

K-12 STEM Education and Workforce Development in Rural Areas

Committee

Katharine G. Frase

Co-Chair

KATHARINE G. FRASE (CO-CHAIR) (NAE) served in many roles over a 30 year career with the International Business Machines Corporation (IBM). She joined IBM in 1986 as a post-doctoral fellow in the IBM Research Division. Her last role with IBM was spearheading (as Vice President, business development) the development of new education solutions to support teachers and student outcomes with individualized, data-driven recommendations. Prior to this role, she served as Chief Technology Officer, IBM Public Sector, in which she provided thought leadership for IBM and its customers on innovation and strategic transformation specific to government, education, life sciences, healthcare and cities.

Earlier roles included as Vice President, Industry Solutions

Research, working across IBM Research on behalf of IBM clients, to create transformational industry-focused solutions, including the application of IBM Watson technologies to business applications and the realization of Smarter Planet solutions; technical and business strategy for IBM's software business; corporate assignments on technology assessment and strategy; and roles in IBM Microelectronics in the management of process development, design/modeling methodology and production of chip carriers, assemblies and test. Dr. Frase was elected to the NAE in 2006 for engineering contributions, including the use of lead-free materials, to the development of electronic packaging materials and processes. She has served as an NAE Councilor from July 2017–August 2023. She has previously served on the National Academies' Committee on Science, Engineering, Medicine, and Public Policy, the Committee on the Status, Role, and Needs of Engineering Technology Education in the United States (co-chair), the Committee on the Study of Education, Training, and Certification Pathways to a Skilled Technical US Workforce (co-chair), and many other National Research Council panels and studies. Dr. Frase holds three patents and 15 refereed publications in the fields of Solid Electrolytes, Ceramic powder synthesis, Neutron diffraction and small angle scattering, High Tc superconductors, and Ceramic packaging.

She received an AB. degree in chemistry from Bryn Mawr College in 1979, and a Ph.D. degree in materials science and engineering from the University of Pennsylvania in 1983.

Tiffany Neill

Co-Chair

TIFFANY NEILL (CO-CHAIR) is a research scientist at the University of Washington Institute for Math + Science Education working to advance equity and coherence in state systems of science education. Neill began her career in education as a middle and high school teacher serving in both traditional and non-traditional school settings. She later assumed a position as an instructional specialist at the K20 Center for Community and Educational Renewal at the University of Oklahoma where she developed a state-wide program known as K20alt designed to support alternative education teachers around the state with innovative and effective approaches to instruction for at-risk students. In 2002, she joined the Oklahoma State Department of Education as the Director of Science and Engineering Education and served in the role for 5 years before becoming the Executive Director of Curriculum and Instruction and later the Deputy Superintendent of Curriculum and Instruction and serving on Cabinet for the State Superintendent of Public Instruction. Neill led agency strategies on academic matters including state and federal policies and state and federal funds to drive student achievement for Oklahoma's 700,000 public school students and led Oklahoma Ready Together: An Action Plan for Supporting Students Through the Pandemic and Beyond.

Neill served as the President of the Council of State Science Supervisors from 2017-2019 and she served on the President's STEM Advisory Board for NSF from 2020-22. She currently serves on the National Assessment Governing Board's development panel to update the NAEP Science Assessment Framework.?

Neill earned a bachelor's degree in biology from Northeastern State University in Oklahoma and a master's in instructional leadership and academic curriculum from the University of Oklahoma, and a Doctor of Philosophy in education from the University of Oklahoma.

Juan-Carlos Aguilar

Member

JUAN-CARLOS AGUILAR is the Director for Innovative Programs and Research at the Georgia Department of Education. He provides internal evaluation support for innovative projects awarded to the State Department of Education as well manages a portfolio of projects funded by the National Science Foundation, the US Department of Education, and private foundations. He worked for nine years as the State Science Program Manager where he oversaw the development and adoption of the current Georgia Standards of Excellence for Science and was the state liaison for science, engineering, and STEM with several national and state professional organizations. He has served as a member of the National Academies for Science, Engineering, and Health's "America's Lab Report" committee and the Steering Committee on Exploring the Overlap Between "Literacy in Science" and the Practice of Obtaining, Evaluating, and Communicating Information. Dr. Aguilar is the past President of the Council of State Science Supervisors (CSSS) where he coordinated projects designed to support states as they made their own plans to adopt and implement the Next Generation Science Standards (NGSS) and oversaw the development of a set of Professional Development Standards in collaboration with CSSS Higher Education partners. Dr. Aguilar has worked as an advisor for the Experiential Citizen Science Training for the Next Generation an Emory project funded under the NIH SEPA 2015. He was the PI for the Georgians Experience Astronomy Research in School a project funded by NASA under their K-12 Competitive Grants Opportunity program and was the co-PI of the Science Learning Integrating Design, Engineering, and Robotics a project funded by NSF's Discovery Research K-12 program. He has served as a member of the Board of Directors for the Georgia Youth Science and Technology Centers, the Valdosta STEAM Board of Advisors the Board of Directors of the Triangle Coalition for STEM Education, and as the chair of the Alliance of Affiliates, a group of nine national organizations focused on science education that support the work of the National Science Teachers Association.

Dr. Aguilar's teaching career started in Guatemala in 1984. He was selected to participate in a training program for High School teachers in the American School of Guatemala. While completing his undergraduate in physics at the University Del Valle of Guatemala, he worked in two 6-12 schools teaching different courses in the areas of Mathematics and Science. In 1989 Juan-Carlos moved to the United States to continue his studies in physics at the University of Louisville in Louisville, KY. He transferred to the University of Kentucky in Lexington, KY in 1991 where he completed his studies for his doctorate in physics. He began working for the Fayette County Schools in Lexington, KY teaching middle school science and mathematics in their new Spanish Immersion Program housed at Bryan Station Middle School (BSMS). During his tenure at BSMS the program grew from 22 students in 1995 to about 123 in 2004. In 1997, he became the Team Leader of the Spanish Immersion Team and in 1998 he assumed the responsibilities of Science Department Chair for the school.

In 2005 Dr. Aguilar moved to Atlanta and began work at the Georgia Department of Education (GaDOE) as the Region 3 Science Implementation Specialists Regional Coordinator. Two years later he was promoted to Science Program Manager for the State of Georgia.

Bradley S. Barker

Member

BRADLEY S. BARKER is a Professor and Youth Development Specialist for Nebraska 4-H Extension in the Institute of Agriculture and Natural Resources (IANR) at the University of Nebraska-Lincoln. From 2019 to 2022 Barker served as a Program Director (Intergovernmental Personnel Act) at the National Science Foundation (NSF), in the Division of Research and Learning in Formal and Informal Environments. His primary research interests are the use of technology and digital manipulatives (i.e., robotics, e-textiles) for teaching and learning. He has also researched the use of technology to connect rural learners to academic experiences through VR and telepresence robotics. Barker was PI on two NSF grants that encouraged middle school youth to explore STEM through hands-on activities centered on precision agriculture and robotics (DRL #0624591 and #0833403.) In 2019 he published two books on the formation of learning communities in the Maker Movement and was co-editor for the 2012 book *Robots in K-12 Education: A New Technology for Learning*. While at NSF Dr. Barker managed a portfolio of projects focused on formal and informal rural learning in STEM. In 2020 Barker was awarded the NSF Director's Team award for his work with the Navigating the New Arctic (NNA) program. Barker received his Ph.D. in 2002 from the University of Nebraska-Lincoln in Curriculum and Instruction with an emphasis in Instructional Technology. Dr. Barker also earned a secondary social sciences teaching endorsement. Throughout his career, Barker has provided professional development for educators in formal and informal learning environments around educational technology. Currently, Barker is the PI on the NSF Advanced Informal STEM Learning (AISL) award (#231972) grant Informal Biodiversity Education Models for Rural and Tribal Youth designed to enhance science identity and environmental stewardship participants and develop a framework that can be leveraged by rural and Tribal communities across the country to engage youth, families, and practitioners in local scientific research practices.

Gloria Burnett

Member

GLORIA BURNETT currently serves as an Associate Professor in the UAA College of Health Department of Human Services. She is the Director of the Alaska Center for Rural Health and Health Workforce as well as the Director of the Alaska Area Health Education Centers (AHEC) Program. Gloria holds a Master of Science in the Science of Instruction and Instructional Technology Specialist certification from Drexel University. She holds a Bachelor of Arts in Psychology with a Minor in Human Development and Family Studies from Pennsylvania State University. She is also a certified Adult and Teen Mental Health First Aid Instructor.

Prior to her nine years in this position, she served as Dean of Students, Allied Health Program Coordinator and NW Alaska AHEC Director at Ilisagvik College, Alaska's only tribal college located in Utqiagvik, AK. She also has prior experience in K-12 education serving as a prekindergarten, fourth grade and K-6 substitute teacher in Pennsylvania prior to relocating to Alaska.

Gloria has a wealth of experience in rural and frontier workforce development, with special attention to indigenous populations. She has spearheaded a variety of projects focused on health career pathways and exploration for youth and adults. She also has experience with health professions training student exposure to rural and frontier communities and continuing education for rural healthcare providers. This work has included K-12 curriculum and program development, strategic partnership and administration of federal, state and local grants and contracts.

In addition to K-12 curriculum development, Gloria has experience with continuing education and professional development for teachers, administrators and healthcare professionals. All of these training opportunities have a special focus on those practicing in rural or underserved communities.

Gloria is recipient of the 2018-19 Alaska Association of Career & Technical Educators Community Contribution Award, 2022 Barbara Berger Excellence in Public Health Education and Promotion Award and 2022 Alaska Primary Care Association Sockeye Award for Workforce Development. She is also a 2022 HERS Institute graduate.

Linda Furuto

Member

LINDA FURUTO was born and raised in the rural town of Hau'ula, Ko'olauloa, O'ahu (population: ~3,300) and grew up farming and fishing from the ocean. Her family and community instilled in her values such as kindness, compassion, strength, aloha, and the importance of visioning beyond the horizon.

Dr. Furuto is currently a Professor of Mathematics Education at the University of Hawai'i at Manoa (UHM) where she directs the M.Ed. Curriculum Studies, Mathematics Education and the world's first degree program in ethnomathematics, which received an official add-a-field licensure in ethnomathematics from the Hawai'i Teacher Standards Board. Prior to joining UHM, Dr. Furuto was an Associate Professor of Mathematics and Head of Mathematics and Science at UH West O'ahu, and a middle and high school mathematics teacher. Dr. Furuto completed her Ph.D. at UCLA, master's degree at Harvard University, and bachelor's degree at BYU in mathematics and mathematics education. Research interests include: quantitative methodology, mathematics achievement, ethnomathematics, and access and equity. Her publications and work have appeared in Oxford University Press, Mathematical Association of America, and the International Congress on Mathematical Education Invited Lectures, among others. Dr. Furuto's activities include being a Visiting Scholar of Mathematics at the University of Tokyo, research-practitioner in the Boston Public Schools as part of Harvard University's Inventing the Future project, secondary mathematics teacher at the Fiji Technical College, secondary mathematics teacher in the Hawai'i State Department of Education, 2023 Obama Foundation Asia-Pacific Leader, and 2025 National Assessment of Educational Progress Visioning Panel Member. Dr. Furuto is an education specialist and apprentice navigator with the Polynesian Voyaging Society in the 2023-2027 Moananuiakea Voyage for Island Earth by celestial navigation on the traditional canoe Hokule'a. Dr. Furuto strives to live by the 'olelo no'eau (Hawaiian proverb)—'A'ohe hana nui ke alu 'ia (No task is too big when done together by all).

Rebekah Jane Hammack

Member

REBEKAH JANE HAMMACK is an assistant professor of science education in the College of Education at Purdue University where she also serves as an advisor to the Purdue Center for Rural Research, Education, and Outreach. Prior to joining the faculty at Purdue University, she was an assistant professor in the College of Education, Health and Human Development at Montana State University, an affiliate faculty of the Montana Engineering Education Research Center, and a faculty fellow of the Montana Center for Research on Rural Education. Dr. Hammack also spent 11 months as an Albert Einstein Distinguished Educator Fellow at the National Science Foundation. Prior to her fellowship at NSF, Dr. Hammack spent 12 years as a middle school science and engineering teacher in Oklahoma. She holds bachelor's and master's degrees in animal sciences and a Ph.D. in professional education studies with a concentration in science education. Her research focuses on the connection of local knowledge and context to STEM interest and identity development in youth, particularly rural and Indigenous youth in elementary and middle grades, as well as how elementary teachers develop teaching efficacy and identity as STEM educators. Dr. Hammack currently serves as PI or co-PI on four federal projects focused on enhancing STEM education in rural schools and communities.

Eric J. Jolly

Member

ERIC J. JOLLY is the President and CEO of the Saint Paul & Minnesota Foundation – an organization working to create an equitable, just and vibrant Minnesota where all communities and people thrive. Dr. Jolly is a cognitive psychologist with a background that also includes engineering and mathematics. Previously, as vice president and senior scientist at Education Development Center, he led technical assistance for NSF's office of system reform for STEM (formerly SMET) education.

As president of the Science Museum of Minnesota he led both a significant science education center and the nation's largest exhibit construction group, bringing groundbreaking science programming to major museums around the nation.

He has previously served as a member of the Mathematical Sciences Education Board, Committee for Equal Opportunities in Science and Engineering, chaired AAAS's EHR division, as well as chair or service to numerous panels for the National Science Foundation and the National Academies.

He is a member of several academic honor societies, a senior member of IEEE, life fellow of AAAS, life appointee to the Hendrickson Institute for Ethical Leadership, life member of SACNAS, and recipient of two honorary doctorates and numerous scholarly awards.

John P. McNamara

Member

JOHN P. MCNAMARA earned his BS in Agricultural Sciences (76) and MS in Dairy Science (78) from the University of Illinois at Urbana-Champaign and a PhD in Human Foods and Nutrition from the University of Georgia, Athens. He taught General Education Biology as Pet Nutrition, Advanced Nutrition and Biochemistry for 33 years, and wrote a text in Pet Nutrition for introductory college and high school Biology/Animal Sciences/AP Biology. He has provided leadership, professional development, content background for K-12 life, chemical, physical and earth sciences as well as all aspects of food systems education. He works across the spectrum of educational content and pedagogy, all grades; plant and animal sciences, consumer nutrition and education, rural and agricultural businesses; farms and farm support companies; and including FFA, 4-H, CTE; Washington Science Teachers Association; National Science Teaching Association. In 2022 he was elected into the Washington State Academy of Sciences for research in nutritional physiology of farm animals and his work to help prepare teachers in integrated STEM teaching. He worked on the NGSS adoption in Washington State including item writing and reviewing; performance expectation reviews; STEM teacher professional growth plans and the NSF funded NextGen STEM teacher preparation program in Washington State. He is presently a member of The National Academies Board on Agriculture and Natural Resources, the Food Animal Science Societies Science Policy Committee and actively plans and presents professional development on all aspects of food systems to K-12 teachers especially in small and rural schools.

He is recognized as a Fellow of The American Dairy Science Association; The American Society of Animal Sciences and received the ADSA Young Scientist (1992); Zoetis Physiology (2015); ASAS Corbin Companion Animal Biology (2007) Awards. He is on the Board on Agriculture and Natural Resources (NASEM); and served on the NANP/NRSP committee in partnership with BANR.

Audrey Meador

Member

AUDREY MEADOR is an Assistant Professor of Mathematics in the College of Engineering at West Texas A&M University. She received her Bachelor and Master of Science degrees in Mathematics from West Texas A&M University and her PhD in Curriculum and Instruction from Texas Tech University. She was previously a K-12 mathematics educator for grades 9-12 in Texas before moving into higher education, where she currently teaches mathematics content and STEM methods courses for pre- and in-service teachers. Her research interests include preservice teacher pedagogical content knowledge development, Number Talks, and the recruitment and retention of underserved and underrepresented populations in Rural STEM education. Currently, she is actively pursuing funding for her research initiative to support formal and informal robotics instruction in Hispanic-serving, rural high schools. Through her research projects, she has participated in partnerships with administrators, teachers, and other higher education institutions to provide professional development in the delivery of instructional routines and STEM education through robotics. Her scholarly contributions include several journal articles and four book chapters, and she is currently a Co-PI on two funded National Science Foundation grants in the Division of Undergraduate Education. Her work has been recognized with the Outstanding Dissertation Award from the School Science and Mathematics Association and the Intellectual Contributions Award from West Texas A&M University's College of Engineering. She has received fellowships through the Service, Teaching, and Research (STaR) program from the Association of Mathematics Teacher Educators and the Institute for Measurement Methodology in Rural STEM Education at the University of South Carolina.

Darris R. Means

Member

DARRIS R. MEANS is the Executive Director for Rural and Community-Based Education and an associate professor in the School of Education at University of Pittsburgh. Prior to becoming a faculty member, he was an administrator for a college access program, Elon University's Elon Academy, working with high school and college students from low-income families and/or students with no family history of college to support their postsecondary education enrollment, persistence, and graduation. He earned his bachelor's degree in political science and sociology from Elon University, his master's degree in counselor education from Clemson University, and his Ph.D. in educational research and policy analysis from North Carolina State University.

Darris has been engaged in qualitative and mixed methods research on rural education and STEM education for a decade. His current research focuses on two areas: (a) science learning, opportunities, and resources that support rural students and Black students in their science degree career trajectories and (b) postsecondary education access and completion for rural students.

Darris currently serves on the Executive Committee for the National Rural Education Association, a leading voice for rural schools and communities nationwide. Darris previously served in several advisory and leadership capacities related to rural education, including serving in 2021 on the advisory board for the Ascendium Education Group to help develop a National Rural Research Agenda and serving as the Chair of the Committee on Justice, Equity, Diversity, and Inclusion for the American Educational Research Association's Rural Education Special Interest Group.

Stephen L. Pruitt

Member

STEPHEN L. PRUITT took office as the sixth president of the Southern Regional Education Board in July 2018. He started his education career as a high school chemistry teacher in Fayette County, Georgia. During his career, Pruitt has amassed education policy, assessment and instructional background at the local, state and national levels.

Before coming to SREB, Pruitt was Kentucky's state commissioner of education. At the national level, he had worked closely with state agencies and educators around the country to improve policy and practice in science education. In Georgia, Pruitt served as science and mathematics program manager, director of academic standards, associate state superintendent for assessment and accountability and chief of staff for the Georgia Department of Education. Pruitt also served as a board member to the Council of Chief State School Officers, as president of the Council of State Science Supervisors and as a member of the writing team for the College Board Standards for College Success for science. In addition, he was named to the National Research Council's Board on Science Education and served on the National Academies of Science Committee on Conceptual Framework for New Science Education Standards that developed the Framework for K-12 Science Education.

A native of Georgia, Pruitt holds a bachelor's degree in chemistry from North Georgia College and State University, a master's degree in science education from the University of West Georgia and a doctorate of philosophy in chemistry education from Auburn University.

Jessica Sampley

Member

JESSICA SAMPLEY is a 20-year veteran educator who currently serves as the Academies and Career and Technical Education (CTE) Director at Gulf Shores City Schools (GSCS). She is a National Board Certified Teacher who previously taught English Language Arts at the secondary (grades 8-12) and post-secondary levels, coached athletics, and served as Technology Coordinator and Assistant Athletic Director. She has committed her entire career to serving rural schools and districts in Alabama.

Jessica grew up in a rural Alabama and is a first-generation college graduate; in her current role, she leverages that experience and focuses on bridging the gap between CTE and core academics. She has successfully developed and implemented innovative projects through the GSCS "Sustainability: Full STEAM Ahead" initiative by leveraging partnerships, resources, and grant funds. Highlights include scuba certification; dune restoration; STEAM Thinking Across the Curriculum; plane building and flight training; Summer WAVE; CTE vertical alignment professional development; an outdoor rock-climbing wall; biking for STEAM learning; and the "Small Town, Big Garden" Project. Jessica's research interests include integrating design/STEAM thinking with a focus on sustainability across the curriculum to increase student engagement and achievement, as well as overcoming disparities in achievement and discipline referrals of historically marginalized groups in Alabama's education system.

Recent honors and awards include: 2023 US Green Ribbon School District; over \$1,000,000 in grants for related projects; Governor's Award in WBL Regional Best Practices; and CLAS Banner School Award.

Jessica holds an Ed.S. in Instructional Leadership from the University of West Alabama, as well as an MFA in Creative Writing from North Carolina State University.

Guan Kung Saw

Member

GUAN KUNG SAW (he/him/his) is an associate professor in the School of Educational Studies at Claremont Graduate University (CGU). His work focuses on diversity, equity, and inclusion in STEM education and workforce development, STEM mentorship and social capital, as well as college access and success. He teaches courses on inequalities in education, sociology of education, and quantitative research methods. A former science teacher in a rural high school and a fellow at the Institute for Measurement Methodology in Rural STEM Education (IMMERSE), Saw investigates the disparities in opportunities to learn, motivation, and career pathways in STEM among rural and small-town students. He co-leads STEM Pathways Research-Practice Partnership to study and improve STEM programs/practices that support underrepresented students from diverse geographical areas. His work has been supported by the National Science Foundation (NSF), Institute of Education Sciences (IES), National Institute of Justice (NIJ), and American Educational Research Association (AERA). Saw has published in journals such as Educational Researcher, International Journal of Science and Mathematics Education, Journal for STEM Education Research, and Policy Insights from the Behavioral and Brain Sciences. Saw received his Ph.D. from Michigan State University (MSU).

Mara Casey Tieken

Member

MARA CASEY TIEKEN is an associate professor of education at Bates College. Her research focuses on educational equity for rural students and communities, including the rural school/community relationship, rural college access, rural school closure, and rural racial justice. Her book *Why Rural Schools Matter* is an ethnographic study examining how rural schools define and sustain their surrounding communities. She is currently working on two multi-year projects; the first explores the college aspirations, transitions, and persistence of rural, first-generation students, and the second, designed in partnership with Arkansas's Rural Community Alliance, documents, examines, and communicates the impacts of school closures on rural Black communities in the Arkansas Delta. Mara is the 2016 recipient of the Lynton Award for the Scholarship of Engagement for Early Career Faculty, and she routinely provides professional development to teachers and administrators on supporting rural college access and success, adopting inclusive practices for rural schools, and understanding rural demographics and poverty. She serves as an associate editor of the *Journal of Research in Rural Education*; she is also an active member of the Rural Sociological Society, the Rural Education Special Interest Group of the American Educational Research Association, and the Rural Youth Catalyst Project's Rural Youth Working Group. In 2011, she received her Doctorate of Education from the Harvard Graduate School of Education. Before beginning her graduate work, she taught third grade and adult education in rural Tennessee.

Elizabeth Cady

Staff Officer