The Center's Mission

- **Attract and prepare** mathematically talented college students to become mathematics teachers
- **Retain and support** those mathematics teachers currently in the classroom

The Center's Vision

An excellent mathematics teacher for every child in every grade

Highlights of the 2016-2017 School Year

- The Center offered two Herbst Enrichment Mathematics Seminars on August 29 which filled to capacity. This was the first time we offered HEMS so early in the year. It is apparent that we should continue to do so.

- The [Thomas R. Brown Family Foundation](http://www.thomasrbrown.org) provided funds to create the IMPACTS Program. CRR was able to offer 10 workshops for teachers in grades K to 5 using these funds. The Foundation also sponsored a weeklong Mathematics Leadership Seminar for teams of teachers from 16 elementary schools. See page 8.

- The Center’s webpage was renovated and moved to a Drupal platform to complement the formats of webpages for the Department of Mathematics and the College of Science. Thank you to the [Thomas R. Brown Family Foundation](http://www.thomasrbrown.org) for supporting the creation of the new webpage. Visit [http://crr.math.arizona.edu](http://crr.math.arizona.edu)

- The Center maintained its 19 partnerships from 2015-2016 and added partnerships with Paulo Freire Freedom Schools (Downtown and University), Baboquivari High School, and the Continental School District. See page 12 for a complete list of partners and donors.

- The Center’s 13th Annual MEAD Conference hosted a record 87 sessions. The keynote speaker, Ruth Parker, inspired the participants to encourage and honor multiple strategies used by students to solve problems.
Stronger Together

Effective teachers are life-long learners. They want to understand deeply the concepts that they teach. They also want to know how best to facilitate student learning of those concepts. Mathematics teacher shortages have reached epidemic levels here in Arizona. Most people would agree that higher salaries would improve the situation, since a number of teachers move to neighboring states enticed by higher salaries. Although the Center cannot change teacher salaries, we can and do provide critical support. According to a study reported in the March 2016 *International Journal of Mathematical Education in Science and Technology*, there are three recurring themes in national teacher retention studies:

1. There’s a need for targeted professional development
2. New teachers need effective mentoring
3. Productive peer collaboration is crucial.

These themes have inspired our work since the Center began in 2001. Each of CRR’s programs intentionally addresses one or more of those targets. Workshop and seminar topics are chosen in collaboration with our partners. Presenters, facilitators, and participants wear nametags during all of our events so that we can get to know each other’s names. Presenters facilitate small group discussions so that teachers may share ideas and hear those of fellow educators. The Mathematics Educator Appreciation Day (MEAD) presenters are mostly local educators who are encouraged to share their effective strategies and lessons. CRR cultivates leadership and it fosters a professional community of educators.

The New Teacher Induction Program provides mathematics learning experiences designed using effective pedagogies. Coaches remember how difficult the first years of teaching are, so they support the intellectual and emotional needs of the beginning teachers, mentoring these new teachers throughout the year.

The Co-Directors are mathematics teacher advocates locally and at the state and national levels. CRR is informed about changes in the state standards and the requirements in the *Every Student Succeeds Act* so that CRR can provide services that support student learning, teacher efficacy, and mandated school directives.
The Tutor Scholar Program recruits college students interested in exploring a mathematics-teaching career. These mathematically talented students enroll in a one-credit class that focuses on tutoring techniques as well as multiple approaches to problem solving. The college students tutor three to five hours per week in selected elementary, middle and high school mathematics classrooms. Students earn a stipend up to $575 for their dedicated, reliable involvement. The teachers with whom they work are chosen based on their enthusiasm for mathematics and teaching, their student-centered classroom environments, and their knowledge of current state standards and supported effective practices.

“My experience in the classroom with the techniques we have learned so far have worked remarkably well. I feel I am connecting especially well with 4 different students, and watching them grow in their math skills is beyond rewarding. Before this class I didn’t realize how creative math was. I now have a completely different mindset when it comes to math.”

- Colby Lancaster (Tutor)

“I learned that there isn’t a single right way to do a math problem, and there isn’t a single right way for you to help them (students) understand a concept.”

- Austin Conry (Tutor)

“Your tutors are always ready to take on the challenge while keeping calm and kind when working with our kids.”

- Devahi Balachandran (High School Teacher)
The New Teacher Induction Program for Secondary Mathematics supports middle and high school teachers new to mathematics education. Participants attend monthly Saturday sessions throughout the school year. These sessions provide a format to share ideas, materials, and concerns, deepen mathematical knowledge, model good teaching, and promote collegiality.

Each participant works with a coach. These coaches are former middle or high school teachers. Coaches meet with teachers several times per semester to help plan lessons, observe instruction, collaborate, and discuss concerns including classroom management, best practices, motivation, maximizing classroom participation, promoting discourse, assessment techniques and more.

Thirteen teachers participated in the New Teacher Induction Program during the 2016-17 school year.

“Thank you for your commitment to new teachers. I appreciate your hard work and especially the classroom observation/feedback. This is invaluable to me.” —High School Induction Teacher

“This is a great program, and I take so much out of it.” —High School Induction Teacher

“I loved when we split up by content area... and knowing about other technologies I didn’t know about before.” —High School Induction Teacher
Teacher Workshops

The Arizona College & Career Ready Standards provide the blue prints for what students should know and be able to do. Dedicated educators continually search for effective lessons and strategies to ensure that students are meeting and exceeding the standards. CRR provides workshops in the evening and on Saturdays to help teachers engage in exemplary lessons and strategies both as mathematics learners and as educators. They then implement these in their own classrooms to develop deeper student understanding of concepts. The participants earn continuing education hours for their involvement in these highly interactive workshops.

“My needs and wants are just more workshops teaching to the deeper level of what the objective means and how to teach it using manipulatives and hands-on learning rather than just algorithms. I’m not strong on the why and am appreciative of the help to learn it”.

— Elementary school teacher

“I've been waiting for such a workshop and finally got to come to one. Pacing was excellent and the variety of activities was useful in terms of pick and choose.”

— High school teacher
Herbst Enrichment Mathematics Seminars

With generous support from Lee and Arthur Herbst, the Center offered three Saturday workshops in which local master teachers shared their expertise in mathematics content and pedagogy with colleagues. Herbst Seminars focus on connecting content to practice and providing teachers with concrete tools and techniques to use in the classroom. Participants receive a continental breakfast, a stipend, and continuing education hours for their participation in these highly interactive workshops.

Let’s Build! Bringing Math Concepts to Life with Science, was facilitated by Allison Davis in August for K-3 teachers.

Engaging High School Students in Modeling with Mathematics was offered by Mona Toncheff in August.


“Thank you for the great opportunity to gather with peers and experts to share ideas to advance student knowledge, engagement, and interest in mathematics. I leave this training with new activities, real-world applications, and projects to help students better interact with standards and build connections in their learning.” —Elementary school teacher

“This is the most engaging workshop I have attended in 15 years of teaching!” —Second grade teacher

“Thank you for your support of the Transformational workshop. I learned many valuable techniques and ideas to support student learning of transformations, congruence and similarly. I feel energized to help students not only learn, but be excited about Geometry.” —High school teacher

“Thank you for providing us with our workshop. As a first year school teacher, I honestly appreciate any and all help that I can get. Thank you! I really appreciate getting acquainted with other teachers. Getting new ideas for class, getting paid for my time, sharing my own challenges and getting some veteran advice.” —High school teacher
Improving Mathematical Problem solving, Acumen, & Confidence for K-5 Teachers and Students

IMPACTS Program

A new series of teacher workshops were offered throughout the school year to address essential mathematical concepts in grades K through 5.

Sixteen teacher teams attend a one-week Mathematics Leadership Institute in June, to deeply explore elementary mathematics and to design site plans for professional development to share strategies and content with colleagues in their schools. Parents and administrators were invited to attend two days of the Institute.

The IMPACTS program is made possible by the generosity of the Thomas R. Brown Family Foundation.

“Thank you so much for valuing education and the lives and minds of our future... so blessed beyond words for your generous gift and for touching the lives of my students in a profound way and making me fall in love with my profession all over again!!!”

—Elementary school teacher

“The presenter was phenomenal. I am highly excited to begin implementing STEM activities in a more meaningful way in my classroom. This workshop was absolutely relevant to what I have been aspiring to do for years.”

—Kindergarten teacher

“I found this workshop to be extremely valuable in understanding the progression of multiplication through the grade levels. It helped me to understand the building of the concept. I also valued the fluency piece and plan to take this directly into my classroom. It has motivated me to research more so that I can be more effective in my teaching.”

—Third grade teacher
The 13th Annual MEAD Conference was held on January 21, 2017. Eight-three different presenters facilitated 87 sessions at Tucson High Magnet School. Participants attended three different 70-minute sessions followed by a luncheon and keynote presentation at the University-Park Marriott.

The keynote speaker, Ruth Parker, was masterful with her problem-posing and audience solution-sharing. Many of the participants have been inspired by Ruth Parker and Cathy Humphreys’ current book, Making Number Talks Matter.

“There was a great range of topics presented!”
“I love MEAD!”
“Fantastic! I want more.”
“I was able to speak to a 1st grade teacher and a university professor!”

—High school teacher
—Middle school teacher
—Middle school teacher
—Fourth grade teacher

Thank you Texas Instruments for sponsoring the MEAD breakfast!
Advanced Placement Practice Exams

Thanks to Bruce MacMillan’s leadership, CRR has been sponsoring Advanced Placement Calculus (AB and BC) Practice Exams since 2008. Students take timed exams that had been actual prior AP exams. The multiple-choice portions are scored while the students complete the free response items. Teachers then teach the students how to score their own free response answers. In this way, they learn the expectation for a well-written, complete solution. By the end of the day, students know what score they would have earned for the exam. The experience gives them practice answering sample items and gives them insight into what preparation is necessary prior to taking the actual AP exam two weeks later.

Beginning in 2014, Josh Tabor started a parallel Advanced Placement Statistics Practice Exam. The statistics students experience the same type of format so that they, too, know what they would have scored on an actual exam.

While the students are taking their practice exams, local AP teachers meet in a separate room so that they can share ideas, lessons and strategies.

On April 29, 2017 322 students and 16 teachers participated in the AP Practice Exams compared to 177 students and 14 teachers in 2016.
## CRR INCOME

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<th>Source</th>
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<td>School &amp; District Partnerships</td>
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<td>Brown Family Foundation</td>
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<td>Herbst Family Endowment Interest</td>
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<td>Induction, MEAD, and Workshop Fees</td>
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## CRR EXPENDITURES

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District Partnerships

Altar Valley School District
Amphitheater School District
Benson Unified School District
Catalina Foothills School District
Continental School District
Flowing Wells School District
Marana Unified School District
Sahuarita Unified School District
Santa Cruz Valley School District
Sierra Vista School District
Sunnyside Unified School District
Tanque Verde School District
Tucson Unified School District
Vail Unified School District

School Partners

AmeriSchools
Baboquivari High School
City High School
Paulo Freire Freedom Schools
Pima Community College West
Salpointe Catholic High School
San Miguel High School
The Gregory School

Individual & Foundation Partners

Arthur & Lee Herbst
Kautz Family Foundation
Thomas R. Brown Family Foundation
Deborah Hughes Hallett
Cody Patterson

Center Personnel

Ginny Bohme, Co-Director
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Arminda Estrada
(Undergraduate Assistant)

Friends of the Center

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Virginia Bohme
Marta Civil
Linda Fountain
Laura Hines
Mike & Deanna McDonald
Ann Modica
Paige Onstad
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Mathematics Educator Appreciation Day Conference Partners

Pima County School Superintendent’s Office
Tucson Unified School District

Conference Donors

Illustrative Mathematics
Texas Instruments

We are grateful to every district, school, foundation, and individual who supports the CRR programs.
Visit us on the web at crr.math.arizona.edu