The Quest

FALL 2013

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The Center for Research in Mathematics and Science Education (CRMSE) is an inter-disciplinary community of scholars who seek to advance mathematics and science education at local, state, and national levels by providing leadership in research into the learning and teaching of mathematics and science, as well as materials and program development, outreach, and evaluation. CRMSE members jointly operate the Ph.D. Program in Mathematics and Science Education (MSED) with the University of California at San Diego.

- $13.6 million in funded projects
- 28 faculty/emeritus members; 26 associate members (doctoral students and staff)
- 9 visiting scholars—See details in the Visiting Scholars section
- 2 MSED graduates—Doctorates awarded: Jaime Diamond and Dov Zazkis
- 8 Colloquia—See details in the Events section
- 11 Special Events
  - Two SEESE Seminars
  - Distinguished Lecturer Series
  - MSED Research Seminar Series
  - SDSU Student Research Symposium
  - SDSU Science and Engineering Sampler
  - San Diego Festival of Science & Engineering Expo
  - San Diego’s Inaugural STEM Summit at Grossmont College
  - Math 605 Graduate Student Poster Session
  - MSED Reception for Graduates
  - Special Presentation by Subaru of America Foundation, Inc., to the LabZone at Lemon Grove Academy for the Sciences & Humanities.
- 5 award-winning faculty
  - Alexander Chizhik, Fulbright Scholar at the Southern Ukrainian Pedagogical University in Odessa, Ukraine
  - Janet Bowers, Outstanding Mathematics and Statistics Faculty of the Year and Dedicated Math Educator Honoree
  - Lisa Lamb, Outstanding CRMSE Faculty
  - Randy Philipp, 2013 President’s Leadership Fund Faculty Excellence Award and AERA Division K–12’s Exemplary Research in Teaching Award
  - Steve Reed, 25 Years of SDSU Service.
- 2012–2013 Nicholas Branca Scholarship Award Recipient: Bridget Druken, MSED Doctoral Student
- Outstanding staff award: Candace Cabral, Project Manager
EVENTS

The CRMSE Colloquium Series continued this year with eight presentations:

- **September 12, 2012**, Dr. Fred Goldberg, Professor, SDSU Department of Physics, and CRMSE member, presented a summary of his trip to Botswana and Turkey.

- **October 5, 2012**, Dr. Dor Abrahamson, Associate Professor of Cognition and Development, Secondary Mathematics Education, in the Graduate School of Education, University of California at Berkeley, presented Some Affordances of Embodied Interaction for Mathematics Teaching and Learning.

- **November 9, 2012**, Dr. Angelika Kullberg, Department of Pedagogical, Curricular and Professional Studies, Gothenburg University, Sweden, presented In What Ways Do Teachers Change Their Teaching After Participating in Learning Studies?


- **February 27, 2013**, Dr. Judy Patterson, Department of Mathematics, University of Auckland, New Zealand, presented Talking about Mathematics and Teaching: Collegial, Intra-Departmental Approaches to Math-Based Professional Development.

- **March 29, 2013**, Dr. José Antonio Juárez López, Department of Physics and Mathematics, Benemérita Universidad Autónoma de Puebla, México, presented Importance of Spatial Situation Model Construction During Text Comprehension of a Mathematical Problem.

- **May 16, 2013**, Dr. Ricardo Nemirovsky, Professor, SDSU Department of Mathematics and Statistics and CRMSE Director, and J. Brooke Ernest, Doctoral Student, SDSU/UCSD Mathematics and Science Education (MSED) Joint Doctoral Program, presented When Mathematical Instruments Become Art Instruments.

Mathematics and Science Education Research Seminar Series for 2012

- **October 8, 2012**, Dr. Micheline T. H. Chi, Professor, MLF Teachers College, Arizona State University, presented Two Kinds and Four Sub-Types of Misconceived Knowledge, Ways to Change It, and the Learning Outcomes.

- **October 22, 2012**, Dr. Daniel Chazan, Professor, Department of Teaching and Learning, Policy and Leadership & Center for Mathematics Education, University of Maryland, presented New Technologies and the Challenges of Particularity and Generality in Depicting and Discussing Teaching.

- **November 5, 2012**, Dr. Michelle Cook, Associate Professor, Teacher Education, Clemson University, presented Visual Representations in Science Education.

- **November 26, 2012**, Drs. Elizabeth de Freitas, Associate Professor, Curriculum and Instruction, School of Education, Adelphi University, and Nathalie Sinclair, Professor, Faculty of Education, Simon Fraser University, presented New Materialistic Ontologies in Mathematics Education: The Body In/Of Mathematics.

Distinguished Lecturer Series

This annual/biannual event was held on the SDSU campus on **October 25 and 26, 2012**. Megan Bang, University of Washington, and Beth Warren, TERC, presented De-Settling Expectations in Science Education, with a focus on improving teaching and learning of science for Native American children.

SDSU 2013 Student Research Symposium

On **March 8–9, 2013**, CRMSE and the Center for Teaching Critical Thinking and Creativity (CTCTC) cosponsored the exhibit, The Art of Geometry: The convergence of art and mathematics.

San Diego’s Inaugural STEM Summit

The Summit was held on **May 3, 2013**, at Grossmont College. CRMSE member, Cynthia Park, helped to facilitate a breakout session on Teacher Leadership and Pathways.

MSED Reception

On **May 17, 2013**, we held a graduation reception for two MSED graduates and families—Jaime Diamond and Dov Zazkis. Jaime has accepted a faculty position in Mathematics Education at the University of Georgia, and Dov, a post-doctoral position at Rutgers University.
OUTREACH

SDSU Science & Engineering Sampler

On March 22, 2013, as part of the San Diego Festival of Science & Engineering, CRMSE sponsored two booths: The Lab Zone, led by Alexander Chizhik and Through the Looking Glass: Explore Patterns with Math Tools, led by Janet Bowers and Susan Nickerson.

Fifth Annual San Diego Festival of Science & Engineering Expo

The Festival was held in March and concluded with an Expo Day in Petco Park on March 23, 2013. Ricardo Nemirovsky and Bohdan Rhodehamel led the CRMSE interactive booth entitled Prime Time With Spirographs: Gearing up to Prime Numbers and Motion Detector Demonstrations.

Office of Pathways to Science, Technology, Engineering, and Mathematics (STEM) Careers in Education

In addition to the regular projects led by Director Dr. Cynthia Park, the Pathways office organized several activities in support of CRMSE initiatives, including the recruitment of SDSU students for the SCI 250 course, the organization of a seminar about a new graduate program on informal mathematics and science education, and a field-trip visit by 300 middle school students to SDSU to promote math and science education.

Revising the K–8 Math Ed Masters to include the Math Specialist credentials

A group of faculty have been working on revising the K–8 Math Ed Masters degree program and the Math Specialist certificate program so that students may earn the new California Mathematics Instruction Added Authorization and the Mathematics Instruction Leadership Specialist credentials as part of the M–K–8 masters program. We hope to have this new program in place within a year.

Fund raising

This year CRMSE worked with Amy Harmon, Director of Development for the SDSU College of Education, to enhance our fund-raising efforts to support our outreach programs including The LabZone, Innovation Lab and SEE Seminar Series. As a result of submitting several proposals for external support, we received $5,000 in funding from the Subaru of America Foundation, Inc., and $5,000 from the Ackerman Foundation, both to support the Lab Zone.

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In addition to these grants, CRMSE also received private donations to support CRMSE activities. Below is a complete listing of donors and levels.

Platinum ($1,000+)

2012–2013 Donors:
- Subaru of America Foundation, Inc.
- Thomas C. Ackerman Foundation
- Northrop Grumman
- San Diego Regional EDC Foundation
- Anonymous
- Steve and Karen Reed
- Kien Lim (MSED alumni)

Gold ($500–999)

2012–2013 Donors:
- Geocon, Inc.

Silver ($250–499)

2012–2013 Donors:
- Nadine and Steve Bezuk

Bronze ($100–249)

Aluminum ($5–99)

2012–2013 Donors:
- Marcia Mattson
- Bud Mehan
- Fred Goldberg
- Barbara Edwards

To donate to support CRMSE, click here: http://giveonline.sdsu.edu/giving and type CRMSE in the third box below “Donation amount.”
• **Dor Abrahamson**, October, 2012, Associate Professor of Cognition and Development, Secondary Mathematics Education, in the Graduate School of Education, University of California at Berkeley, presented a colloquium and worked with Ricardo Nemirovsky’s project team.

• **Figen Uysal**, October, 2012, Department of Mathematics, Bilecik University, Turkey, presented a colloquium and worked with Chris Rasmussen’s project team during the Fall semester.

• **Elizabeth de Freitas**, November, 2012, Associate Professor, Curriculum and Instruction, School of Education Adelphi University UCSD, and **Nathalie Sinclair**, Professor, Faculty of Education, Simon Fraser University, presented a research seminar and worked with Ricardo Nemirovsky’s project team.

• **Angelika Kullberg**, November, 2012, Department of Pedagogical, Curricular and Professional Studies, Gothenburg University, Sweden, visited CRMSE for 3 weeks in October 2012. During her stay she gave a special interactive seminar for MSED students and a colloquium for the CRMSE community, attended doctoral seminars, and met with faculty. One of her areas of research is learning study, which is a variant of lesson study that is grounded in variation theory (developed by Ference Marton at Gothenburg University). (photo to right)

• **Robert J. Nanna**, January, 2013, Doctoral Student, University of Massachusetts, presented a colloquium and worked with Randy Philipp’s project team.

• **Judy Paterson**, February 27, 2013, Department of Mathematics, University of Auckland, New Zealand, presented a colloquium and worked with Chris Rasmussen’s project team.

• **José Antonio Juárez López**, March, 2013, Department of Physics-Mathematics, Benemérita Universidad Autónoma de Puebla, México, presented a colloquium and worked with Ricardo Nemirovsky’s and Randy Philipp’s project teams.

• **Anna L. V. Lundberg**, April, 2013, doctoral student in Mathematics Education at the Department of Pedagogical, Curricular and Professional Studies, Gothenburg University, Sweden, visited the MSED program and CRMSE for two weeks in April 2013, working with Joanne Lobato and MSED students. She is a doctoral student supervised by Cecilia Kilhamm. Anna also is a team member of Roger Säljö’s research team, which has been participating in an early algebra international comparative study involving Norway, Finland, Sweden, and the U.S. Her thesis data on proportional reasoning and the use of representations in tasks with proportionality derive from that project.
PRIORITIES AND INITIATIVES

Advisory Board

The sixth meeting of the CRMSE Advisory Board was held on June 27, 2013, at CRMSE. CRMSE welcomes advisory members from the San Diego Community at large, who have interests in mathematics and science education. During the meeting, we reported on the work of CRMSE, highlighting our five initiatives, including the LabZone, the CRMSE Innovation Lab, work toward developing a new graduate program in informal mathematics and science education, public education (SEE Seminar Series), and development. We also discussed CRMSE’s fund raising efforts and identified volunteers from the Advisory Board to participate in follow-up discussions on CRMSE’s initiatives. Advisory Board members include:

- Mike Chapin, Member, Board of Directors, San Diego Regional Economic Development Corporation
- Ernest Anastos, Superintendent, Lemon Grove School District
- Chris Deckard, Senior Scientist, K–12 Outreach, SPAWAR Systems Center
- Barbara Edwards, Executive Director, Math for America San Diego
- Aly Evans, National Project Manager, Art of Science Learning, Balboa Park Cultural Partnership
- Kristin Evans, Education Director, Birch Aquarium at Scripps
- Helen Gonzales, Region 9 After School Lead Coordinator, Extended Learning Unit, San Diego County Office of Education
- Nigella Hillgarth, Executive Director, Birch Aquarium at Scripps
- Keith Malcom, Director of Educational Services, Lemon Grove School District
- Arthur Olson, Director, Molecular Graphics Laboratory, Scripps Research Institute
- Jameson Rienick, Mathematics Coordinator, San Diego County Office of Education
- Ned Smith, Chair of Science and Technology Working Group, San Diego Foundation
- Nancy Taylor, Executive Director, San Diego Science Alliance
- Bruce Westermo, Assistant Dean for Student Affairs, College of Engineering, San Diego State University

The involvement of members of the CRMSE advisory board has led to revising existing initiatives and developing new initiatives.

CRMSE Initiatives

CRMSE Learning Lab and after-school program

The LabZone continued at the Lemon Grove Academy for the Sciences and Humanities in the Lemon Grove School District this year. The Pathways Office conducted recruitment of SDSU students to enroll in the SCI 250 course, Learning Science and Math in Informal Education Setting, taught by Alexander Chizhik and coordinated by Amy Hook. This course also meets General Education requirements, which makes it even more attractive to undergraduate students. Ten students enrolled in the class. Approximately 10 middle school students participated twice a week. This year, thanks to a grant from Subaru Foundation of America, Inc., the LabZone students took a field trip to SDSU, touring the CRMSE Innovation Lab, Earthquake Simulation Lab, and the Visualization Lab.

SDSU students work with Lemon Grove Academy students in the LabZone
CRMSE Initiatives con’t

Public Education: STEM Education, Economics, and Equity (SEEE) Seminar Series

Along with collaborators from SDSU, the University of San Diego, UCSD, San Diego EDC Foundation, the San Diego Science Alliance, and the League of Women Voters San Diego, CRMSE hosted two seminars:

• Joining forces with Full STE[+a]M Ahead Networking: STEM or STEAM? Integrating the Arts into STEM Education, on October 1, 2012, at the SDG&E Energy Innovation Center.

• Innovative STEM Education for a Diverse San Diego, held on April 29, 2013, at the SDG&E Energy Innovation Center.

We have begun planning the 2013-14 SEEE Seminar Series. The Fall seminar, to be held on October 14, will discuss K–12 Online STEM Education: Promise or Problem?

Math Technology/CRMSE Innovation Lab

The Innovation Lab is a unique facility where faculty and researchers develop ways of studying mathematics by designing and constructing physical models and devices allowing for the engagement of touch, body motion, kinesthesia, and large-scale activities in the learning of mathematics. In addition to several computer-control machines to manufacture pieces, it includes a special classroom where groups of students can be video-recorded for research on learning and design. This year the Lab focused on the integration between art projects in undergraduate mathematics education. We are planning the creation of an “Online Store” offering materials, software, and hardware developed at CRMSE to enrich math and science education. A proposal to support the creation of a “Mathbus” disseminating the technologies of the lab throughout local middle schools was submitted to the National Science Foundation but not awarded.

Graduate Program on Informal Science and Mathematics Education

The Graduate program will be offered by the College of Extended Studies with the support of the Colleges of Education and Sciences. Its faculty will include SDSU faculty as well as experienced staff from museums and community centers in San Diego, particularly the institutions located in Balboa Park participating in the Balboa Park Cultural Partnership. This program is expected to generate interest among teachers, professional staff in museums and community centers, and those with training in mathematics and science who wish to work in education without the curricular and testing constraints of formal education. We currently are developing a survey to determine interest in the program.

Development: Funding and Marketing Ideas to Support Initiatives

CRMSE has contracted with Kim Richards, KDR PR, for six months beginning on May 1, 2013, to develop public relations activities to build awareness and better communicate the wealth of CRMSE expertise and resources available to the Community.
ACCOMPLISHMENTS

Professional Accomplishments

Note: CRMSE members in **bold** text. CRMSE associate members are in *red* text. Current and former graduate students in *blue* text.

**Randolph Philipp** was recognized this year with two major awards. He was one of only five SDSU faculty to receive the President’s Leadership Fund Award, recognizing members of the SDSU community whose work is “innovative, forward-thinking, entrepreneurial and which will be a part of the university’s continued development as a major public research university.” [http://newscenter.sdsu.edu/sdsu_newscen](http://newscenter.sdsu.edu/sdsu_newscen)ter/news.aspx?s=74210

Also, Miriam Sherin, Victoria Jacobs, and **Randolph Philipp** were selected for the Division K Exemplary Research in Teaching and Teacher Education Award. Editors of Mathematics Teacher Noticing: Seeing through Teachers’ Eyes selected for Exemplary Research in Teaching Award. [http://coe.sdsu.edu/news/2013spring.php#mathteach](http://coe.sdsu.edu/news/2013spring.php#mathteach)

**Janet Bowers** was honored at the College of Sciences’ Academic Year-End & Emeriti Faculty Reception for her dedicated work to revive SDSU’s Math Club. **Janet Bowers** also was awarded outstanding faculty in the Department of Mathematics and Statistics for 2013.

**Candace Cabral** was honored at the College of Sciences’ Academic Year-End & Emeriti Faculty Reception as CRMSE’s outstanding staff member for her superb administrative support to CRMSE for two decades. She has fulfilled a variety of positions and provides substantive contributions to the projects she works on.

**Lisa Lamb** was honored at the College of Sciences’ Academic Year-End & Emeriti Faculty Reception as the PI of two large NSF-funded research projects, the Noyce project and Project Z.

**Kathy Williams**, along with a team of researchers, conducted a large-scale study that “Reveals Trends in Science Education” that was highlighted in the SDSU Newscenter: [http://newscenter.sdsu.edu/sdsu_newscen](http://newscenter.sdsu.edu/sdsu_newscen)ter/news.aspx?s=74210

**CRMSE members serve as members of several advisory boards:**

- Executive Director, Association of Mathematics Teacher Educators (AMTE)
- Advisory Board member, California Association of Mathematics Teacher Educators (CAMTE)
- Member, California Subject Examinations for Teachers (CSET) Mathematics Subject Matter Advisory Panel, January 2013–present.
- Member, Advisory Board, NSF-funded “Mobile, Movement, and Math”, John Black, Sandra Sheppard, and Frances Nankin, PIs, Teachers College, December 2012–present.
- Member, Advisory Board, NSF-funded “Project FIRE”, Julie Cwikla and Jennifer Vonk, PIs, Teachers College, December 2012–present.
- Member, Advisory Board, NSF-funded “Project FIRE”, Julie Cwikla and Jennifer Vonk, PIs, University of South Alabama, January 2011–present.
- Member, Math Specialist Credential Task Force, California Association of Mathematics Teacher Educators, Fall 2011–present.

**Tom Carey** serves as the following:

- Senior Partner at the Carnegie Foundation for the Advancement of Teaching in Palo Alto, CA. During this time he contributed to plans for scaling up Carnegie’s

  innovative Statway™ and Quantway™ course pathways and the affiliated Networked Improvement Communities.

- Visiting Scholar for the California Community Success Network where he provides strategic advice and project leadership on Knowledge Exchange Networks for community college mathematics faculty. In 2012–13, this included serving as leadership catalyst for the Math Faculty Inquiry and Innovation Team across the nine colleges of the Los Angeles Community College District. In 2013–14, this work is being extended to a regional network for all 20 community college math departments in the Los Angeles area. In addition to enhancing student success in developmental mathematics, this network is also exploring assessment for student meta-cognitive capabilities for mathematics and the impacts of Common Core State Standards for Mathematics on community college math teaching.

- Visiting Scholar in research and innovation centers at three Canadian universities: the Centre for Excellence and Innovation in Learning of Vancouver Island University, the Institute for Innovation and Scholarship in Teaching and Learning at Kwantlen Polytechnic University, and the Technology-Enhanced Knowledge Research Institute of Athabasca University. This work focuses on strategic faculty collaborations to develop teaching and learning environments for exemplary knowledge-intensive work.

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Joanne Lobato serves as a member of the following:

- Advisory Board Member for “Investigating Differentiated Instruction and Relationships between Rational Number Knowledge and Algebraic Reasoning in Middle School,” an NSF CAREER grant, Amy Hackenberg (PI), Indiana University, 2013–2018.
- Advisory Board Member for Framing Learning Contexts to Promote Transfer-of-Learning, an NSF CAREER award project, Randi Engle (posthumous)/Alan Schoenfeld (acting PI), UC-Berkeley, 2009–2014.
- Advisory Board Member for the National Council of Teachers of Mathematics’ new research handbook in mathematics education (planned for 2016/2017).
- Joanne also participated in the Epistemic Algebraic Student Conference, a working group of researchers held June 2–4, 2013, in Athens, GA. The conference was sponsored by the Department of Mathematics and Science Education at the University of Georgia, and by The Wyoming Institute for the Study and Development of Mathematics Education (WISDOMe).

Chris Rasmussen serves as a member of the following:

- Advisory Board Member for the research project, Teaching Mathematics Well in Community Colleges: Understanding the Impact of Reform-Based Instructional Resources, V. Mesa (PI), funded by the National Science Foundation Faculty Early Career Development Program, 2008–2013.

Donna Ross serves as a member of the following:

- Member of the State Review Team (SRT) consisting of 80 science experts representing K–12 science teachers, administrators, county science consultants, college and university professors, scientists, science informal centers, and business and industry. Since November 2011, the SRT reviewed five public and private drafts of the NGSS and provided feedback to Achieve and to the CDE.
- Member of the Science Expert Panel (SEP), a smaller group representative of the SRT, which reviewed the national NGSS to make preliminary recommendations for field comment, reviewed feedback from public meetings and the SRT surveys, and made final recommendations for the CA standards based on NGSS to the SSPI. These final recommendations include proposed learning progressions for Elementary (K–5), Middle (6–8), and High School (9–12) Science.

MSED Graduates, 2013

In May 2013, CRMSE hosted a celebration for our two summer graduates, Jaime Diamond (July) and Dov Zazkis (August).

Jaime’s dissertation is entitled “Teachers’ Beliefs Regarding the Generalization of Students’ Learning and How to Support the Generalization of Students’ Learning.” Her advisor is Dr. Joanne Lobato. Jaime will be an Assistant Professor in the Department of Mathematics and Science Education at the University of Georgia in Athens.

Dov’s dissertation is entitled “Calculus Students’ Representation Use in Group-Work and Individual Settings.” His advisor is Chris Rasmussen. Dov will be a Postdoctoral Researcher in the Graduate School of Education at Rutgers University, working with Keith Weber and Pablo Mejia Ramos.

Fifth-year MSED Student: Molly Kelton is working on her dissertation research under her advisor Dr. Ricardo Nemirovsky. Her dissertation is entitled, “Math on the Move: An Ethnographic Study of School Field Trips to a Mathematics Exhibition.”

Fourth-year MSED Students: Spencer Bagley and Jessica Ellis both successfully defended their proposals this past academic year and Bridget Druken, Brooke Ernest and Mike Fredenberg are in the process of moving on to candidacy.

Third-year MSED Students: John Gruver and Casey Hawthorne passed their second-year exams this Summer.
Second-year MSED Students: David Quarfoot and C. David Walters successfully completed their first year with us and will be ready to jump into a new set of courses in the Fall.

Michael Garcia is leaving the program and will become a teacher at High Tech Middle School in San Diego this Fall.

Welcome new MSED Students: This Fall three new doctoral students will join the MSED program:

- Naneh Apkarian received her masters from UCSD where she worked as a TA.
- Raymond LaRochelle received his masters from American University where he worked as an Algebra instructor.
- Hayley Miles-Leighton received her masters from University of Arizona where she also worked as a TA.

Naneh and Raymond will have teaching assignments in the SDSU Department of Mathematics and Statistics for their first year and Hayley will be working with Chris Rasmussen.

Mike Fredenberg will be serving as a TA in the School of Teacher Education during the 2013–2014 academic year.

Molly Kelton recently was interviewed by Education Week about her dissertation work: Adams, C. (2013). Museums open doors to informal math learning. Education Week, http://www.edweek.org/ew/articles/2013/06/05/33mathmuseum_ep.h32.html?tkn=TVVF6aPnCSH0W5ZNx9pg%2FBM3%2Fs4yrl3pMlin&cmp=ENL-EU-NEWS1

MSED Grads Participate in STaR Program

Dr. Ian Whitacre (Florida State University, Tallahassee), 2012 MSED graduate, was selected to participate in the 2012 cohort of the Service, Teaching, and Research (STaR) Project for early career mathematics educators. This induction program, funded by the National Science Foundation, includes a summer institute in Park City, Utah (July 13-18, 2012), structured networking opportunities, and a follow-up session at the annual meeting of the Association of Mathematics Teacher Educators in February, 2014. Dr. Charles Hohensee (2011 MSED graduate) and Dr. Megan Wawro (2011 MSED graduate) joined the STaR Program in its 2011 cohort.

Other Accomplishments of MSED Students

Casey Hawthorne was one of four recipients in 2013 of the Susan Gay AMTE Conference Scholarship Awards. The award is named after Susan Gay in honor of her extraordinary service to AMTE over many years as conference director, president, secretary, and board member-at-large, established to provide graduate students financial support to attend the AMTE annual conference. Each year up to four graduate students receive the award, which covers the cost of graduate student early registration and an additional $400 to offset the cost of attending the conference. To qualify, one must be a graduate student making steady progress toward completion.

Also, Casey Hawthorne was the first MSED student supported by the SDSU College of Education. He taught two sections of MthEd 212, Children’s Mathematical Thinking, in Fall 2012 and taught TE 903, Secondary Math Methods, in Spring 2013. The College of Education support is continuing this year.

Jaime Diamond (second from left) and Dov Zuzkis (second from right) celebrate receiving their doctorate degrees with fellow MSED students Spencer Bagley (left), Bridget Druken (center) and Mike Fredenberg (right).
PUBLICATIONS

2012–Present

Note: CRMSE members in **bold** text. CRMSE associate members are in **red** text. Current and former graduate students in **blue** text.


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PROJECT UPDATES

Note: CRMSE members in bold text. Undergraduate students in blue text.

BioHUB: An Internet HUB for the Conceptual Assessment in Biology Community. NSF, 8/1/2011–7/31/2013. $199,991. K.S. Williams (PI), K.M. Fisher (co-PI). Over the past 10 years, with colleagues, I have been developing question items that can be used to address prevalent alternative conceptions in science that inhibit the construction of accurate scientific knowledge. By uncovering non-scientific conceptions of our students we can develop ways to address them. I received an initial NSF award funding the third Concept Assessments in Biology (CAB) Meeting (May 17–20, 2010), that brought together 30 leaders in the field, from around the world. Subsequently I obtained funding to create an internet HUB (BioHUB) for the growing community of faculty and researchers developing and using CABs to inform curriculum and instruction and transform biology education. The Conceptual Assessments in Biology HUB (BioHUB) is being developed in collaboration with “ciHUB” (concept inventory HUB) website creators at Purdue University. Currently ciHUB.org hosts conceptual assessments in engineering, physics, and statistics. The BioHUB will provide a central and accessible location for CAB information, dissemination, discussion, and research. It will provide college and secondary educators with easy access to CABs, offer assistance with optional administration and scoring of CABs, and provide guidance for interpretation and use of CABs in exploring students’ prior knowledge, interactive teaching, and assessing learning gains. The five-year NSF-funded REESE grant, Characteristics of Successful Programs in College Calculus (Chris Rasmussen, PI), is nearing the end of the fourth year. Case studies of 17 successful programs have now been completed, and the project is making good progress on the five main goals:

(1) To improve our understanding of the demographics of students who enroll in calculus.

(2) To measure the impact of the various characteristics of calculus classes that are believed to influence student success.

(3) To conduct explanatory case study analysis of exemplary programs in order to identify why and how these programs succeed.

(4) To develop a theoretical framework that articulates the factors under which students are likely to succeed in calculus.

(5) To use the results of these studies and the influence of the MAA to leverage improvements in calculus instruction across the United States.

Starting in January, 2013, the project received an REU (Research Experiences for Undergraduates) supplement. The two students, Kady Hanson and Gina Nunez, are making great strides and contributions to the project.


Inquiry in Mathematics Teacher Education (IMTL), Janet Bowers (PI) and Nadine Bezuk (co-PI). Cajon Valley School District, National School District, and San Diego State University, Grant from the California Mathematics and Science Partnership Program, July 2011–June 2014. This three-year grant funded a collaborative project between San Diego State University, Cajon Valley School District, and National School District to support elementary and middle school mathematics teachers enhancing their mathematics teaching to implement the Common Core State Standards and increase the mathematics achievement of students, particularly English learners and newcomers.

Integrating Change in Calculus Instruction, Janet Bowers has received a grant from SDSU’s Presidential Leadership Fund to lower the failure rate for Calculus I. The grant proposed a four-pronged approach to revising the way calculus is taught:

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(1) the use of undergraduate tutors (who are prospective high school teachers) to work with the instructor during class time to support students’ in-class work; (2) interviewing client discipline instructors in areas such as physics, computer science, accounting, etc., to gain a better perspective on which topics should be most emphasized; (3) collect and analyze student analytic data to better monitor student progress and reach out to those who are doing poorly; and (4) use technology to encourage the development of more conceptual understanding.

Investigating Academic Climates and Institutional Contexts for Science Faculty with Education Specialties (SFES) across the U.S. NSF, 9/1/2012–8/31/2013. $77,054. K.S. Williams, Senior Personnel, J. Rudd, PI

Noyce Mathematics and Science Master Teaching Fellowship Program, National Science Foundation, $2,995,400. Lisa Lamb (PI), Randy Philipp, Susan Nickerson, Donna Ross, Kathy Williams (co-PIs), with Meredith Houle Vaughn, August 2012–July 2017. This project supports 32 specially selected secondary mathematics and science teachers for five years. During that time, we will not only support their teaching, but their emergence into teacher leaders. Qualcomm, Inc. provided an additional $500,000 in matching funds to support the teachers’ work.

Project ALGEBRAIC (Addressing Learning Gaps in Education by Raising Algebraic Understanding and Increasing Content Knowledge), Susan Nickerson (PI) and Nadine Bezuk (co-PI). Lake Elsinore Unified School District, Temecula Valley Unified School District, and San Diego State University, Grant from the California Mathematics and Science Partnership Program, July 2010–September 2013. This three-year grant funded a collaborative project between San Diego State University, Lake Elsinore Unified School District, and Temecula Valley Unified School District to support mathematics teachers in grades three through Algebra I to enhance their mathematics teaching and implement the Common Core State Standards and increase the mathematics achievement of students.


Reducing Bottlenecks and Improving Student Success: Promising Practices, Janet Bowers, Richard Levine, James Frazee, Chris Rasmussen, Mark Dunster, and Kristin Duncan received a grant from the CSU Chancellor’s office for $168,030. This money will support the efforts of the PIs to implement and research the efficacy of a variety of measures to reduce the D/F/W rates across three critical bottleneck courses: Pre-Calculus, Calculus, and introductory Statistics during the 2013–2014 school year.

San Diego Mathematics Project, Rafaela Santa-Cruz (director) and Nadine Bezuk (co-director). This project supports mathematics teachers in San Diego County by coordinating professional development and outreach programs.
PRESENTATIONS

2012–Present

Note: CRMSE members in bold text. CRMSE associate members are in red text. Current and former graduate students in blue text.


Bezuk, N. (2012, October 10–12). Developing fraction reasoning to support algebra success. Regional meeting of the National Council of Teachers of Mathematics, Dallas, TX.


Carey, T. (2012, August). Open educational resource collections as knowledge Building Spaces for Faculty. Presentation at Institute for Knowledge and Innovation Technology summer institute Building Cultural Capacity for Innovation, University of Toronto.


Lobato, J. (2013, June). Why do we need a set of conceptual learning goals in algebra when we are drowning in standards? Invited address to the Epistemic Algebraic Student Conference, University of Georgia in Athens.

Lobato, J. (2013, April). The transfer showcase: Exciting contemporary advances about and educationally central phenomenon. Annual Conference of the American Educational Research Association, San Francisco. The talk also served as a tribute to Dr. Randi Engle’s research in this area. Sadly, Professor Engle lost her battle with pancreatic cancer six months before this session that she organized.


annual meeting of Association for Mathematics Teacher Educators.


Tom Carey also presented in policy briefings to the following groups:

* Los Angeles Community College District Board (Student Success Committee): December 2012.
* Colleges Ontario Council of Presidents: October 2012.