Science Investigations and Engineering Design for Grades 6-12

Committee

Brett D. Moulding

Co-Chair

Brett Moulding is currently the director of the Utah Partnership for Effective Science Teaching and Learning. He was the state science education specialist and coordinator of curriculum from 1993 to 2004 and then director of the curriculum and instruction until 2008. Mr. Moulding taught chemistry for twenty years at Roy High School in the Weber District Science and served as the district teacher leader for eight years. Mr. Moulding also served on the Board of the Triangle Coalition, the NAEP 2009 Framework Committee and was the President of the Council of State Science Supervisors from 2003–2006. Mr. Moulding has received the Governor's "Teacher Recognition Award," the "Presidential Award for Excellence in Mathematics and Science Teaching" and the "Award of Excellence" from the Governor's Science and Technology Commission. He served on the the National Academies of Sciences, Engineering, and Medicine's Committee that developed the Framework for K-12 Science Education as well as on three committees related to education at NASA. He was a member of the Board on Science Education from 2005-2011. He graduated from the University of Utah with a bachelor's degree in chemistry with minors in biology, math, and physics. He also has a master's degree in education from Weber State University and an administrative supervisory certificate from Utah State University.

Nancy Songer

Co-Chair

Dr. Nancy Songer is the dean and distinguished university professor in the School of Education at Drexel University. Prior to this, Dr. Songer was a professor of science education and learning technologies at the University of Michigan for eighteen years, and the director of the Center for Essential Science, a multi-disciplinary research organization addressing the underrepresentation of urban students in the fields of science, technology, engineering and mathematics. Her areas of expertise include STEM education, urban education, and educational assessment and her research focuses on the design of education innovations for promoting critical thinking in science, environmental awareness, increased interactivity, and participation in science careers. She is renowned for her research on how to engage and support complex scientific reasoning among students ranging from elementary to high school ages. Her scholarship has received frequent recognition including a Presidential Faculty Fellowship awarded by President Clinton. As dean of the School of Education at Drexel University, Songer is leading urban STEM initiatives investigating new definitions of public school-university partnerships in association with several West Philadelphia public schools within the Drexel University School of Education's neighborhood. She served on the the National Academies of Sciences, Engineering, and Medicine’s Committee on a Framework for Assessment of Science Proficiency in K-12. Songer earned a bachelor’s degree in biological sciences from the University of California, Berkeley, a master’s degree in developmental biology from Tufts University, and a doctorate degree in science education and learning technologies from the University of California Davis.

Juan-Carlos Aguilar

Member

Dr. Juan-Carlos Aguilar is the Director of Innovated Programs and Research at the Georgia Department of Education. He serves as liaison between the Georgia Department of Education and the different science organizations across the state, and the Georgia Department of Education and the Georgia University System in science. He serves on the Board of Directors for the Georgia Youth Science and Technology Centers and the Valdosta STEAM Board of Advisors. He served as the Georgia Department of Education Science Program Manager for the previous nine years. As part of his responsibilities as Science Program Manager, he oversaw state policy in science education, coordinated K-12 science curriculum development, co-directed Georgia's K-12 STEM initiative, and supervised the alignment of the state assessments with the Georgia Performance Standards for science. He led the revision and adoption of the new Georgia Standards of Excellence in Science. These new standards are Georgia's effort to implement the vision for science education described in the K-12 Framework for Science Education document. He is the past president of the Council of State Science Supervisors. He served as board member on the Triangle Coalition for STEM Education. He is currently working as an advisor for the NIH SEPA 2015 Emory grant titled Experiential Citizen Science Training for the Next Generation. He was the principal investigator on the Georgians Experience Astronomy Research in the Classroom grant funded by NASA and is the Co-Principal investigator on the Science Learning Integrating Design, Engineering, and Robotics (SLIDER) project. He was a member of the Steering Committee on Exploring the Overlap between "Literacy in Science" and the Practice of Obtaining, Evaluating, and Communicating Information. He was previously a classroom teacher including 10 years as a middle school science and mathematics teacher at a Spanish middle school and five years as a high school physics teacher, both in Fayette County, Georgia. He also taught science and mathematics for four years at a high school in Guatemala City. Dr. Aguilar served on the committee that organized the National Academies of Sciences, Engineering, and Medicine workshop on Exploring the overlap between "Literacy in Science" and the Practice of Obtaining, Evaluating, and Communicating Information. He has a Licenciature in Physics from the University Del Valle of Guatemala. In addition, he received a principal certification from Morehead State University. He was awarded a M.S. in Physics from the University of Louisville and a Ph.D. in Physics from the University of Kentucky.

Anne Egger

Member

Dr. Anne Egger is an associate professor at Central Washington University (CWU), where she has a joint appointment in geological sciences and science education and also serves as director of the Office of Undergraduate Research. Egger is currently serving as president of the National Association of Geoscience Teachers (NAGT), and has also served as chair of its Professional Development Planning and Website Committees. Through NAGT and other projects, Dr. Egger has led numerous professional development workshops for faculty, graduate students and post-docs, and in-service teachers, focusing on building skills in active learning. As an author, editor, and co-project director for Visionlearning, Egger develops freely-available, web-based, peer-reviewed readings for learning about science in a way that integrates the process of science, helping students understand how we know what we know, the data that support our scientific explanations, and the people behind the science. Additionally, she is involved in developing rigorously-tested curricular materials that integrate geoscience and societal issues across the curriculum at the undergraduate level. She has conducted research on how prepared future teachers are to teach about the sustainability concepts of the NGSS, and considered the mismatch between introductory college earth science courses taken by future teachers and the material they will be expected to teach in their own classrooms. Prior to her appointment at CWU, Dr. Egger was a lecturer and the undergraduate program coordinator in the School of Earth Sciences at Stanford University. She earned a bachelor’s degree in geology and geophysics from Yale University and a master’s degree and doctorate in geological and environmental sciences from Stanford University.

Erin Furtak

Member

Dr. Erin Marie Furtak is associate professor and Program Area Chair of Science Education at the University of Colorado Boulder, as well as the chair of the CU Teach Secondary Science, Engineering, and Mathematics Teacher Education Program. Previously, she was a public high school science teacher. Her current research focuses on how to support secondary science teachers in improving their everyday formative assessment practices. She was principal investigator for a CAREER grant from the National Science Foundation to investigate how a long-term professional development program centered on a learning progression for natural selection supported high school teachers in iteratively designing, enacting, and revising formative assessments. Recently, she has extended this work in a long-term research-practice partnership supporting formative assessment design with high school physics, chemistry, and biology teachers in a large, urban school district. Dr. Furtak received the Presidential Early Career Award for Scientists and Engineers (PECASE) in 2011 and the German Chancellor Fellowship from the Alexander von Humboldt Foundation in 2006. She is involved in professional development partnerships with school districts and organizations in Colorado and across the U.S. She earned her a bachelor’s degree in environmental, population, and organismic biology from the University of Colorado Boulder, a master’s degree in education from the University of Denver, and a doctorate in curriculum and teacher education from Stanford University.

Kenneth Huff

Member

Kenneth L. Huff is a National Board Certified Teacher in early adolescence science. His present appointment is a middle school teacher in the Williamsville Central School District, Williamsville, NY. Kenneth serves the New York State Education Department as a member of its Science Education Steering Committee, and he founded and leads a Young Astronaut Council for fifth through eighth grade students at his school. In addition to his teaching responsibilities, Kenneth is a member of the National Science Teachers Association (NSTA), Board of Directors-Division Director Middle Level Science Teaching; Vice-President, Science Teachers Association of New York State; a Candidate Support Provider for National Board for Professional Teaching Standards, and an Inaugural Fellow of 100Kin10. Kenneth is past president of the Association of Presidential Awardees in Science Teaching, and served on the writing team for the Next Generation Science Standards (NGSS). He continues to serve Achieve in development of resources for the NGSS and serves the College Board as a member of its Pre-AP Science Development Committee. Mr. Huff has been recognized with awards for his teaching and science leadership including the Presidential Award for Excellence in Mathematics and Science Teaching, Empire State Excellence in Teaching Award, NSTA Robert E. Yager Foundation Excellence in Teaching Award, NSTA PASCO STEM Educator Award, NSTA Outstanding Aerospace Educator Award, and NSTA Toyota Tapestry Award. He is the recipient of the Douglas B. Seager Award for Outstanding Contributions to Science Education, Science Teachers Association of New York State Excellence in Science Teaching Award, the Educator Achievement Award from the American Institute of Aeronautics and Astronautics, and has been inducted into the Crown Circle for Aerospace Education Leadership by the National Congress on Aviation & Space Education. He is a member of the Teacher’s Advisory Council of the National Academies of Sciences, Engineering, and Medicine. A New York native, Kenneth earned his B.S. and M.S. from the State University of New York College at Buffalo.

Joseph Krajcik

Member

Dr. Joseph Krajcik is Lappan-Phillips Professor of Science Education and director of the CREATE for STEM Institute, a joint institute between the Michigan State University (MSU) College of Natural Science and the College of Education to improve the teaching and learning of science and mathematics through innovation and research. Prior to these appointments at MSU, Dr. Krajcik taught high school chemistry and physical science in Milwaukee, WI for eight years, and taught at the University of Michigan for twenty-one years. His areas of expertise include curriculum and instruction, science education, and teacher education, learning, and policy. Throughout his career, he has focused on working with science teachers to reform science teaching practices to promote students' engagement in and learning of science. He is currently the principal investigator and co-principal investigator for two National Science Foundation grants to design, develop and test middle school assessments and curriculum materials aligned with the Next Generation of Science Standards. He served as lead writer for developing Physical Science Standards for the Next Generation Science Standards and lead writer for the Physical Science Design team for the Framework for K–12 Science Education. Dr. Krajcik served as co-editor of the Journal of Research in Science Teaching, and has authored and co-authored curriculum materials, books, software and over 100 manuscripts. He was honored to receive a Distinguished Professorship from Ewha Woman's University in Seoul, South Korea in 2009 and Guest Professorship from Beijing Normal University in Beijing, China in 2002. He has made presentations on reforming science education in Chile, Singapore, China, Thailand, Brazil and South Korea, is a fellow of the American Association for the Advancement of Science (AAAS), and has served as president of the National Association for Research in Science Teaching (NARST), from which he received the "Distinguished Contributions to Science Education Through Research" Award in 2010. Dr. Krajcik earned a doctorate in science education from the University of Iowa.

Michael C. Lach

Member

Dr. Michael Lach is the director of STEM Education and Strategic Initiatives at the UChicago STEM Education at the University of Chicago, where he conducts research and provides technical assistance focusing on large scale improvements in mathematics and science education in the United States. Previously, he was appointed by Secretary Arne Duncan to lead science and mathematics education efforts at the U. S. Department of Education. Dr. Lach began his professional career teaching high school biology and general science at Alceé Fortier Senior High School in New Orleans in 1990 as a charter member of Teach For America. After 3 years in Louisiana, he joined the national office of Teach For America as director of program design, developing a portfolio based alternative-certification system that was adopted by several states. Returning to the science classroom in 1994 in New York City Public Schools, and then back to Chicago in 1995, he was named one of Radio Shack's Top 100 Technology Teachers, earned National Board Certification, and was named Illinois Physics Teacher of the Year. He has served as an Albert Einstein Distinguished Educator Fellow, advising Congressman Vernon Ehlers (R-MI) on science, technology and education issues. He was lead curriculum developer for the Investigations in Environmental Science curriculum developed at the Center for Learning Technologies in Urban Schools at Northwestern University and published by It’s About Time, Inc. As an administrator with the Chicago Public Schools, he led the district’s instructional improvement efforts in science and mathematics in a variety of roles between 2003 and 2009, ultimately becoming chief officer of teaching and learning overseeing curriculum and instruction in 600+ schools. He currently serves on the Board on Science Education. He has also served on multiple committees of the National Academies of Sciences, Engineering, and Medicine including the Committee on High School Science Laboratories: Role and Vision (the group that produced the 2006 report), the Committee on Guidance on Implementing the NGSS, the Committee on Understanding and Improving K-12 Engineering Education in the U.S., and he also served on the Climate Change Education Roundtable. He earned a bachelor's degree in physics from Carleton College, a master’s degrees from Columbia University and Northeastern Illinois University, and a doctorate from the University of Illinois at Chicago.

Ronald M. Latanision

Member

Dr. Ronald Latanision (NAE) is a Senior Fellow at Exponent, Inc., an engineering and scientific consulting company and an emeritus professor at the Massachusetts Institute of Technology. At MIT, Dr. Latanision held joint faculty appointments in the Department of Materials Science and Engineering and in the Department of Nuclear Engineering. He led the School of Engineering's Materials Processing Center at MIT as its Director from 1985 to 1991. In addition, he is a member of the National Academy of Engineering and a Fellow of ASM International, NACE International, and the American Academy of Arts and Sciences. From 1983–1988, Dr. Latanision was the first holder of the Shell Distinguished Chair in Materials Science. Dr. Latanision was a founder of Altran Materials Engineering Corporation, established in 1992. Dr. Latanision's research interests are focused largely in the areas of materials processing and in the corrosion of metals and other materials in aqueous (ambient as well as high temperature and pressure) environments. His expertise extends to electrochemical systems and processing technologies, ranging from fuel cells and batteries to supercritical water power generation and waste destruction. Dr. Latanision has served as a science advisor to the U.S. House of Representatives Committee on Science and Technology in Washington, D.C. In June of 2002, Dr. Latanision was appointed by President George W Bush to membership on the U.S. Nuclear Waste Technical Review Board, and was reappointed for a second four-year term by President Barack Obama. Dr. Latanision has been active in a variety of educational initiatives, including serving as Chairman of the Council on Primary and Secondary Education at MIT, founder of the MIT Science and Engineering Program for High School Teachers, and serving as Co-Chairman of the Network of Educators in Science and Technology, (NEST). He was a Co-Principal Investigator of the NSF-sponsored statewide systematic educational reform initiative in Massachusetts, Project PALMS (Partnerships Advancing Learning of Math and Science). Over the past 30 years, Dr. Latanision has served on over 20 technical and education-related study and advisory committees of the National Academies, including as co-chair of the National Academy of Engineering committee that recently produced Engineering Technology Education in the United States. In 2011 he was named Editor-in-Chief of the NAE Quarterly, The Bridge. He received a B.S. in Mettallurgy from the Pennsylvania State University and a Ph.D. in Metallurgical Engineering from the Ohio State University.

Mitchell Nathan

Member

Dr. Mitchell Nathan is full professor of educational psychology (learning science) in the School of Education at the University of Wisconsin-Madison. Additionally, he is the director of the Center on Education and Work, the director of the IES Postdoctoral Fellowship Program in Mathematical Thinking, Learning and Instruction, and holds faculty appointments in the Department of Curriculum and Instruction, the Psychology Department, and the Wisconsin Center for Educational Research (WCER). He is a member of the University of Wisconsin-Madison Cognitive Science Cluster, and an affiliate of the interdisciplinary program in learning, understanding, cognition, intelligence and data science (LUCID). Dr. Nathan served as chair of the Learning Sciences program from 2004-2010. In his research, Dr. Nathan uses experimental design and video-based discourse analysis methods to study learning and teaching in school settings. He investigates the role of prior knowledge and invented strategies in the development of algebraic thinking and the notion of Expert Blind Spot, to explain teachers' instructional decision making, and how teachers use gestures, embodiment and objects to convey abstract ideas during instruction in STEM fields. Dr. Nathan is currently serving on the editorial boards of several top journals in education research, including The Journal of the Learning Sciences, Journal of Pre-College Engineering Education Research, and on the advisory board to the editor of the flagship Journal of Engineering Education. He also serves on the advisory board for The INSPIRE Research Institute for Pre-College Engineering at Purdue. He is principal researcher for projects funded by the National Science Foundation, U.S. Department of Education’s Institute for Educational Sciences, and National Institutes of Health-NICHD. Dr. Nathan previously served on the National Academy of Engineering and National Research Council Committee on Integrated STEM Education, which led to the 2014 NRC report STEM Integration in K-12 Education: Status, Prospects, and an Agenda for Research; and on the planning committee for the National Research Council Division on Engineering and Physical Sciences Space Studies Board that led to the workshop and 2015 NRC report, Sharing the Adventure with the Student: Exploring the Intersections of NASA Space Science and Education. He earned bachelor’s degrees in electrical and computer engineering, mathematics, and history from Carnegie Mellon University and a doctorate in cognitive psychology from the University of Colorado-Boulder.

Eileen R. Parsons

Member

Dr. Eileen Parsons is a professor of science education in the School of Education at The University of North Carolina at Chapel Hill. Dr. Parsons studies the influences of socio-cultural factors, specifically race and culture, on learning in science and participation in science, technology, engineering, and mathematics (STEM). Her research uses primarily, but not exclusively, qualitative methods to investigate the cultural and racial responsiveness of practices with respect to African American students in K-12 learning environments, with a focus on middle school. Additionally, she studies cultural and racial inclusiveness for traditionally underrepresented students of color in undergraduate STEM. She has been involved in K-12 education in a myriad of ways: She taught high school science and math; instructed elementary, middle school, and high school science methods courses in undergraduate and master's teacher preparation programs; coached lateral entry teachers; and facilitated the professional development of practicing teachers. She has served on the selection panels for the Ford Foundation Fellowships organized by the National Academies of Sciences, Engineering, and Medicine. She earned a bachelor’s degree in science teaching (chemistry) from the University of North Carolina at Chapel Hill. Her master’s and doctorate degrees in science education are from Cornell University.

Cynthia Passmore

Member

Dr. Cynthia Passmore is a professor specializing in science education in the School of Education at the University of California, Davis. Her areas of expertise include models and modeling in student learning, curriculum design, and teacher professional development. As part of the Sacramento Area Science Project (SASP), an education partnership between the University of California-Davis and California State University-Sacramento, Dr. Passmore has focused on investigating model-based reasoning in a range of contexts and is particularly interested in understanding how the design of learning environments interacts with students’ reasoning practices. She is a member of the American Educational Research Association, the National Association for Research in Science Teaching, the National Science Teachers Association, and the Association for the Education of Teachers of Science. Dr. Passmore earned her Ph.D.in curriculum and instruction from the University of Wisconsin, and prior to her doctoral studies, she was a high school science teacher.

Helen R. Quinn

Member

Dr. Helen Quinn is professor emerita of particle physics and astrophysics at SLAC National Accelerator Laboratory at Stanford University. Prior to her appointment at Stanford University, she completed a postdoctoral fellowship at Deutsche Elektronen-Synchrotron in Hamburg, Germany, taught high school physics, and then joined the staff and faculty of Harvard University. As a theoretical physicist, her research focused on theoretical particle physics with an emphasis on phenomenology of the weak interactions, particularly CP violation, and her work with colleague Robert Peccei resulted in what is now known as the Peccei-Quinn symmetry. Dr. Quinn was elected to the National Academy of Sciences in 2003 and was president of the American Physical Society in 2004. In addition to her scholarship in physics, she has had long-term involvement in science education and in the continuing education of science teachers. She was an active contributor to the California State Science Standards development process. She chaired the Committee on a Conceptual Framework for New K–12 Science Education Standards for the National Research Council. In addition to other committee work focused on physics and space, she served on a number of committee's focused on science education, in particular she was a member of the Committee on a Framework for Assessment of Science Proficiency in K-12, the Committee on Guidance on Implementing the NGSS, the Committee on Science Learning K-8, and the committee that organized the workshop on Exploring the overlap between "Literacy in Science" and the Practice of Obtaining, Evaluating, and Communicating Information. She was a member of the Board on Science Education from 2005-2009 and its chair from 2009-2014. Additionally, she has taught extensively and has been involved in outreach activities to encourage interest in the field of physics, including running summer programs for teachers and bringing college students from around the country to undertake research at the SLAC National Accelerator Laboratory. In honor of both her outstanding research in particle physics and her singular contributions to K-12 education, she was awarded the "Karl Taylor Compton Medal for Leadership in Physics" by the American Institute of Physics in 2016. Dr. Quinn earned a bachelor's degree in physics and a doctorate in elementary particle physics from Stanford University.

Andrea Tracy

Member

Andrea Tracy is currently a Biology and AP Physics teacher, as well as Science Department Chair at MacArthur High School in Lawton, Oklahoma. She has an extensive background in middle school science teaching, curriculum development, and assessment. Prior to her roles at MacArthur High School, she was an Adjunct Professor at the University of Phoenix-Okinawa, Japan where she held an appointment in the Masters of Education in Teaching Department, specializing in teaching and professional development. Ms. Tracy is a member of the National Science Teachers Association and the Association for Supervision and Curriculum Development. She did the course work for a master's degree in Teaching from Hamline University, holds an Oklahoma School Principal certification and is currently pursuing her doctoral studies in Educational Leadership and Management at Capella University. Ms. Tracy earned a bachelor's degree in Biology from the University of North Dakota-Grand Forks and a master's degree in Education Administration from Lamar University.