The overall goal of the grant is to improve students' learning of mathematics by

increasing the number of highly qualified special education, middle school mathematics teachers in four public schools and one non-public school in Bergen County, New Jersey.



Starting in January 2010, the Center collaborated with four districts in Bergen County, Bergenfield, Bogota, Cliffside Park and Palisades Park and worked with their school-based planning teams (SBPT) to develop a plan to enable their identified teachers to have high quality professional development in both mathematics and literacy to assist them as they become highly qualified in these areas. Professional development began with sessions whose topics included Universal Design for Learning (UDL), 21st Century Skills, and technology strategies to enhance reading skills. Twenty-four teachers from the four identified districts participated in the professional development experiences.

IMPACT Project Directors are Harriet Schweitzer and Lynda Ginsberg, and Jennifer V. Jones is the IMPACT Project Coordinator.

Waksman Student Scholars Program (<http://morgan.rutgers.edu>).

The Waksman Student Scholars Program (WSSP) is directed by Professor Andrew Vershon (Department of Molecular Biology and Biochemistry), and is co-directed by Dr. William H. Sofer (retired). The WSSP has been designed to connect high schools and the Rutgers University research community by engaging teachers and students with University faculty and GE Healthcare professionals to collaborate on an authentic research project in molecular biology and bioinformatics. The primary goal of the 2009 WSSP was to develop and encourage a research climate in the schools by establishing, supporting and sustaining on-going relationships among research scientists and teams of high school teachers and students. The WSSP consisted of two interrelated parts: the WSSP summer Institute and the WSSP academic year program. The Waksman Student Scholars Program entered its seventeenth year with the 2009 summer Institute, which ran from July 6, 2009 - July 31, 2009.

22 teams made up of 24 teachers and 35 high school students from New Jersey and Pennsylvania participated in the month long program. Participants in the summer Institute attended daily seminars and worked in the laboratory, learning the procedures, skills and techniques that were used to carry out the research activities back at their high schools during the academic year. There was a strong emphasis on data analyses, computational biology and bioinformatics. Additional sessions included deliberating bioethical issues, exploring career opportunities and attending seminars given by guest speakers and graduate students. Participants also met with University scientists and scientists from our corporate sponsor, GE Healthcare, to discuss recent advances in the field of molecular biology. The summer Institute concluded with a poster session, when students presented their month long work to scientists, Rutgers faculty, guardians and siblings. The students and teachers who participated during the summer Institute were encouraged to recruit more students to join in the research activities during the academic year.

The research project for the 2009 WSSP focused on the genomic analysis of the duckweed *Wolffia arrhiza*. Duckweeds are aquatic herbs found in streams or ponds and are one of smallest, fastest growing, flowering plants. These plants grow virtually anywhere there is freshwater and sunlight. They can also be cultured in a high school setting, and samples can be grown under a variety of different experimental conditions. Duckweeds also have potential roles in bioremediation and biofuels, and therefore relate to issues that may affect students' lives outside of school.

Student Scholars isolated and sequenced duckweed genes from a cDNA library. The resulting sequences from these genes had never been determined before. Some of the students' analyses have been published in the international sequence databases for use by the scientific community. (For a listing of the sequences, please go to the web site <<http://www.ncbi.nlm.nih.gov>> select "nucleotide" in the Search Box and type in "WSSP" in the dialogue box after the 'for' prompt). To date, 217 sequences are either published or have been submitted for publication. Another 278 sequences have been analyzed by the students, reviewed by the faculty and staff and are ready to be submitted for publication (these numbers reflect the sequence analyses conducted by students at all three sites (see below)).

As part of the academic year activities, six follow up meetings were conducted back at the Waksman Institute. Since laboratory activities are minimal during these sessions, many more students are invited to attend, and frequently well over 100 guests, including high school students, teachers, project faculty and staff, and scientists from our corporate sponsor, GE Healthcare, joined us. The 2009 WSSP concluded on June 8, 2010 with the Waksman Forum Poster Session hosted by GE Healthcare in Piscataway, NJ. With over 325 people attending, the high school students presented their findings from their yearlong research endeavors by defending their posters to University and industry researchers, teachers, peers, parents, guardians, and siblings.

2009 HiGene: A Genome Sequencing Project for High Schools

HiGene: A Genome Sequencing Project for High Schools is an ITEST Comprehensive Project that receives funding from the National Science Foundation. The goal of this program was to help teachers use information technology, specifically bioinformatics and the computer analysis of protein and nucleic acid three dimensional structures. Together project faculty worked with teachers to develop strategies that were introduced into existing high school programs and reflected the way that science is actually practiced.

A supplement to this NSF award allowed us to conduct Institutes or Workshops at two additional locations during this time period. In addition to the 4 week summer Institute and ensuing academic year activities in New Jersey, another 7 teachers and 10 students were instructed about the HiGene by Dr. Andrew Vershon, the HiGene project director, at a two week summer Institute (August 3, 2009 - August 14, 2009) at Johns Hopkins University, Baltimore MD. Co-PIs Dr. William Sofer and Dr. Vershon instructed one teacher and 27 students in a two-day Workshop (September 24 & 25, 2009) at the University of Texas, Austin. The following table summarizes the 2009 WSSP and HiGene projects at three sites:

#	School	City	State	AY Class or Club	Students
1	Bayonne High School	Bayonne	NJ	Class	12
2 ¹	Bladensburg H.S.	Bladensburg	MD	Club	3
3	Bordentown HS	Bordentown	NJ	Club	6
4	Colonia High School	Colonia	NJ	Club	12
5	East Brunswick High School	East Brunswick	NJ	Official after school Class	56
6	Hackettstown H.S.	Hackettstown	NJ	Club	28
7	High Point Regional High School	Sussex	NJ	Club	17
8	Hillsborough H.S.	Hillsborough	NJ	Club	11
9	James Caldwell High School	West Caldwell	NJ	Class	14
10	John F. Kennedy Memorial High School	Iselin	NJ	Club	32
11	John P. Stevens High School	Edison	NJ	Club	8
12 ¹	Largo High School	Largo	MD	Club	3
13	Liberty High School	Bethlehem	PA	Class	19
14	Monmouth Regional High School	Tinton Falls	NJ	Club	4
15	Montville Township High School	Montville	NJ	Class	37
16	New Brunswick Health Sciences Technology H.S.	New Brunswick	NJ	Club	6
17 ¹	Oxon Hills H.S.	Oxon Hills	MD	Club	2
18	Pascack Hills H.S.	Montvale	NJ	Class	22
19	Pascack Valley Regional High School	Hillsdale	NJ	Class	7
20	The Pingry School	Martinsville	NJ	Club	14
21	Rutgers Preparatory School	Somerset	NJ	Class	9
22 ¹	Science & Mathematics				

	Academy at Aberdeen High School	Aberdeen	MD	Club	47
23 ¹	Sidwell Friends	Washington	DC	Club	9
24	Somerville H. S.	Somerville	NJ	Club	31
25 ¹	Walter Johnson H.S. ³	Bethesda	MD	Class	52
26	Watchung Hills Regional High School	Warren	NJ	Club	23
27	West Windsor-Plainsboro High School South	Princeton Junction	NJ	Club	48
28 ²	Westwood H.S.	Westwood	TX	Class	27
	Total				559

¹ Schools that participated in the summer Institute at Johns Hopkins

s University.

² A school that participated in a two-day workshop at University of Texas, Austin.

³ Two teachers from Walter Johnson High School participated in HiGene during the academic year.

DNA Sequence Analysis Program (DSAP)

Our goal for this project, which receives funding from the National Science Foundation, is to engage high school students and teachers in authentic research in molecular biology and bioinformatics, and to have them publish their findings in databases used by the scientific community. To help them succeed in this endeavor, an online, multifaceted, interactive, learning and teaching tool known as DSAP: the DNA Sequence Analysis Program, was developed, field tested, and will be widely distributed over the World Wide Web (WWW). By using DSAP, participants were guided through the data analysis component of a research project. DSAP is also an embedded assessment tool: it provides information about how technology education supports knowledge acquisition in an inquiry-based learning environment.

Working with computer programmers, project faculty and staff have designed DSAP to help students analyze the novel DNA sequences they find while conducting their wet laboratory investigations that are conducted as part of the Waksman Student Scholars Program (WSSP) and HiGene Programs. Ultimately they publish their findings on international genomic databases (specifically the databases found at the National Center for Biotechnology Information (NCBI)). A listing of the students' publications (as of the summer of 2010) can be found at:

<http://avery.rutgers.edu/WSSP/StudentScholars/WSSP09/WSSP09_PubSeq.html>

Project Evaluation : Both the WSSP and HiGene used formative and summative evaluation protocols to monitor progress throughout the year. During the summer, pre- and post- Institute evaluations were administered that monitored changes in student attitudes and viewpoints about the nature of science and the way science is practiced. A pre- and post-instrument was developed to measure content gains and was administered through DSAP. DSAP itself, was an assessment tool: it was designed to help users go through the steps required to analyze DNA sequences before these are submitted to international databases. As it guided users through the analysis of DNA sequences, it automatically presented the next question based on previous responses, thus serving as an embedded assessment of conceptual knowledge and understanding of molecular biology and bioinformatics. All responses were catalogued and archived in a database, allowing for the monitoring of student progress and the online guidance they received from their teachers.

Project Directors

The WSSP, HiGene and DSAP were directed by Dr. Andrew Vershon, Department of Molecular Biology and Biochemistry at Rutgers University, and Dr. William Sofer (retired). The New Jersey projects were held at, and administered by, the Waksman Institute, Busch Campus, Rutgers University, Piscataway, New Jersey. HiGene@Hopkins was held on the Homewood Campus of Johns Hopkins University in Baltimore, Maryland. HiGene@UT was held at the University of Texas in Austin, Austin, Texas.

Technology Programs

The Digital Teaching and Learning Lab @ CMSCE has developed a series of professional development experiences to assist educators as they bring the latest advances in technology into their classroom. CMSCE technology professional development workshops are offered in the following areas: Art, Language Arts, Mathematics, Science, Social Studies, Technology Integration, Collaboration, Learning Strategies, SMART Board, Special Education, Test Prep, and Video Conferencing. Teachers from every legislative district in the state attend our workshops. These workshops are conducted at the Digital Teaching and Learning Lab as well as in school districts.

For detailed descriptions of all CMSCE technology programs, see <http://cmsce.rutgers.edu>

- **21st Century Learning Initiative**

The Center piloted its 21st Century Learning Initiative in five New Jersey school districts during the 2008-2009 academic year. The CMSCE 21st Century Learning Initiative is designed to help educators keep up with today's changing educational and technology needs. The goal is to increase teacher and student academic content knowledge through hands-on workshops, coaching/mentoring sessions, professional learning networks and online collaborations. Teachers will develop a necessary level of expertise and comfort to integrate the 21st Century Tools into their classrooms. During its second year, this initiative worked with four school districts including eight schools.

- 51 Teachers from across the State immersed themselves in social networking tools such as Twitter and Diigo to develop educational personal learning networks.
- Lisa Thumann facilitated ongoing face-to-face meetings and online communications encouraging the teachers to share resources and classroom experiences
- The teachers were charged with implementing projects using 21st Century Skills with their students.
- Lisa Thumann mentored and co-taught in each of the classrooms enrolled in the Initiative
- Three online webinars were held in the evenings where the teachers and their building administrators attended and participated in professional development virtually using Elluminate, a desktop videoconferencing program.
- Resources for the Initiative were:
 - <http://Thumannresources.com>
 - <http://twitter.com>
 - <http://www.diigo.com>

- **Video Conferencing**

The Center is a recognized leader in the area of video conferencing. We offer workshops to schools as well as coordinate video conferencing events for other faculty at the University to enhance their ability to share information with peers around the country.

The Center received a grant from Verizon to lead a state collaborative effort to put together all the NJ educational resources that provide programming over video conferencing to K20 students and teachers. The Center reached out to content providers throughout New Jersey and the tri-state area to put together over 300 quality K12 programs that are aligned to state standards. This year the grant was renewed to expand and update the videoconferencing offerings. The programs are in a database that can be searched by grade level and content to better meet the teachers' needs. Polycom provided the funding to print the catalog that has been disseminated at conferences and workshops throughout the state. The online catalog can be found at:

http://cmsce.rutgers.edu/resources/vc/search/search_verizon_db.php

In addition to content provider information, the catalog provides contact information for over 100 teachers in New Jersey who would like to participate in videoconferencing collaborative activities.

Workshops

The Center continues to have workshops for teachers and content providers to increase the programming available for the K12 community. Updates to the programs occur several times during the year. The Center provides several programs to assist teachers as they experience videoconferencing. The Center works with Rutgers professors to bring experts into the K12 classroom.

Read Across New Jersey Year II

Read Across New Jersey paired 56 classes via web cam or room-sized videoconferencing equipment to share literacy activities. An interactive website was created and maintained by the Center to enhance the collaborations.

Read Across the Atlantic partnered 30 classes (15 in the US with 15 in Wigan, UK.) The Center worked with the UK coordinator to pair the classes, test and create an interactive online environment with an eBoard. Teachers and students met via webcam or room-sized equipment to present literacy projects and share their unique cultures.

Illuminate

The Center worked with Rutgers and Illuminate support to offer K12 teachers an opportunity to reach out to their peers and content providers around the world. Training was held by Center staff on how to use the software, hardware and to integrate it into the curriculum.

Content Provider Connections

The Center provided customized support to K12 schools on the use of videoconferencing equipment and software and on its integration into the curriculum. After initial training, Center staff worked with the teachers individually to find programming to support teaching and learning. Judy Bornstein worked with authors, historians, professors and other content providers to make the vc experience beneficial to each class.

These initiatives have placed the Center in the forefront of this exciting technology that will bring the world to the classroom.

- **Whiteboards**

Interactive whiteboards give educators and students the ability to make ink electronic. Lessons that were once one dimensional now easily become engaging, two-dimensional and interactive. Web 2.0 are web applications that make the Internet more participatory. Students and educators using Web 2.0 applications such as blogs, wikis and podcast generators are connecting with others through content on the Internet.

CMSCE has taken on an increasingly more prominent role in technology integration in districts throughout New Jersey. Many of our courses are now taught in districts as well as in our lab. Districts turn to us for help in utilizing their Videoconferencing systems. As the number of districts purchasing SMARTBoards and Promethean ActivBoards increases, so does the number of districts that request us to in-service their staff. We provide training for interactive whiteboarding across the curriculum in-district as well as with the SMARTBoard and Promethean board we have in our lab at the Center.

- **Google Workshop for Educators**

The CMSCE partnered with CUE Inc to offer NJ educators the Google Workshop for Educators (GWE). A GWE introduces participants to innovative ways Google tools can be used in education. A full day of fast-paced presentations and hands-on activities includes experience with advanced search techniques, collaborative web-based applications, and inspirational instructional strategies. Google Certified Teachers share ways they've implemented tools such as Google Docs, Google Earth, Google Sites, and... even more. Participants who complete the event are given access to the Google Workshops for Educators Network (GWEN), an online community focused on supporting educators as they learn more about the power of Google to drive student learning.

Lisa Thumann, the Center's resident Google Certified Teacher, organized and facilitated two GWE's during the year. The Center offered a GWE in July and January a total enrollment of 75 NJ educators.

- **Technology Integration**

The Center staff worked with more than 30 school districts and over 600 teachers to help them integrate technology into their curriculum. We also conducted workshops in the Digital Learning Lab for 750 teachers.

CMSCE offered a variety lab-based and in-district workshops on topics including:

- Language Arts Prep Across the Curriculum
- iPods in Education
- Effective Google Search Techniques
- Google Tools for the Creative Classroom
- Test Prep for NJ ASK, GEPA and HSPA in Mathematics and Science
- Technology in the Math Classroom
- Academy for Collaboration at a Distance (ACAD)
- Internet Safety
- Curriculum Mapping
- Book Study: ASCD Priorities in Practice: The Essentials of Science
- eBoards
- Web 2.0 for Math
- Videoconferencing Showcase
- Project Based Learning
- SmartBoard
- Promethean ActivBoard
- Podcasting and Vodcasting
- Blogging
- PowerPoint, PowerPoint Producer
- Windows Movie Maker
- Geometer's Sketchpad
- Using a TI-Graphing Calculator
- Writing in Math
- Web 2.0 for Science
- Differentiating Instruction in Math for Special Needs Students

The Center offered free workshops on a variety of topics including:

- Internet Safety
- Smart Boards
- Promethean Activ Boards
- First in Math

The Center collaborated on the ESTEEMS (Establishing Excellence in Math and Science Education) grant to integrate technology tools into the teacher training.

- **Technology Integration in Pre-service Education**

The Center collaborates with Dr. Prosper Godonoo, director of the Paul Robeson Cultural Center, to provide mentors to the Plainfield High School in Plainfield, NJ.

- **Special Needs**

- Several workshops were available for professional development in all the curricular areas on the integration of technology into the curriculum.

Technology Facilitators

CMSCE conducts a wide variety of professional development offerings. We have assembled a dedicated and knowledgeable group of workshop facilitators. Below, we present biographical information about our workshop facilitators:

Judy Bornstein (jsborn@rci.rutgers.edu) is the Senior Technology Specialist at the Center. As a classroom teacher of both special needs students and technology, and staff member at the Center, she is continually researching the most current strategies for integrating technology into the curriculum. Judy is a Palm Certified Instructor. She has been involved in exploring videoconferencing in education for over 10 years.

Patti Frank (patti.frank@gmail.com) has taught grades K-8 for over 31 years with a focus on science education. Pat earned graduate degrees in education from The College of New Jersey and is proud to be a National Board Certified Teacher.

Deborah Gries (d_gries@hotmail.com) has facilitated workshops for CMSCE and mentored teachers integrating handheld technology into their classroom teaching since 2000. She has brought her knowledge of mathematics and science into the classroom through the use of handheld technology, GIS technology and SMARTBoards.

Jackie Halaw (mshalaw@yahoo.com) is a Nationally Board Certified, middle school science teacher in South Brunswick, NJ. Prior to working in South Brunswick, Jackie worked as a geologist and as an educator at Liberty Science Center in Jersey City. Her professional interests include interactive student notebooks, science test preparation, blogging, and she was recently trained as a Yahoo! Teacher.

Patricia Hutton (tikap@aol.com) is a former educator who has been working at the Center since 2009. She has been involved in literacy professional development and is a Moodle expert.

Heather Johnson (hwjohnson@onelearningcurve.com) M.Ed., NBCT, has teaching experience in elementary and middle childhood education, working with students in urban and suburban districts. As a National Board Certified Teacher, Heather has engaged in creating professional development for teachers at elementary, middle and high school levels and in all subject areas to help them reach high standards of education in their classrooms.

Karen Murray (klmurray@rci.rutgers.edu) is a former chemical engineer who has been part of the educational community for more than 10 years. She has been involved in mathematics and science in schools as the Project Director for Merck Institute for Science Education (MISE) and MetroMath Center for Learning and Teaching, a project of CMSCE.

Elyse Pernick (epernick@yahoo.com) is a former classroom teacher who has been facilitating workshops for CMSCE since 2008. She has been involved in areas such as mathematics, interactive whiteboards, learning strategies and works with teachers in their classroom to help them incorporate newly learned strategies.

Marilyn Rabinowitz (marilynrab@aol.com) is a former literacy teacher and reading and writing specialist. Currently, she is an adjunct at Middlesex County College. Marilyn conducts workshops in reading and writing and works in the classrooms mentoring teachers

Roberta Rim (robertarim45@gmail.com) is a former high school mathematics teacher and Assistant Superintendent from South Amboy School District. She has been a consultant at CMSCE since 2004. She is dedicated to making math instruction fun and exciting, to developing a love for learning mathematics, and to improving student performance. She is a trained instructor in UDL via CAST.org.

Kristine Scharaldi (kscharaldi@hotmail.com) is an experienced classroom teacher and has assisted teachers with technology integration in the curriculum for over ten years. Kristine earned a Masters Degree in Computers and Education from Teachers College, Columbia University. Kristine is a SMART Certified Master Trainer for the SMART Board Interactive Whiteboard.

Dawna Schultz (dschultz@gmail.com) is a mechanical engineer and classroom teacher who has been working with the Center for over 5 years. She is a skilled presenter via videoconferencing and works with children to develop their understanding and love for all things engineering. She is a trained instructor in UDL via CAST.org.

Sally Schannen (sally.schannen@gmail.com) Sally Schannen is a consultant for professional development in mathematics, specializing in K to 8. She creates and disseminates instructional materials, demonstrates lessons, plans with teachers, gives in-class support, and instructs about current research and practices. She is a trained instructor in UDL via CAST.org.

Lisa Thumann (lisa.thumann@gmail.com) taught computers for grades K-8. In 2002, Lisa began working as a consultant for the Center and is now our Senior Technology Coordinator. Lisa explores ways to bring technology

tools into the classroom to enhance student learning and teacher productivity. Lisa is a Google Certified Teacher. She is a trained instructor in UDL via CAST.org.

Comments from Participants

- Another excellent opportunity to create lessons, review UDL principles, technology resources and new hands-on activities to incorporate into lessons or centers. (administrator in Universal Design for Learning in-district initiative)
- The professional development provided me with a lot of additional and helpful information to make my lessons more engaging. (teacher in Internet Resources for All Learners)
- I loved all the different activities and websites for Algebra. I can't wait to work with my students. (teacher in in-district mathematics professional development)
- I liked the fact that it was interactive, and provided tools for an interactive classroom. (participant in Basic SmartBoard workshop)
- What a great experience. The leader provided us with interactive resources plus wonderful technology. Excellent! (participant in Universal Design for Learning in-district initiative)
- Hands on practice helped to 'cement' new topics. I'm glad we didn't spend a great deal of time on basics. (participant in Universal Design for Learning in-district initiative)
- This workshop did what it was advertised to do. I learned about the NJ Ask, types of questions, strategies for students, and also interactive activities to help students prepare for them. I am grateful that the presenter was willing to share her materials with everyone. (participant in Test Prep workshop)
- What I liked best was that I was able to take home the activities we made during the workshop and immediately use them. (teacher in SMARTBoard for Science workshop)
- Wow! What great resources - access to SMART notebooks, templates and the "how to create activities" from the gallery - lesson activities toolkit. (participant in ABC Creating Lessons! workshop)
- This UDL workshop taught me all about social networking. I can't wait to Tweet on Twitter! (participant in Universal Design for Learning in-district initiative)
- I appreciate the interactive hands on learning and time to explore different applications. (participant in Middle School Math Activities for SMARTBoard workshop)
- Hands on--excellent balance of explanations and demonstration with time to try out what was modeled (participant in Promethean Interactive Whiteboards workshop)
- It was amazing to realize how much information we have and that we can present it in new and exciting ways. (participant in SMARTBoard for Math workshop)
- Interactive, ability to ask questions and get what we need, tons of useable materials, and a great presenter. What else can I ask for? (participant in NJ ASK 7,8, Data Analysis and Probability workshop)
- The workshop included great activities to use in the classroom. (participant in Differentiating Instruction in the Math Classroom workshop)
- I loved everything but most of all I loved voki. I can see the students very involved in it. (participant in Universal Design for Learning in-district initiative)
- I learned so much I am overwhelmed. I can't wait to bring this to the classroom and get my students collaborating with each other. (participant in Google Teachers Workshop)
- Lots of prepared resources for us to use in our classrooms. Our students will learn a lot. (participant in End-of-Course Biology workshop)

Comments from Participants in Collaborative Videoconferencing Projects

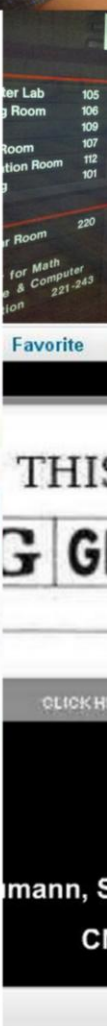
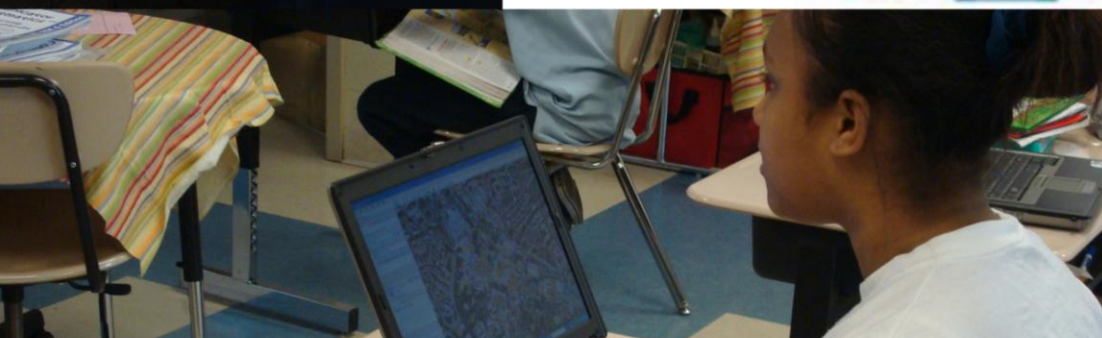
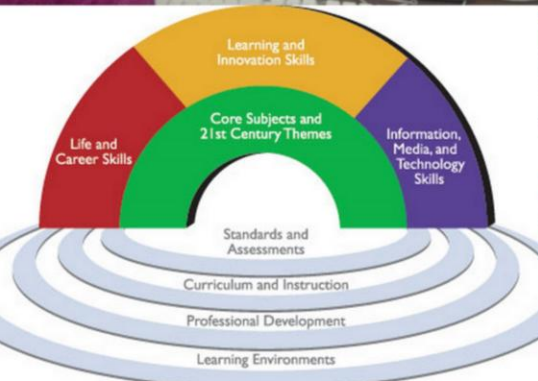
- I enjoyed seeing the connection students made by asking and answering questions at the end of the presentations.
- It allowed our students the chance to met and interact with students from other parts of the state.
- Seeing the children from both countries completely engaged and enjoying the experience. It was amazing. I still can visualize the faces of my students and those in the UK students, as they listened to each other. The final waving good-bye to each other was equally memorable. The student, as well as myself, just didn't want the contact to end. It was a phenomenal experience.

- When we can still make our children, who are saturated with technology go 'WOW' you know you have a hit. It has helped their understanding of cultural differences and really helped in their numeracy work on time difference. It was just great to see how children are the same no matter how far away they live.
- Just the idea of communicating with a different country was extremely exciting. We loved asking the other students questions and getting to know one another. We plan on continuing our conferencing.
- My students were surprised to learn that they do not have a president in England, that the UK students had no idea what the White House was, the UK does not have special days where they celebrate historical figures, but they do celebrate "Pancake Day" where they have a contest to see who can make the largest pancake at the school! My students thanked me over and over and said I was the best teacher they ever had, so I guess they had fun! :)
- The best part was that the students realized that although they live so far away, they really are quite similar. A lot of the interests are the same and that surprised them.
- Seeing the children from both countries completely engaged and enjoying the experience. It was amazing. I still can visualize the faces of my students and those in the UK students, as they listened to each other. The final waving good-bye to each other was equally memorable. The student, as well as myself, just didn't want the contact to end. It was a phenomenal experience. And both sides were very excited. This is a memory of a lifetime!
- I wanted to let you know that the Read Across the Atlantic is a big hit! We have already video conferenced once and have plans to do it at least 2-3 more times. The kids are having a wonderful time learning about other cultures and their school. What an amazing program!
- ...and from a student: Their class was beautiful. One student answered my question about the queen. He said he saw her but it was in London. I was so sad when we had to leave them. I almost cried. I want to get together with our new friends again. It was sad when we all waved good-bye. I wish our whole class could go for a trip to their school. I would be friends with them.

A look at our professional development in action

The above comments were a brief sampling of the enthusiastic responses of workshop participants. Sometimes, one can also glean additional useful information by watching as teachers participate in the variety of programs we offer. Although we cannot share videos in this reports, we can show images that give a flavor of the involvement of participating teachers. A collage of these images appears on the next page.

Google™ Teacher Academy



MetroMath

MetroMath- The Center for Mathematics in America's Cities is one of 13 Centers for Learning and Teaching funded by the National Science Foundation. MetroMath is a collaboration between The Graduate Center of the City University of New York, Rutgers University, and the University of Pennsylvania.

The MetroMath Center has identified three key issues in urban mathematics education, aligned with its focus, around which the research agenda has been organized:

- Interactions between urban families and communities, and the mathematics addressed in urban classrooms;
- The role of affect and motivation in learning conceptually challenging mathematics;
- Outcomes of policies aimed toward recruitment, education, and retention of qualified urban mathematics teachers.

- **MetroMath Study #1: Community-to-School Mathematics**

MetroMath lead faculty/staff: Massey, Remillard

The purpose of this study is to examine mathematical practices outside of school mathematics and their relationship to mathematics learning in schools. We use the term *out-of-school practices* to refer to a number of activities, structured and unstructured, during afternoons, summers, and weekends that fall outside the time and settings allocated for mathematics instruction in schools. Activities and practices in these different settings may make distinctly different contributions to learning. School-based learning, with an emphasis on mathematical notations, algorithms, and systems of wide generality, may be unparalleled in introducing students to the power of formal mathematics (e.g., algebra; generalized procedures for performing calculations with rational numbers). However, classroom instruction has been less effective at developing an intuitive sense of mathematics that is readily accessible for thinking in other settings and that is fluidly integrated with purposeful activities.

The disconnections between in-school and out-of-school mathematics are well documented in the literature. The aim of this study is to examine in great detail the relationship between out-of-school and in-school mathematics activity in order to consider the possibility that greater connections might be forged and that disconnections might be explained.

- **MetroMath Study #2: The Role of Caregivers in Supporting Conceptually Challenging Mathematics Learning**

MetroMath lead faculty/staff: Ginsburg, Remillard

This study is examining the roles that urban parents and other caregivers are given and/or choose to enact to support their children's mathematics learning, particularly in relation to their children's homework. It also examines the children's mathematics positioning, by others and by themselves, as they cross back and forth between school and home.

The goal of this group is to develop a research base that will identify resources and opportunities that could be coordinated to promote the learning of conceptually challenging mathematics, making school mathematics a more effective, powerful, and meaningful experience for urban students.

- **MetroMath Study #3: Affect and Motivation**

MetroMath lead faculty/staff: Goldin, Schorr, Epstein

This study is investigating the development of powerful affect around conceptually challenging mathematics in urban classrooms. The Affect Working Group is implementing one study, in two sites, seeking to understand

how to create conditions in classrooms that make urban students *engaged and invested learners* of mathematics. The initial sites were selected based on evidence these conditions are present. The middle grade level was chosen for a variety of reasons, but most particularly because this is considered a pivotal or critical age for children in mathematics – an age when achievement differences can become exacerbated (e.g., see NAEP data).

The study entails identification of affective variables and indicators in relation to the literature and in relation to our prospective research sites in Newark and Plainfield; the formulation of interview protocols and questionnaires for use with professional staff; interviews with teachers and other professional staff; and initial classroom observations.

- **MetroMath Study #4: Policy Approaches to Recruitment and Retention**

MetroMath lead faculty/staff: Liu, Rosenstein

This study is surveying the broad array of strategies and policies that have been instituted in cities across the United States for recruiting, preparing and retaining middle and high school teachers of mathematics to the profession. Strategies considered include alternate routes to certification, increasing teacher preparation programs, recruitment of career teachers (“Resident Teacher Corps”), programs encouraging temporary coverage (“Teach for America”), and importing teachers.

This study addresses each of a number of policy approaches to the issues of the recruitment, retention, and professional development of urban teachers of mathematics. The goal of the study is to document and understand the various policy approaches that urban districts are employing to recruit, retain, and develop math teachers. The expectation is that MetroMath will be able to provide information and guidance to urban districts on which policy approaches they might reasonably pursue.

- **MetroMath Study #5: Mathematics Alternative Certification Study**

MetroMath lead faculty/staff: Cooley, Donoghue

This three-year study focuses on alternative teacher certification, one of the policy choices to be broadly studied in MetroMath Study 4 (above). It examines the preparation of alternatively certified mathematics teachers (grades 7-12) with regard to their capacities to present and engage students in conceptually challenging mathematics, including how they bring content knowledge and pedagogical content knowledge to classroom activity. It also examines broader issues such as the components of alternative certification programs instituted in various urban settings, and the characteristics of the programs’ participants.

This study is:

- Documenting aspects of the design and implementation of alternative mathematics teacher certification programs that bear upon teaching conceptually challenging mathematics.
- Providing data and analysis that could inform policy decisions by school district officials and program revisions by participating colleges and universities.

Identifying factors (preparation, opportunity) that may be associated with retention or intent to remain in urban mathematics teaching.

The New Jersey Partnership for Excellence in Middle School Mathematics (NJ-PEMSM)

The New Jersey Partnership for Excellence in Middle School Mathematics (NJ-PEMSM) has been funded by the National Science Foundation at \$5 million for the period of September 2009 through August 2014.

The goal of the project is to develop the expertise of teachers in mathematics, pedagogy, and leadership so as to enhance the mathematical achievement of their students and to share their expertise further as lead teachers, mathematics coaches, and district resources. NJ-PEMSM includes school districts facing a cross-section of the most serious educational challenges for American public schools: economic stresses in the home and community environments, a diversity of sociocultural contexts, and partial student proficiency on statewide mathematics assessments. The newly-developed NJ-PEMSM Institute, with summer and academic year components, will enroll

100-120 active middle school mathematics teachers, in four cohorts over five years, as Partnership Fellows. They will undertake a program that develops deep mathematical content knowledge and research-based pedagogical strategies to engage students in learning. The mathematical domains include number and operations, algebra, geometry, probability, and discrete mathematics, while teaching strategies include attention to children's mathematical reasoning processes, affect and motivation. The Institute will develop leadership skills that empower participants to communicate their expertise to colleagues, and to positively influence their school districts. Participants will be able to earn an M.Ed. in Mathematics Education, and/or advanced licensures (e.g., Middle School Mathematics Specialization, Curriculum Supervision). Ongoing support structures will sustain a community of expert practice, while research will document outcomes and support extension and further development of the work. A special focus will be placed on the mathematical achievement of special-needs students. The project will support an additional 100 special education teachers from partner districts to attend workshops and collaborate with the Partnership Fellows in addressing needs within their districts.

This project involves Rutgers mathematics and science faculty from the School of Arts and Sciences, mathematics education faculty from the Graduate School of Education, and teachers from seven partner school districts in New Jersey. These districts have a combined middle grades enrollment of more than 15,000 students each year. The Partnership Fellows will directly teach 3,000 or more middle school students each year, and indirectly benefit many more through their contributions to their colleagues' teaching effectiveness and their districts' mathematics programs. In addition, the model offered by NJ-PEMSM will serve as a resource to similar efforts across the United States. The research questions addressed by the project, pertaining to teachers' acquisition of mathematical knowledge, ability to bring that knowledge effectively into their teaching strategies, and leadership impact, will contribute to the knowledge base for improving professional development of middle school mathematics teachers in diverse school district contexts, especially urban contexts. Results that document improved mathematical achievement among students will increase our understanding of successful strategies, including those that can enhance the success of special-needs students in mathematics.

- **Management Team**

Amy Cohen-Corwin, Department of Mathematics (PI)
 Michael Beals, Mathematics Department, Dean Arts & Sciences (Co-PI)
 Carolyn Maher, GSE (Co-PI)
 Joan Bennett, Center for Women (Co-PI)
 John Coleman, Toms River Regional School District (Co-PI)
 Lynda Ginsburg
 Gerald Goldin
 Yakov Epstein
 Karen Murray

- **Partner School Districts**

Carteret
Long Branch
Plainfield
Old Bridge
Orange
Sayreville
Toms River Regional

- **The NJ-PEMSM Institute**

Partnership Fellows will attend two Summer Institutes (SI-1 and SI-2) in successive summers, enroll in Academic Year (AY) courses during the intervening year and during preceding and subsequent semesters. They will also participate in Short Offerings during the academic year, and in collaborative Action Research leading to their M.Ed. projects. We have already devoted extensive planning to these institute components, and will describe each briefly.

The first cohort of 26 middle school teachers began their Institute study in Spring 2010 with the graduate-level course titled *Seminar in Mathematical Ideas*. During the summer of 2010, the cohort members

continued with two additional graduate-level courses, *Number, Operation and Algebra* and *Geometry and Measurement*, all taught by members of the Mathematics Department faculty.

Strengthening America's Competitiveness Through Adult Math Instruction

The Adult Numeracy Instruction (ANI) project, funded by the U.S. Department of Education, Office of Vocational and Adult Education, is a collaboration among MPR Associates and subcontractors CMSCE, TERC (Cambridge, MA) and University of Tennessee, with funding for Rutgers University of \$309,000. The project began in September, 2007 and will conclude in August, 2011. Lynda Ginsburg, Senior Research Associate at CMSCE, directs the involvement of Rutgers University.

The project seeks to answer several important questions in the field of adult numeracy: what to teach to adults who return to complete their education, how to teach it, and how to teach teachers to teach it.

There are two primary components of the project:

1. Analysis of the findings of the National Mathematics Advisory Panel (NMP) for their relevance to adult education, an examination of the body of research on adult mathematics learning, and development of a research-based, peer-reviewed document titled *Principles of Adult Numeracy Instruction*. Lynda Ginsburg has directed the development of the content of this document. The document will be released by the Department of Education during 2011.
2. Enhance and field-test a professional development model built on the "Elements of Quality Professional Development" in Department of Education's *Environmental Scan of Adult Numeracy Professional Development Initiatives and Practices*. The year-long professional development activities are being implemented in 2010-2011 in two states (GA and AR) following a competition overseen by the Department of Education. Lynda Ginsburg is a member of the field-test evaluation team.

CMSCE Partnerships 2009-2010

- **Partnerships with School Districts**

The Center partners with school districts to provide high level professional development and mentoring for their staff. Center staff provided professional development in Avon Borough, Bayhead, Bloomfield, Buena, Camden, Carlstadt, Carteret, City Of Orange Township, Clifton, District of the Chathams, Franklin, Freehold Borough, Hamilton, Hanover Park, Harrison, Hebrew Academy of Morris, Highpoint Regional, Keyport, Lakewood, Long Branch, Matawan-Aberdeen, Middletown, Ocean Township, Old Bridge, Palisade Park, Paramus, Plainfield, Princeton Regional, Sayreville, Scotch Plains-Fanwood, Soaring Heights Charter School, Solomon Schechter Day School of Essex and Union, Spring Lake, The Wardlaw-Hartridge School, Toms River Regional, West New York and other districts throughout the state. The Center worked with teachers from nearly all 650 school districts throughout the state of New Jersey impacting hundreds of thousands of young students.

- **Partnerships with Rutgers STEM Faculty**

An important goal of the Center for Mathematics, Science and Computer Education is to involve STEM faculty in our K-12 outreach. Two recent examples of such involvement include:

- The GK12 Program (funded and renewed by the National Science Foundation)
This project brought together faculty, from physics, geology, biology, mathematics and education to help improve the teaching and learning of STEM curriculum in middle schools. As a result of their involvement, we have brought together a cadre of talented and dedicated graduate and undergraduate fellows in STEM disciplines to work closely with teachers and students and help inspire them and broaden their knowledge.
- Metro Math Center (funded by the National Science Foundation)
This project has brought together mathematicians, math educators, urban studies faculty, and cognitive science faculty from three universities and both the Rutgers Newark and New Brunswick campuses to build the infrastructure of mathematics education in America's cities.

In addition, we have reached out to engineering faculty to collaborate with them in the creation of a K-12 educational component when they have submitted proposals to NSF. In 2009-2010 we intend to increase collaborative efforts with STEM faculty as they submit proposals in their areas of expertise that require a K12 educational component.

- **Partnerships with Rutgers Units**

- The Center continues its collaborative relationship with Dr. Raphael Caprio, Vice President for Continuous Education and Outreach.
- The Center works closely with The Rutgers Foundation on a number of funding initiatives.
- The Center works closely with the Paul Robeson Cultural Center and Dr. Prosper Godonoo, director of the Center. While enhancing the educational experience of Black students at Rutgers, the Center provides opportunities for all students to receive a more culturally diverse and enriching educational experience. In collaboration with the Center, CMSCE provides service opportunities in local school districts for the Rutgers students to act as mentors. We are also pursuing various funding opportunities for additional projects.
- The Center worked closely with Graduate School of Education. The linkage between the Center for Mathematics, Science, and Computer Education and the Graduate School of Education deserves special note. Much of the impetus and planning for the development of the Center stemmed from the work of members of the GSE. The GSE has sponsored summer courses in conjunction with Center projects and Center Summer Institutes. Numerous GSE faculty members guide Center sponsored projects. Materials developed in these Center-sponsored projects have infused courses taught by GSE faculty thus transmitting the latest and best ideas in math, science and technology to GSE graduate students. The linkage between the Center and the GSE is special, strong, and inextricable. GSE faculty are the lifeblood of the Center and their work with the Center invigorates them and enhances their teaching. The Center, in collaboration with GSE faculty, is creating and delivering a multi-disciplinary four semester sequence of courses entitled, "MU Seminar designed for doctoral students and practicing teachers." The Center is funding 5 MetroMath fellows.
- The Center works closely with the Vice President Joan W. Bennett and the Office for Promotion of Women in Science, Engineering, and Mathematics to support programming designed to enhance opportunities for increased participation by women in science, technology, engineering, and mathematics. The Office for Women in Science, Engineering and Mathematics (WiSEM) shares many of the same goals and objectives as CMSCE. WiSEM focuses specifically on issues facing women in SEM fields. Their initiatives include support of lectures and workshops, offering of mini grants to support interdisciplinary studies and the formation of strategic partnerships. For example, they have worked with the President's Council on Diversity to develop best practices for conducting faculty searches, with the Center for Women and Work and Bio-1 Wired to develop leadership courses, and with the Douglass Project to support scholarships for undergraduate women.

- **Partnership with Other Universities and Research Institutes**

- The Center is collaborating with the University of Pennsylvania and the City University of New York Graduate Center to develop common multi-disciplinary graduate courses and research to improve mathematics learning in urban environments.
- The Center is collaborating with the Stanford Research Institute to submit a proposal on developing a questionnaire instrument to measure engagement in learning mathematics.

- **Partnerships with Business and Industry**

- The Center continues working with Verizon and NJ Edge to help informal education institutions establish videoconferencing capabilities and programs for schools throughout New Jersey and the world.
- The Center has established partnerships with technology companies to bring cutting edge technology strategies and software to K-12 schools in New Jersey. Among these companies are eBoard and Seacliff Technologies, E-Beam, Logitech, Polycom and Impact Technologies, VoiceThread, Google, Elluminate, and ooVoo.

CMSCE Presentations, Papers, and Dissertations 2009-2010

Science Conference Presentations

The co-PI (AV) conducted a hands-on workshop entitled "Challenging High School Biology Students" at the 33rd annual New Jersey Science Convention (NJSC) in Somerset, NJ on 10/13/09. 46 teachers attended the presentation and engaged in hands-on activities of protein modeling, and took home a packet of materials and a CD of the Amino Acid Game developed by the project co-PI (WS). Information about the HiGene program for teachers and engaging their students in DNA sequence analysis was also distributed.

The co-PI AV led a workshop at the national meeting of the National Science Teachers Association (NSTA) held in Philadelphia, PA on March 20, 2010.

Publishing Student Work on NCBI: Science

As a result of clone analyses conducted by the high school students and their teachers, 217 sequences have already been either published or have been submitted for publication on GenBank. Another 278 sequences will be submitted in late summer 2010. Therefore a total of 495 sequences that will be published this year by the WSSP/HiGene project participants for use by the scientific community.

MetroMath

Presentations:

G. A. Goldin, Y. M. Epstein, R. Y. Schorr, & L. B. Warner (presented by Goldin), "Affective Structures, Beliefs, and Mathematical Learning." EARLI 13th Biennial Conference, Amsterdam, August 25-29, 2009.

Liu, E., Rosenstein, J.G., Swan, A.E., and Khalil, D., (2009, April). How Unique are Urban Districts' Challenges with Recruiting/Retaining Math Teachers?—A Comparison with Suburban Districts. American Educational Research Association, San Diego, CA.

Liu, E., Rosenstein, J.G., Swan, A.E., and Khalil, D. (2009). The Strategy and Organization of Support for Mathematics Teachers in Eight Urban Districts. (Included in a Symposium entitled "Preparation, support and retention of middle and high school mathematics teachers in urban and high poverty districts: Views from the East and West coasts.") American Educational Research Association, San Diego, CA.

Lin, K. (2009). Factors impacting the pursuit of mathematics for female PhD students. MAA Session on Building Diversity in Advanced Mathematics: Models that Work.

Dunn, M. & Schorr, R. (2009). Using a Train-the-Trainer model in Scale-up: Fostering Strategic Similarities. The Association of Mathematics Teacher Educators Thirteenth Annual Conference in Orlando, FL.

Arias, C., Devlin, C., Jones, J., Pedrick, L., Warner, L. & Schorr, R. (2009). Multiple Perspectives on Affect in Urban Mathematics. Association of Mathematics Teacher Educators Thirteenth Annual Conference, Orlando, FL.

Alston, A., Brett, P., Goldin, G., Jones, J., Pedrick, L., & Seeve, E. (2008). The Interplay of Social Interactions, Affect, and Mathematical Thinking in Urban Students' Problem Solving. In Figueras, O., Cortina, J.L., Alatorre, S., Rojano, T., & Sepulveda, A. (Eds.), Proceedings of the Joint Meeting of the Psychology of Mathematics Education 32 and the North American Chapter of the International Group for the Psychology of Mathematics Education XXX. Vol. 2. Mexico: Cinvestav-UMSNH. (pp. 33-40).

Schorr, R., Warner, L. & Arias, C. (2008). When students disagree: engagement and understanding in an urban middle school math class. Presented at the Joint Meeting of PME 32 and PME-NA XXX (the National and International Group for

the Psychology of Mathematics Education), L Morelia, Michoacan, Mexico: Cinvestav – UMSNH.

Baker, J. Y. & Lim, V. Y. (2009). The effects of organizational decision making on an after-School Entrepreneurship Program. Paper and poster presented at the AERA Annual Meeting. San Diego, CA.

Bose, E., & Schnee, E. (2009). Parents don't do nothing: Reconceptualizing parental null actions as agency. Paper presented at the annual meeting of the American Educational Research Association, San Diego, California.

Rodriguez, M. & Schnee, E. (2009). "Amarrados de Pies y Manos*: Non-English Speaking Latino Immigrant Parents' School Engagement". Paper presented at the American Educational Research Association (AERA) Conference. San Diego, California.

*Our Hands and Feet are Tied

Rashid, H., English-Clarke, T., & Ginsburg, L. (2009). Parents' and teachers' mathematics homework beliefs and expectations. Paper presented at the annual meeting of the American Educational Research Association (AERA), San Diego, California.

Bose, E., & Flicker, J. (2009). Tracing the transformation of homework tasks: Textbook, school, and home. Poster session presented at the research pre-session of the annual meeting of the National Council of Teachers of Mathematics, Washington, D.C.

Bush, W., Ginsburg, L., Meader, P., Schmitt, M.J. (2009). Numeracy trifecta: Win, place and show with algebra. Preconference workshop. Commission on Adult Basic Education. Louisville, KY.

Rashid, H., Rogat, T., Ginsburg, L. (2009). Fostering motivation for mathematics and mathematics homework: The role of home-based parent involvement. Poster presented at the annual meeting of the American Educational Research Association (AERA), San Diego, CA.

Ginsburg, L. 2009 Do sociomathematical classroom norms travel home with adult learners? Paper presented at the annual meeting of the American Educational Research Association (AERA), San Diego, CA.

Ginsburg, L., Rashid, H., English-Clarke, T., Bose, E., Schnee, E. Rodriguez, M., Civil, M. (2009). Parent involvement in schooling through mathematics homework: Urban parents' views of the possibilities and the realities. Symposium presented at the annual meeting of the American Educational Research Association (AERA), San Diego, CA.

Haydar, H.N., Vatak, S. & Angulo N. (2009). "Any right to get it wrong? Beginning urban teachers and students mathematical errors." Presentation at the Thirty First Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Atlanta, GA.

Haydar, H.N. & Vatak, S. (2009). "Any Right to Get It Wrong? Beginning Urban Teachers and Students Mathematical Errors" Presentation at the National Council of Teachers of Mathematics (NCTM) research pre-session, Washington, DC.

Vatak, S., Meagher, M. (2009). The Mathematical Knowledge for Teaching (MKT) of New York City Teaching Fellows. Presentation at the Research Pre-session of the National Council of Teachers of Mathematics Annual Meeting, Washington, DC.

Brantlinger, A., Cooley, L., & Michelli, N. (2009). Demographics of Alternative Certified Mathematics Teachers in New York City. Paper Presented at the CUNY Education Conference at the CUNY Graduate Center, New York City, NY.

Meagher, M. & Brantlinger, A. (2009). "When Am I Going to Learn to Be a Mathematics Teacher?" A Case Study of an Alternatively Certified Teacher. Paper Presented at the CUNY Education Conference at the CUNY Graduate Center, New York City, NY.

Brantlinger, A., Cooley, L., & Smith, B. (2009). Preservice Preparation of Mathematics Candidates in the New York City Teaching Fellows Program. Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, CA.

Smith, B., Brantlinger, A. & Cooley, L. (2009) Pre-Service Preparation of Alternatively Certified Mathematics Teachers. Thirty-First Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Atlanta, GA.

Gonzalez, L., Brantlinger, A. (2009). Instructional Interventions and Equity: Lessons and Implications From Our Work in Math for Social Justice. Ethnography in Education Research Forum (University of Pennsylvania). Philadelphia, PA.

Pence, B., Liu, E., Brantlinger, A., Cooley, L., Khalil, D., Rosenstein, J., & Swan, A., (2009). Preparation, Support, and Retention of Secondary Mathematics Teachers in Urban and High Poverty Districts. (Symposium). Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, CA.

Meagher, M. & Brantlinger, A. (2009). "When Am I Going to Learn to Be a Mathematics Teacher?" A Case Study of an Alternatively Certified Teacher. Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, CA.

Donoghue, E., Brantlinger, A., & Henry, S. (2009). Kelly and the Context of Her Mathematics Cohort in the New York City Teaching Fellows Program. NCEI/NCAC Effective Pathways into Teaching Conference. Hosted by the National Center for Education Information (NCEI), National Center for Alternative Certification (NCAC), and Organized by Westat. Washington DC.

Meagher, M., & Brantlinger, A. (2008). Mathematics instruction in high needs NYC middle schools. Presentation at the Thirtieth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education and Thirty-Third Meeting of the International Group for Psychology of Mathematics Education, Morelia, Mexico.

Haydar, H.N. (2008). "Who's Got the Chalk?" Beginning Mathematics Teachers and Educational Policies in New York City", Presentation at the Oxford Round Table, Oxford, UK.

Haydar, H.N. (2008). "Beginning Teachers and Students Mathematical Errors". Presentation at the 40th New England Educational Research Organization Conference - Hyannis, MA.

Gonzalez, L. (2008). Teaching math for social justice: Reflections on a community of practice aimed at preparing teachers in this area. Emerging Scholars in Education Conference (CUNY Graduate Center). New York, NY.

Journal Publications:

Glickman, N.J., & Scally, C.P. (2008). "Can community and education organizing improve inner-city schools? Journal of Urban Affairs, 30(5), 557-577.

Liu, E., Rosenstein, J.G., Swan, A.E., & Khalil, D. (2008). When districts encounter teacher shortages: The challenges of recruiting and retaining mathematics teachers in urban districts, *Leadership and Policy in Schools*, 7, 296-323.

Jackson, K. & Ginsburg, L. (2008). Algebra for all? The meanings that mothers assign to participation in an algebra class. *Adults Learning Mathematics International Journal*, 3(2a), 10-28.

Schorr, R.Y., & Goldin, G.A., (2008). Expression of affect in an inner-city SimCalc classroom. *Educational Studies in Mathematics*, 68, 131-

Gonzalez, L. (2009). Teaching mathematics for social justice: Reflections on a community of practice for urban high school mathematics teachers. *Journal of Urban Mathematics Education*, 2, 22-).

Ginsburg, L., Rashid, H., English-Clarke, T. (2009). Parents learning mathematics: For their children, from their children, with their children. *Adult Learning Quarterly*.

Liu, E., Rosenstein, J.G., Swan, A.E., & Khalil, D. (2009). How urban districts are responding to the challenges of recruiting and retaining mathematics teachers. *Teachers College Record*. Submitted.

Schorr, R.Y., Epstein, Y.M., Warner, L.B., & Arias, C.C. (2009). Mathematical truth and social consequences: The intersection of affect and cognition in a middle school classroom. *Mediterranean Journal for Research in Mathematics Education*. Submitted.

Warner, L.B., Schorr, R.Y., & Davis, G.E. (2009). Flexible use of symbolic tools for problem solving, generalization and explanation. *ZDM—International Journal of Mathematics Education*, 41, p. 663-.

Technology

Main Session Presenter, [Building Learning Communities \(BLC09\)](#), Boston, MA, July 29-31, 2009

Google Workshop for Educators, [iNACOL's Virtual School Symposium \(VSS\)](#), Glendale, AR, November 13, 2010

High Tech Hall presenter, [NJEA Convention](#), Atlantic City, NJ, November 4-5, 2010

Main Session Presenter, [Building Learning Communities \(BLC10\)](#), Boston, MA, July 14-16, 2010

Co-Coordinator-[Edubloggercon East](#), Building Learning Communities (BLC10), Boston, MA, July 12, 2010

Session Presenter for [YoLink](#), [ISTE](#), Denver, Colorado, June 28-30, 2010

Lead Learner, [Google Workshop for Educators](#), Minot, ND, June 8-9, 2010

[Keynote Speaker](#), New Jersey Educational Technology Institute Conference ([NJETI](#)), Stockton College, NJ, May 13, 2010

Using Multimedia in the Classroom, NJEA Technology Institute, Stockton College, NJ, May 1, 2010

Keynote Speaker, NJEA Technology Institute, Trenton, NJ, April 24, 2010

“[This is Not Your Grandmother's Google](#)“, NJECC Annual Conference, Montclair University, NJ March 16, 2010

“[Google Search – Hold Onto Your Hats](#)“, Google Teacher Academy for Administrators, Austin, TX, March 5, 2010

“Managing Filter Failure – Getting to the Good Stuff”, Educon 2.2, Philadelphia, PA, January, 2010

“Classroom Reset 2010”, Montclair University, NJ, January 6, 2010

“Developing Your Personal Learning Network Using Twitter”, CIE, Kean University, NJ December 11, 2009

“Google Sites”, Google Teacher Academy, Washington DC, December 9, 2009

“Google Workshop for Educators”, iNACOL, Austin, TX, November 15, 2009

“Stretching Your Technology Dollar: Shoestring Innovations”, NJEA High Tech Hall, Atlantic City, NJ, November 5 & 6, 2009

“In Tune with The 21st Century Student”, New Jersey Association for Educational Technology (NJ AET), Lakewood, NJ, October 14, 2009

“In Tune with Your Personal Learning Network (PLN)”, New Jersey Association for Educational Technology (NJ AET), Lakewood, NJ, October 14, 2009

“Google Search: At a Mile a Minute”, Google Teacher Academy, Boulder, CO, August 5, 2009

CMSCE Future Visions 2010-2011

2010-2011 promises to be an exciting year for the Center for Mathematics, Science, and Computer Education. The following activities are high priorities for the upcoming year:

IMPACT Project: Looking Ahead

Professional development for IMPACT teachers will continue during the summer with a Rutgers 3-credit graduate course entitled Topics in Mathematics: Enhancing Mathematics Understanding. This course will offer IMPACT teachers an intensive summer 2010 professional learning opportunity to support their attainment of highly qualified middle school mathematics teacher status (HQT) and increase their understanding of mathematics to help their students increase their mathematical achievement.

The Center plans to submit a proposal for Year 2 (9/1/2010-8/31/2011) to sustain on-going classroom and on-line support for IMPACT teachers during the 2010-2011 school years. Mathematics and literacy topics, UDL principles, and 21st Century skills will be addressed using Elluminate for on-line meetings and problem solving sessions, CMSCE-4-Learning Diigo website to build and foster a cross-district professional learning community, and the Center’s eBoard sites for lesson plan and resource sharing. E-mail and Elluminate sessions ensure that SBPT members remain actively involved in the implementation of the project and work closely with Project Directors Harriet Schweitzer and Lynda Ginsberg, and Jennifer V. Jones, Project Coordinator for the duration of the grant period.

Expanding the Vision – 21st Century Learning Initiative

The CMSCE 21st Century Learning Initiative is designed to help educators keep up with today's changing educational and technology needs. The goal is to increase teacher and student academic content knowledge through hands-on workshops, coaching/mentoring sessions, professional learning networks and online collaborations. Through sessions at the CMSCE, virtual meetings, ongoing online communication and in-class mentoring we are able to support teachers and their students as they move their classrooms into the 21st Century.

Expanding the Vision – Universal Design for Learning (UDL)

“Universal Design for Learning (UDL) is a framework for designing curricula that enable all individuals to gain knowledge, skills, and enthusiasm for learning. UDL provides rich supports for learning and reduces barriers to the curriculum while maintaining high achievement standards for all.” (CAST.org) Through workshops and in-class mentoring we are able to support teachers and their students as they integrate UDL principles.

Expanding the Vision – Connecting Teachers and their Students through Videoconferencing Technology

The Center has been working with Verizon and videoconferencing groups and providers throughout New Jersey and the United States to bring this ever-growing technology into school districts. As desktop videoconferencing becomes increasingly popular and accessible, the Center continues to unite students with experts from around the globe in order to experiences beyond the four walls of their classroom. We will also sponsor mini videoconference workshops to extend the teachers and administrators understanding of this cutting edge technology as well as develop desktop videoconference tutorials for educators to access at their own convenience.

Expanding the Vision – Digital Teaching and Learning

As the Center moves to support innovative teaching and learning, we continue to develop and offer courses that will aid educators in mastering the necessary skills for 21st Century learning. By building professional development that allows for collaboration and flexibility, the Center will provide support for effective strategies in teaching and assess students the necessary technology skills. The Digital Teaching and Learning Lab has submitted proposals to funding agencies to support this effort.

Yakov M. Epstein
Center Director

Harriet Schweitzer
Associate Director

CMSCE Funding 2009-2010

Funding derived from the New Jersey Department of Education, The National Science Foundation, Corporations and Foundations and School District Cost Sharing totaled \$2,143,253 on an annualized basis for 2009-2010.

CMSCE Staff 2009-2010

During the past year, the Center staff numbered 31 full-time and part-time individuals.

TABLE 1
CENTER EXECUTIVE COMMITTEE
2009-2010

<i>Luke Burke</i>	<i>Professor, Chemistry (Camden Arts and Sciences) burke@camden.rutgers.edu</i>
<i>Richard DeLisi</i>	<i>Dean, Graduate School of Education, delisi@rci.rutgers.edu</i>
<i>Yakov M. Epstein</i>	<i>Director of the Center (ex officio): Professor, Dept. of Psychology (FAS), yepstein@rci.rutgers.edu</i>
<i>Eugenia Etkina</i>	<i>Associate Professor (Science Education) Dept. of Learning and Teaching (GSE) eugenia.etkina@gse.rutgers.edu</i>
<i>Gerald A. Goldin</i>	<i>University Director, Science and Mathematics Partnerships, Professor (Mathematics and Science Education). Dept. of Learning and Teaching (GSE), and Depts. of Mathematics and Physics (FAS)(ex officio), gagoldin@dimacs.rutgers.edu</i>
<i>William Librera</i>	<i>Presidential Research Professor of Education, blibrera@rci.rutgers.edu</i>
<i>Carolyn A. Maher*</i>	<i>Professor (Mathematics Education), Dept. of Learning and Teaching (GSE), cmaher@rci.rutgers.edu</i>
<i>Arthur J. Powell</i>	<i>Associate Professor, Academic Foundations (Newark), adpowell@andromeda.rutgers.edu</i>
<i>Fred S. Roberts</i>	<i>Director, Center for Discrete Mathematics and Theoretical Computer Science, froberts@dimacs.rutgers.edu</i>
<i>Joseph Rosenstein*</i>	<i>Professor, Dept. of Mathematics (SAS) , joer@math.rutgers.edu</i>
<i>James M. Schlegel</i>	<i>Professor, Dept. Of Chemistry, (Newark Arts and Sciences,), jimms@andromeda.rutgers.edu</i>
<i>Kathleen M. Scott</i>	<i>Associate Professor, Dept. Of Biological Sciences (SAS), scott@biology.rutgers.edu</i>
<i>Roberta Schorr</i>	<i>Associate Professor, Academic Foundations (Newark Arts and Sciences,), schorr@rci.rutgers.edu</i>
<i>Harriet Schweitzer</i>	<i>Center Associate Director for Educational Programming (ex officio), harriets@rci.rutgers.edu</i>
<i>Bill Tucker,</i>	<i>Professor, Psychology (Camden Arts and Sciences) btucker@camden.rutgers.edu</i>
<i>Bill Whitlow, Jr.</i>	<i>Professor, Psychology (Camden Arts and Sciences) bwhitlow@camden.rutgers.edu</i>

**Member of original working committee to develop the Center.*

TABLE 2
CENTER STAFF
2009-2010

CMSCE Central Staff

Yakov M. Epstein	Center Director
Gerald A. Goldin	Director, Science and Mathematics Partnerships
Harriet Schweitzer	Associate Director
Kathleen Scott	Associate Director for Undergraduate and Graduate Programs
Patricia A. McManus	Business Manager I
Michele Giusti	Administrative Assistant II
Debbie Sclafani	Clerical
Kathy Lin	Graduate Assistant I

MetroMath Staff

Karen Murray	Project Manager
Lynda Ginsburg	Senior Research Associate

ESTEEMS Staff

Hector Lopez	Project Director: ESTEEMS
Amari Verastegui	Program Coordinator

Science Program Staff

Susan E. Coletta	Sr. Science Education Specialist
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Technology Program Staff

Judy Bornstein	Sr. Technology Education Specialist
Lisa Thumann	Sr. Technology Education Specialist
Kristine Scharaldi	Instructor
Roberta Rim	Instructor

Jackie Halaw	Instructor
Heather Johnson	Instructor
Sally Schannen	Instructor
Debbie Gries	Instructor
Elyse Pernick	Instructor
Patti Frank	Instructor
Pat Hutton	Instructor
Marilyn Rabinowitz	Instructor

TABLE 3

UNIVERSITY FACULTY PARTICIPATING IN CENTER PROJECTS 2009-2010

<i>Dr. Alice Alston</i>	<i>Lecturer, Mathematics Education, Graduate School of Education</i>
<i>Dr. R. Michael Beals</i>	<i>Vice Dean for Undergraduate Education, School of Arts and Sciences, Professor of Mathematics, (NB-SAS)</i>
<i>Dr. Joan W. Bennett</i>	<i>Associate Vice President for Promotion of Women in Science, Engineering, and Mathematics and Professor, Plant Biology and Pathology (SEBS)</i>
<i>Dr. Michael J. Carr</i>	<i>Professor, Department of Geology and Dean, Physical & Mathematical Sciences, FAS</i>
<i>Dr. Jolie A. Cizewski</i>	<i>Professor, Department of Astronomy and Physics, and Vice Dean of the Graduate School</i>
<i>Dr. Amy Cohen-Corwin</i>	<i>Professor, Department of Mathematics</i>
<i>Dr. Margaret Barry Cozzens</i>	<i>Research Professor of Mathematics, (NB-SAS)</i>
<i>Dr. Yakov M. Epstein</i>	<i>Center Director, Professor, Department of Psychology</i>
<i>Dr. Richard Falk</i>	<i>Professor of Mathematics, (NB-SAS)</i>
<i>Dr. William Firestone</i>	<i>Professor, Educational Theory, Policy, and Administration, Graduate School of Education</i>
<i>Dr. Rochel Gelman</i>	<i>Department of Psychology and Co-Director, Rutgers Center for Cognitive Science</i>
<i>Dr. Norman Glickman</i>	<i>University Professor, Center for Urban Policy Research</i>
<i>Dr. Gerald A. Goldin</i>	<i>University Director, Science and Mathematics Partnerships, Professor Mathematics and Science Education, Mathematics and Physics</i>
<i>Dr. Prosper Godonoo</i>	<i>Director, Paul Robson Cultural Center</i>
<i>Dr. Richard Neil Lyons</i>	<i>Professor of Mathematics, (NB-SAS)</i>
<i>Dr. Carolyn A. Maher</i>	<i>Professor, Mathematics Education, Graduate School of Education</i>
<i>Dr. Robert E. Nahory</i>	<i>Web Developer, Dana Library, Newark</i>
<i>Dr. Arthur Powell</i>	<i>Associate Professor, Academic Foundations Department, Newark</i>
<i>Dr. Fred S. Roberts</i>	<i>Professor of Mathematics, (NB-SAS)</i>
<i>Dr. Joseph Rosenstein</i>	<i>Professor, Department of Mathematics</i>

Dr. Kathleen M. Scott *Professor, Cell Biology and Neurosciences and Director, Math Science Learning Center*

Dr. Roberta Y. Schorr *Assistant Professor, Academic Foundations Department, Newark*

Dr. Andrew Vershon *Professor, Department of Molecular Biology and Biochemistry*

Dr. Keith Weber *Assistant Professor, Mathematics Education, Graduate School of Education*

Dr. Robert Wilson *Professor of Mathematics, (NB-SAS)*

Table 4

**CENTER FOR MATHEMATICS, SCIENCE, AND COMPUTER EDUCATION
PROJECT FUNDING 2009-2010**

PROJECT TITLE	INCLUSIVE	PROJECT DIRECTOR	TOTAL	ANNUALIZED
NEW JERSEY DEPARTMENT OF EDUCATION				
IMPACT	1/15/2010-8/31/2010	Schweitzer Ginsburg	\$300,000	\$300,000
ESTEEMS	7/1/09-6/30/10	Lopez	\$525,000	\$525,000
TOTAL NJ DEPARTMENT OF EDUCATION:			\$825,000	\$825,000
NATIONAL SCIENCE FOUNDATION				
Adult Literacy	7/01/09-6/30/10	Ginsburg	\$86,477	\$86,477
NJPEMSM	9/1/09-8/31/10	Goldin	\$614,389	\$614,389
TOTAL NSF FUNDING:			\$700,866	\$700,866
SELF-SUPPORT PROGRAMS				
Technology Institutes	07/01/09-06/30/10	Schweitzer	\$617,387	\$617,387
TOTAL SELF-SUPPORT PROGRAMS			\$617,387	\$617,387
TOTAL FUNDING FOR 2009-2010			\$2,143,253	\$2,143,253