

# Second-Generation Programs: The Far-Reaching Impact of EDGE



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**Abstract** EDGE community members undertake many diverse initiatives. These diverse programs and activities are one way that the EDGE program is having an impact on the mathematics community beyond the successful completion of PhDs among participants. This article includes a wide sample of particular efforts by the community and serves as evidence of the broad reach and as a reference for others who wish to do outreach in the mathematics community.

Many in the EDGE community are actively working to diversify mathematics through a variety of activities, programs, websites, etc. A wide variety of activities, as seen in the many examples below, encourage women, students, and faculty of color, first-generation students, and LGBTQ mathematicians, among others. Other initiatives are aimed at exposing the larger public to mathematics and mathematicians to help challenge the idea of who can be a mathematician. These programs are vast in their audiences: middle-school girls, high-schoolers, undergraduates, graduate students, and even professional mathematicians. The examples provided below were collected through self-reporting by EDGE community members. They are examples of the good work that the EDGE founders, directors, and community members are doing beyond EDGE and also should serve as a valuable resource. There are likely many initiatives and individuals whom we have missed and this list will continue to grow in the years and decades ahead. In these examples, however, we see how EDGE participants create, direct, and lead initiatives aimed at diversifying mathematics beyond EDGE. They are second-generation EDGE activities.

The EDGE community, as discussed in this article, includes all student participants, graduate student mentors, and professional mathematicians who have taught in the program. As a way to distinguish the roles, we offer the following key:

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E## denotes EDGE Participant with year, M## graduate student mentor, I## instructor.

Many programs serve multiple purposes, but we attempt to organize them by target audience or key activity for the initiative.

## 1 Activities for Girls (K-12)

Many programs exist to encourage K-12 girls' interest in mathematics. Sonia Kovalevsky (SK) Days occur all over the country and are typically one-day conferences to engage high-school girls in mathematics. They were not begun by the EDGE community; however, several members of the community have founded or played significant roles in such programs at their home institutions.

*Sonia Kovalevsky Days*, Omayra Ortega E01, I12 (founder). University of Iowa, Arizona State, Pomona College. Focus of the day is on high-school students and the transition to college; middle-school students are also welcome. The day includes an undergraduate panel, a keynote by professional woman in mathematics or related field, and hands-on activities. The goal is to share the fun of mathematics while allowing girls to build community to learn they are not alone.

*SK High School and Middle School Mathematics Day*, Carolyn Otto E06 (co-organizer), University of Wisconsin-Eau Claire.

*FEMMES Capstone*, Ziva Myer E11, M15 (presenter), Duke University. FEMMES (Females Excelling More in Math, Engineering and Science) provides outreach programs in STEM for middle-school girls.

*Shippensburg (PA) Math Circle*, Sarah Bryant E02, I15,18 (co-founder, co-director). Program that shares the joy and creativity with fourth and fifth graders in a rural area with 60% free/reduced lunch rate.

## 2 Seminars/Classroom Activities/Research Opportunities/Conferences for Undergraduates

*Math Mentoring*, Christine Berkesh E04 (co-founder), Duke University. Program for undergraduate women in mathematics with emphasis on peer mentoring and fostering connections between undergraduates, graduate students, postdocs, and faculty.

*"Mathematician Mondays"*, Carolyn Otto E06, University of Wisconsin-Eau Claire. Short introductions to living mathematicians at the start of class once a week, with a focus on women and underrepresented groups.

*"Celebrating Women in Mathematics" Colloquium*, Carolyn Otto E06 (organizer), University of Wisconsin-Eau Claire. A STEM colloquium organized for undergraduates in conjunction with the local SK Day. A diverse group of four to six women in mathematics from a variety of careers talk to the students about their

mathematical journey, including their challenges and their successes. 2018 Speakers included Dr. Syvillia Averett (College of Coastal Georgia) and Dr. Evelyn Lamb (Roots of Unity Blog, *Scientific American*).

*Math Modeling Competition*, Kamila Larripa E01, Humboldt State University. Over 20 students annually are mentored through the process of preparing for and participating in the Consortium for Mathematics and its Application's international multi-day competition, the Mathematical Contest in Modeling; women students are a majority of the participants. Activities continue throughout the year. Student mentors have been funded by a grant to run problem-solving sessions and a coding boot camp. An additional outside speaker is brought in to mentor female undergraduates. An increase in students attending graduate school has been observed since these efforts have started.

*Hidden No More Lecture Series*, Alison Marr E02, Southwestern University. A speaker series focusing on women from underrepresented minority/ethnic groups talking about their personal journeys in mathematics and the mathematics they do. The series will continue and expand to include speakers from all STEM fields.

*Aqua Squad*, Candice Price M12, University of San Diego. A research group that features problems in social justice, viewed through the lens of mathematics that includes undergraduate students of color.

*EQUIP: Embracing Quantitative Understanding and the Inquiry Process*, Alison Marr E02 (co-creator, co-director), Southwestern University. A program to strengthen math skills and make connections between math and other STEM fields for first-year students from backgrounds underrepresented in STEM (defined as racial/ethnic minorities, first-generation students, and those from challenged socioeconomic backgrounds).

*Peer Supplemental Instruction (PSI)*, Jamyé Curry E09 (co-founder), Georgia Gwinnett College. Support students in a successful transition from high school to college-level STEM courses. The program provides collaborative learning opportunities for students enrolled in gateway courses. PSI Student Leaders prepare lesson plans using STEM-centered active learning strategies with the aim of students' learning skills and understanding of the material in their classes. Assessment of the program has revealed gains in student grades and leader knowledge of course concepts. In addition, both leaders and student participants gain new skills and competencies that should contribute to their success in STEM education and ensuing careers.

*Washington Directed Reading Program*, Samantha Fairchild E15 (co-organizer), University of Washington. Each undergraduate is paired with a graduate student for a math reading experience. The goal is to help those in underrepresented groups build a relationship with a mathematician and learn what it means to do mathematics.

*Young Women in Mathematics (YWM)*, Raegan Higgins E02, I14–17, EDGE Co-director, Texas Tech University (TTU). A unique opportunity for TTU women to empower, motivate, and support one another in a field where they may face obstacles due to their gender.

*Association for Women in Mathematics Student Chapter*, Emille Davie Lawrence E01 (founder), University of San Francisco.

*Pacific Coast Undergraduate Math Conference*, Alissa Crans M03, I08,12 (co-organized 2005–2015). Undergraduate Conference that earned the American Mathematical Society Programs That Make a Difference Award.

*Association for Women in Mathematics at the Technion (WoMathTech)*, Arielle Leitner E09, Israel Institute of Technology. First organization for Israeli women in mathematics; currently, in Israel, women comprise approximately 15% of undergraduate students and 5% of the faculty in mathematics.

*Wheaton College Summit for Women in STEM*. Rachele DeCoste E98, M02, I15 (co-founder, co-organizer), Wheaton College (MA). One-day summit for over 200 regional undergraduates, faculty, and other STEM professionals. Day includes panel, keynote, undergraduate research talks, informal networking, and community-building.

### 3 Conferences and Programs for Graduate Students and Professional Mathematicians

*Women in Mathematics Regional Symposia (WiM-)*, Conferences that highlight female speakers, with the aim of creating regional professional and personal networks of women mathematicians, encouraging students to present in welcoming environments, and discussing challenges faced by women mathematicians.

- Alissa Crans M03, I08,12, Amy Radunskaya EDGE co-director. Southern California.
- Amy Buchmann E10, Yen Duong E10. Midwest, Texas and the Carolinas.

*WiSCon (Women in Symplectic and Contact Geometry/Topology) at ICERM*, Ziva Myer E11, M15 (co-organizer). Research Collaboration Conference for Women to build a network of women in the field.

*Women in Noncommutative Algebra and Representation Theory (WINART)*, Chelsea Walton I12–15.

- (Contact organizer) Banff International Research Station, Banff, Canada, April 2016.
- (Contact organizer and research group co-leader) WINART2, University of Leeds, Leeds, UK, May 2019.

*Underrepresented Students in Topology and Algebra (USTARS)*, Candice Price M12 (co-founder, co-organizer). Conference to showcase the research of underrepresented graduate students. The aim of the conference is to cultivate research and mentoring networks among such students.

*Designing for Equity by Thinking in and about Mathematics*, Juliana Belding E03 (member). NSF-funded professional development program that addresses racially based inequities in secondary mathematics education in the United States.

*Career Mentoring Workshop for Women in Mathematics (CaMeW)*. Rachelle DeCoste E98, M02, I15 (founder, director). A 3-day workshop for women entering their final year in graduate school that aims to support women as they search for their first postdoctoral position.

## 4 Organization of Research Sessions at National Meetings

*EDGE Paper Sessions at the JMM* (co-organizers)

- Shanise Walker E12; Laurel Ohm E13.
  - MAA Contributed Paper Session “The EDGE Program: Pure and Applied Talks by Women Math Warriors”, 2019.
  - MAA Contributed Paper Session “20th Anniversary-The EDGE Program: Pure and Applied Talks by Women”, 2018.
- Candice Price M12; Amy Buchmann E10.
  - AMS Special Session on Pure and Applied Talks by Women Math Warriors Presented by EDGE, 2017.
  - MAA Contributed Session on Pure and Applied Talks by Women Math Warriors Presented by EDGE, 2016.
  - Pure and Applied Talks by Women Math Warriors Presented by EDGE, 2015.
  - Pure and Applied Talks by Women Math Warriors Presented by EDGE, 2014.

*Sessions at AWM Research Symposium*

- Alejandra Alvarado E02; Candice Price M12 (co-organizers) “EDGE-y Mathematics: A Tribute to Dr. Sylvia Bozeman and Dr. Rhonda Hughes”, 2017.
- Kathleen Ryan E08 (co-organizer); Research from the “Cutting EDGE”, and (co-editor) *Advances in the Mathematical Sciences: Research from the 2015 Association for Women in Mathematics Symposium*.

*AMS-AWM Special Session on Women in Symplectic and Contact Geometry and Topology*, JMM 2018, Ziva Myer E11, M15 (co-organizer).

*MAA Town Hall Meeting on Goals for Minority Participation in Mathematics*, MathFest 2013, Alissa Crans M03, I08,12; Talithia Williams E00 (co-organizers). Report: <https://www.maa.org/news/maa-mathfest-2013-town-meeting-on-goals-for-minority-participation-in-mathematics>.

*MAA Town Hall Mathematical Mamas—Being Both Beautifully*, MathFest 2018, Emille Davie Lawrence E01; Erin Militzer E04 (co-organizers).

## 5 Establishing Networks

*Math Mamas Facebook Group*, Emille Davie Lawrence E01 (creator and administrator). Facebook group to provide support and advice for self-identifying mothers who are in mathematics. Currently, the group has over 600 members.

*Women and Non-binary Researchers in Noncommutative Algebra and Representation Theory*, Chelsea Walton I12–15 (creator and manager). Site and email listserv that is a resource for (cis and trans) women and non-binary researchers in Noncommutative Algebra and Representation Theory. <http://women-in-ncalg-repthy.org/>.

*EDGE Ambassadors Initiative*, Keisha Cook E14, M17 (co-founder and organizer). Provide role models to women at Historically Black Colleges and Universities (HBCUs) by sending EDGE participants to visit mathematics departments at HBCUs to give talks, participate in panel discussions and discuss EDGE, and pursuing graduate degrees in mathematics.

## 6 Public Awareness of Mathematics or Increasing Diversity in Mathematics

*Mathematically Gifted and Black*, Erica Graham E06; Raegan Higgins E02, I14–17, EDGE Co-director; Candice Price M12; Shelby Wilson E06 (co-creators). A website devoted to recognizing and highlighting the work of Black mathematicians. A new profile is posted each day during Black History Month. <http://mathematicallygiftedandblack.com/>. In 2018, the AMS printed a poster highlighting the historical contributions of Black mathematicians and one featuring a selection of living mathematicians featured on the website.

*NOVA Wonders*, Talithia Williams E00 (host). Six-part 2018 PBS series that considers some of science's biggest questions and the scientists behind the research to answer them.

*Power In Numbers: The Rebel Women of Mathematics*, Talithia Williams E00 (author). 2018 book containing biographies of women in mathematics, both historic and current.

*Journal of Humanistic Mathematics* Special Issue on Mathematics and Motherhood, Emille Davie Lawrence E01 (co-editor). Volume 8, Issue 2 (July 2018).

“Own your Body's Data” TED Talk, Talithia Williams E00. TED talk on collecting and using data on the human body that has been viewed over 1.5 million times.

*PBS Infinite Series*, Tai-Danae Bradley E14 (host). PBS web series on mathematics and science.

*New Hampshire STEM Education Task Force*, Susan D'Agostino E98 (appointed member). Served the NH Governor who requested recommendations and help implementing programs designed to modernize STEM education in the state.

*Math3ma*, Tai-Danae Bradley E14 (creator). Website to help students transition from undergraduate to graduate mathematics through the sharing of the author's own experiences. <https://www.math3ma.com/>.

## 7 Other

*Dr. Gertrude Geraets Endowed Fund* Stacy Hoehn E04, Franklin College. Provides \$1000 award to undergraduate, with preference going to a female majoring in mathematics or computing, to encourage more women to persist in these majors. The award recognizes Dr. Geraets who received her Ed.D. during a time when few women were earning doctorates.

*Association for Women in Mathematics*, Executive Director, Karoline Pershell E03.

*Golden Anniversary Campaign for the National Association for Mathematicians (NAM)*, Emille Davie Lawrence E01 (committee member). In honor of NAM's 50th anniversary in 2019, the committee aims to raise money to endow all of NAM's programs.

*Undergraduate Mathematics Major*, Susan D'Agostino E98 (founder), Southern New Hampshire University. Founded a mathematics major at a university with a large first-generation population.

*Associate Department Head for Equity and Diversity*, Miriam Freedman E00, Penn State. An advocate in the Chemistry Department for developing a diverse faculty and graduate student body.