Archived Colloquia for Spring 2021

Friday, April 30th at 5pm. - Wendy DenBesten (Mathematics Teacher at Bullard High School)

Title: Parabolas, Properties and Proofs

Abstract: Are all U-shaped curves parabolas? Are all parabolas similar? How can we prove this? Let's explore fun ways to connect the geometric definition of a parabola with the equation that defines it. We will discuss how this exploration supports many of the CCSS Math Practices. To play along at home, make sure you have some wax, tissue, or tracing paper and a straightedge. We will also be using Desmos.

Short Bio: Wendy DenBesten is a veteran math teacher with 30+ years of classroom teaching experience at high schools in the Fresno area. She has been actively involved for most of these years in curriculum writing, consulting, and teacher training for the College Board (AP, SAT and SpringBoard), Eureka Math/EngageNY, Illustrative Math, and others. In addition, she worked in FUSD's Research Evaluation and Assessment department helping schools interpret data and creating and administering local assessments from 1997-2001. She has presented at NCTM Annual meetings, Advanced Placement Annual Meetings, CMC-South, and CMC-North. While teaching high school, she has served as department chair, lead teacher, WASC Co-chair and committee chair, MESA and Math Team advisor. She is a proud graduate of Michigan State University (BA Mathematics, 1988) and has taken graduate level classes at both Fresno State and Fresno Pacific. She has two children, Emma (BS Mathematics – Fresno State) and Evan, and married her high school sweetheart, Joe DenBesten (BS Electrical Engineering – Fresno State). Twitter/IG: @denbestenmath

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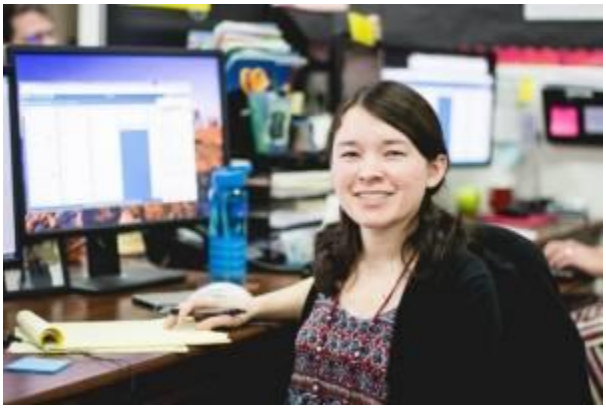
Friday, April 9, 2021 at 4pm - Katie Urabe (Operations Research Analyst at The U.S. Army Research and Analysis Center)



Title: From Student Research to Operations Research Analysis

Abstract: How does student research connect to real life work? Alumna Katie Urabe from The U.S. Army Research and Analysis Center (TRAC) will discuss her journey to a career in mathematics and how she uses math in her job, highlighting the similarities and differences between student research and real world applied math. This talk will draw on examples from applying statistics, optimization, and machine learning to military problems and close with STEM career opportunities in the Department of Defense.

Short Bio: Katie Urabe holds Bachelor's Degrees in Mathematics and Linguistics from Fresno State, where she was the 2012 President's Medalist. She received her Master's Degree in Mathematics from Fresno State in 2014. After graduation, she taught math at local community colleges, then went into educational publishing as a math curriculum expert for DataWorks Educational Research and Edmentum. In 2016, Katie became an operations research analyst for The U.S. Army Research and Analysis Center (TRAC) in Kansas City, through which she received a 2019 Master's Degree in Operations Research from Kansas State University and a Data Science Certificate from the Naval Postgraduate School. She has worked on military studies using optimization, graph theory, and statistics to support multi-billion dollar acquisition decisions. Her most notable achievement was a study on the creation and implementation of a Soldier Credentialing program that was presented to Congress and passed into legislation.

Friday, April 9, 2021 at 1pm - Dr. Omar Deguchy (Data Scientist, Lawrence Livermore National Laboratory)

Title: Machine Learning for Synthetic Aperture Radar

Abstract: In the world of remote sensing, machine learning algorithms have shown promise in applications associated with a variety of imaging modalities. In particular, the use of neural networks in conjunction with Synthetic Aperture Radar (SAR) images have been shown to be effective for automatic target recognition. This talk focuses on two different applications of neural networks with SAR data. In the first application, we address the lack of SAR data used for training target recognition models. The goal is to augment the quality of synthetic SAR data by using a modified generative network. In the second application, we propose a method to solve the forward and inverse scattering problem for SAR. The method uses a simplified neural network to approximate an inverse to the SAR sensing matrix, allowing us to recover images from SAR measurements.

Math Colloquium Series: Celebrating Black History Month and Women's History Month

Friday, March 26th, 2021 at 5pm

By Zoom

Speaker: Dr. Genetha Gray (Employee Success Strategy & Analytics team at Salesforce)

Colloquium Title: *Math in and of the Workforce*

Abstract: Prior to COVID, advances in technology were already challenging traditional concepts of the when, where, and how of work. In 2018, Gallup reported that 43% of US workers are remote at least sometimes. Moreover, as measured by FlexJobs in 2018, the math and economics job category had the highest growth in remote job opportunities. All this change has been sped up significantly by the realities of working safely during a pandemic and what "returning to normal" actually means for the working world. To understand the new realities of the workplace, companies have turned to people analytics, a data-driven approach to managing the workforce. In this talk, I will describe how my mathematical career has progressed and led me to the field of people analytics. Then, I will give an overview of the kinds of problems that my team considers including how to help an organization of over 60,000 employees all over the world find their best place to work. It will focus on some of the unusual places that math can be found in the corporate workforce and also include some interesting observations about the workforce itself.

Short bio: Dr. Genetha Anne Gray manages the Research & Data Science group of the Employee Success Strategy & Analytics team at Salesforce. Her work focuses on optimizing the employee experience using data. Genetha has also held positions as research scientist at Intel Corporation and a technical staff member at Sandia National Labs. She has worked on engineering, cyber security, energy, and people analytics applications. She has a Ph.D. in Computational & Applied Mathematics from Rice University and specializes in analytics techniques for decision making. She has co-authored numerous publications and is a frequent presenter.

Friday, March 5, 2021 - Dr. Emille D. Lawrence (University of San Francisco)

By Zoom at 9:00 a.m.

Colloquium Title: Spatial Graph Theory: A Primer

Abstract: Spatial graph theory started in the 1980's as a way to answer certain questions about chemical molecules. But topologists have since taken the field to new dimensions. In this talk we will have an introduction to spatial graph theory which will include some interesting properties of spatial graphs, why they have more structure than knots, and how we can associate a group to a spatial graph.

In addition to this topic, Dr. Lawrence will also talk about her journey to a career in mathematics.

Short Bio: Emille Davie Lawrence is a Term Associate Professor of Mathematics and Statistics and Chair at the University of San Francisco. She earned her B.S. in mathematics from Spelman College and her Ph.D. in mathematics from the University of Georgia. She has also been a postdoctoral fellow at the University of California, Santa Barbara and an Assistant Professor at California State Polytechnic University, Pomona. Her research focuses on topological properties of spatial graphs, and she is involved in several national programs aimed at broadening participation in the mathematical sciences. Emille enjoys speaking about mathematics to people of all ages and believes strongly that mathematics should be accessible to everyone. Her non-professional life is filled with music and other performing arts, and spending meaningful time with her husband and two children.

Friday, February 26, 2021 - Dr. Robin Wilson (Cal Poly Pomona)

Colloquium Title: Reflecting on the past to understand the present brilliance of Black mathematicians

By Zoom at noon

Abstract: Until recently stories of Black achievement in mathematics have not often been told, and for many these stories are assumed to be non-existent. In order to imagine a future where Black students are free from anti-Black policies and attitudes, it is important to disrupt the myth of absence of Black mathematical achievement. In this talk we will reflect on some of the extraordinary ways in which people from throughout the African Diaspora have participated in the development of mathematics from pre-history to present day, and the important role Black mathematicians have played in the American mathematical community. I will also share some of my own mathematical journey.

Short Bio: Robin Wilson is a Professor of Mathematics at California State Polytechnic University, Pomona. The product of the public school system in Sacramento, CA, he attended UC Berkeley where he developed a passion for teaching mathematics as a student in Berkeley's Professional Development Program started by Uri Treisman. He joined the faculty at California State Polytechnic University, Pomona in 2007 after an appointment as a UC Presidents' Postdoctoral Scholar in the Department of Mathematics at UC Santa Barbara. Dr. Wilson was a Visiting Professor at Georgetown University in 2014 and a Visiting Professor at Pomona College for Fall 2017. Dr. Wilson is currently Co-Director of the California Math Project at Cal Poly Pomona, a program that supports the professional development of K-12 teachers. He chaired Diversity committees at the Park City Mathematics Institute, the MSRI, and at Cal Poly Pomona. For the past 3 years he has served on the Editorial Board of the Notices of the AMS and has served as editor of the Black History Month issue. In addition, he is Co-Director of the BAMM! Program. His current research interests include both low-dimensional topology and math education.

Friday, February 12, 2021 - Dr. Omayra Ortega (Sonoma State University)

Colloquium Title: *Understanding Math Models of Coronavirus*

By Zoom at noon

Abstract: The virus that causes COVID-19 is a new coronavirus that has spread from person-to-person and has spread throughout the world. COVID-19 symptoms can range from mild (or no symptoms) to severe illness. I will present a model developed for COVID-19 using a system of ordinary differential equations following the natural history of the infection. The model uniquely incorporates the behavior of susceptibles and symptomatic individuals; the susceptible in the community are willing to support all social distancing efforts including lockdown while symptomatic are willing to self-isolate. Analysis and simulations of the model show the possibility of multiple waves of infections. The results also show the importance of incentivizing self-isolation as a means to reduce disease transmission. I will also present some statistics regarding the disproportionate burden of coronavirus on traditionally underserved groups as a call to action to study this current pandemic.

Short Bio: Omayra Y. Ortega is an Assistant Professor of Mathematics & Statistics at Sonoma State University in Sonoma County, California. She earned her Ph.D. (2008) and an M.S. (2005) in applied mathematics and computational sciences from the University of Iowa, where she also was awarded her Masters of Public Health. She earned a B.A. in music and in pure mathematics from Pomona College in 2001.

Dr. Ortega is the President of the National Association of Mathematicians (NAM) a non-profit professional organization with the mission of promoting excellence in the mathematical sciences and promoting the mathematical development of all underrepresented minorities, especially those of African descent.

Dr. Ortega has directed the Mathematical Epidemiology Research Group (MERG), an undergraduate research group, since 2007. Her scholarly interests reflect her expertise in mathematics: mathematical and computational biology, mathematical epidemiology, infectious disease epidemiology, and the participation of women and marginalized groups in sciences. Regarding the latter, she has organized an annual Sonia Kovalevsky High School Mathematics Day at several institutions including the University of Iowa, ASU's West campus, Pomona College, and Sonoma State University in recognition of the pioneering women including Ruth Gonzalez and Euphemia Lofton-Haynes, who were some of the first to receive PhDs in mathematics.

February 3 - Cammie Gray (Ph.D. Candidate in Mathematics Education) University of New Hampshire

Zoom at 1 p.m.

Title: *Exploring the Mathematical Connections Preservice Teachers Make Between Abstract Algebra and Secondary Mathematics: Implications for Precollege Learning and Teaching*

Abstract: Abstract algebra has been identified as an important course for preservice secondary mathematics teachers because much of the abstract algebra content is connected to, and thus relevant for, secondary mathematics teaching (Wasserman et al., 2017). However, many

preservice teachers do not recognize the usefulness of an undergraduate abstract algebra course and see no relation between abstract algebra and secondary school mathematics (Christy & Sparks, 2015; Ticknor, 2012). This research talk will focus on the experience of two secondary mathematics education majors, Michelle and Sammy, who participated in a multi-stage, qualitative study designed to explore how preservice teachers establish connections between abstract algebra and secondary school mathematics. During the talk, I will outline the phases of the study, briefly discuss preliminary results from all participants and then focus on the analysis of data regarding Michelle and Sammy.

February 3 - Yuling Zhuang, Ph.D. (Post-doctoral Research Associate) College of Engineering, The University of Georgia

Zoom at 11 a.m.

Title: *Supporting Collective Argumentation in Mathematics Classrooms*

Abstract: Argumentation is one of the eight standards of mathematical practice that plays a key role in promoting meaningful learning of mathematics (Common Core State Standards for Mathematics, [CCSSM], 2010). Research has revealed that teachers face significant challenges in engaging students in productive argumentative practices. The main goal of my research is to help teachers learn to use argumentative discourse in supporting students' reasoning, critical thinking, and communicative skills. My research is basically situated in two lines 1) Developing classroom interventions and practical tools for argumentation by linking between theoretical and applied research. 2) Concentrating on teachers' learning about argumentation (nature and development). These two lines of research come together in finding ways to help teachers learn to use argumentation in classrooms.

In this talk, first I will present how mathematics teachers used incorrect answers within their support of collective argumentation (the first line of research). The framework of levels of truth in argumentation was conceptualized to describe forms of acceptable classroom-based argumentative discourse. Next, I will present the research project I am currently working on, which focuses on supporting elementary teachers to teach mathematics in integrated STEM contexts (the second line of my research). To conclude, I will share the implications of my research about using an argumentation-based approach in teaching and introduce future research endeavors that will contribute to this goal.

February 1 - Ayse Ozturk (Ph.D. Candidate in Mathematics Education) Ohio State University

Zoom at 9 a.m.

Title: *Examining the Relationship between Equity-based Instructional Practices and Bilingual Students' Mathematical Modeling Competency*

Abstract: The study has a dual focus on theorizing secondary bilingual students' constructions and sensemaking of mathematical models in a classroom setting and identifying equitable teaching practices that facilitate students' mathematical modeling process by analyzing small group and whole-class discussions.

January 29, 2021 - Hyejin Park, Ph.D. (Assistant Professor of Mathematics Education) James Madison University

Zoom @ 2 p.m.

Title: *Selecting Proof Methods: Student Strategies in the Transition-to-Proof Course*

Abstract: Proof and proving are critical practices that are essential for doing mathematics. One of the major instructional goals of an undergraduate mathematics program is to develop students' ability to construct proofs using various methods (e.g., direct proof, proof by contradiction, or proof by induction). Many undergraduate students first encounter mathematical proof and learn different proof methods in the transition-to-proof course designed to help students transition from computational thinking to abstract and scientific thinking. In this talk, I will discuss strategies that transition-to-proof course students use for selecting proof methods as they prove or disprove mathematical statements. The knowledge of how students make decisions about proof methods can help college instructors teaching proof and proof-writing understand how students learn about proofs.

January 27, 2021 - Yaomingxin Lu (Ph.D. Candidate in Mathematics Education) Western Michigan University

Zoom @ 12 p.m.

Title: *Understanding and Supporting Undergraduate Students' Productive Struggles in Mathematics*

Abstract: Mathematics educators and researchers suggest that struggling to make sense of mathematics is a necessary component of learning mathematics with understanding (Hiebert & Grouws, 2007). However, students' struggles with learning mathematics are often viewed as a problem and are cast in a negative light in mathematics classrooms (Hiebert & Wearne, 1993; Borasi, 1996). Given the difficulty undergraduate students face in higher-level math courses, it's important that their struggles can be understood and supported in order to build a more inclusive classroom environment. In this presentation, I will talk about two lines of my research on productive struggle. The first, explored in my dissertation, gives insight into what undergraduate students do in their proving processes as they are engaging in productive struggle.

Specifically, I characterize where students get stuck in their proving processes and how they navigate out of their stuck points. My statistics education research with prospective teachers highlights the instructional implications of my research on productive struggle. Namely, how instructors can support students in productive struggle when learning about major mathematical/statistical concepts, especially through the use of technology. The results of my research are helpful in assessing undergraduate students' proving/problem-solving processes and providing guidelines for instructors in supporting students engaging in more productive struggle during their proving/problem-solving practices—practices that are extremely important for their success in higher-level math courses.

January 26, 2021 - Kaitlyn Serbin (Ph.D. Candidate in Mathematics Education) Virginia Tech University

Zoom @ 2 p.m.

Title: *Prospective Teachers' Understanding of Connections Between Inverse, Identity, and Binary Operation*

In this presentation, I will discuss the preliminary results of my dissertation research. I examine the development of Prospective Secondary Mathematics Teachers' (PSMTs) understanding of connections between concepts in Abstract Algebra and secondary Algebra. I draw on the theory, Knowledge of Nonlocal Mathematics for Teaching, which suggests that teachers' knowledge of connections between advanced and secondary mathematics can become useful for teaching when it first helps to change or reshape teachers' understanding of the content they teach. I examine this reshaping process by investigating how PSMTs extend, deepen, unify, and strengthen their understanding of concepts related to inverse functions and equation solving as they learn about connections between those concepts and the algebraic structures of groups and rings. I conducted four clinical interviews with each of three students enrolled in a Mathematics for Secondary Teachers course before and after instructional units covering equation solving and inverse functions. I analyzed the students' mathematical understanding demonstrated in these interviews and identified how their understanding of inverses and equation solving was reshaped over the semester, focusing on the connections they made between different binary operations, inverses, and identities. My next steps in this work are to examine how the PSMTs' understanding of Abstract Algebra supports this reshaping process and to investigate how PSMTs use this mathematical understanding as they engage in the teaching practice of noticing students' mathematical thinking.