

STEM Smart: Lessons Learned From Successful Schools

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PLENARY SPEAKERS BIOGRAPHICAL INFORMATION

Ashok Agrawal

Managing Director for Professional Development and Director of Outreach and Engagement, American Society for Engineering Education

Prior to assuming his present position, Ashok Agrawal was the vice president for academic affairs, the dean of the Math, Science, Engineering, and Technology Division, and was responsible for leading and administering STEM-related transfer and career programs at St. Louis Community College at Florissant Valley. Agrawal has served as a program officer at the Division of Undergraduate Education at the National Science Foundation (NSF), and continues to assist the NSF on special projects. Agrawal has also served on the National Academy of Engineering (NAE) Committee to Advance Engineering Studies at Tribal Colleges, the NAE Committee on Community Colleges Role in Engineering and Education, and the National Research Council (NRC) Board on Engineering Education. In 2006, Agrawal was appointed by the governor of Missouri to serve on the Missouri Math, Engineering, Technology, and Science (Mo-METS) task force. He also serves on the planning team of the St. Louis Region's FIRST Robotics Competition and on the advisory committee of the St. Louis Science Center. Agrawal led the effort to establish a St. Louis Regional Engineering Academy for St. Louis area schools. He is also a member of the Society of Manufacturing Engineers–Education Foundation board. Agrawal is an ASEE Fellow and the recipient of the 2012 James H. McGraw Award and the 1996 Frederick J. Berger Award. In addition, he is the recipient of the 2003 Governor's Award for Excellence in Teaching. He has also served on the Technology Accreditation Commission of ABET and has received several grants from the NSF. Agrawal holds an MS in Materials Science, an MS in Mining Engineering from the University of Kentucky, and a BS in Metallurgical Engineering from Nagpur University in India.

Joseph Coccozza

Co-Director of Education and Outreach Programs, Biomimetic MicroElectronic Systems, Engineering Research Center; Assistant Professor of Research, Ophthalmology, University of Southern California

Under the stewardship of Joseph Coccozza, the Biomimetic MicroElectronic Systems Engineering Research Center (BMES ERC) has established a comprehensive and innovative outreach initiative, designed to integrate science and engineering principles into the curriculum of elementary, middle, and high schools, as well as at the community college level. The Center has established long-term partnerships with a handful of schools in the greater Los Angeles area. It has tailored its outreach activities to the specific needs of educational stakeholders including students, teachers, and parents. Coccozza also established the Engineering for Health Academy (EHA), a partnership between the BMES ERC and a local high school. EHA is modeled as a small learning community. Students make a three-year commitment to the program transitioning through a series of four integrated core courses. Senior year, EHA students enroll in a Capstone Class, are matched with University of Southern California (USC) laboratories, and are mentored by graduate students. Another program developed by Coccozza is Science for Life (SFL). SFL was designed to increase science literacy of children by integrating science and engineering principles into the third, fourth, and fifth grades. SFL utilizes research conducted in BMES ERC laboratories as focal points, transforming the elementary classroom into a virtual scientific laboratory. The curricula build upon students' prior knowledge and nascent curiosity; introduce novel

information in an incremental fashion; involve students in the collection, recording, and analysis of data; and stress the scientific process over a “right or wrong” mindset. Prior to coming to USC, Coccozza was a high school science instructor, during which time he developed university partnerships that augmented science curricula. Coccozza received his PhD in Neuroscience from Purdue University.

Janice Earle

Program Director, National Science Foundation

Janice Earle currently serves as a senior program director for K–12 STEM education in the Directorate for Education and Human Resources at the NSF. As such, she is responsible for a Foundation-wide activity on K–12 STEM education. She has been at the NSF since 1991 and has worked with several of the Foundation’s education programs. Previously, Earle served as the cluster lead for the Research and Evaluation on Education in Science and Engineering (REESE) and CAREER programs housed in the Division of Research on Learning in Formal and Informal Settings and as coordinator for EHR evaluation activities. Earle works with several of the agency’s policy-oriented efforts such as those with the National Academy of Sciences, the National Research Council, and the U.S. Department of Education. Earle received a BA in History from the University of Michigan, an MA from Teachers College, Columbia University, and a PhD in Education Policy and Planning from the University of Maryland.

Pramod Khargonekar

Assistant Director, National Science Foundation

Dr. Pramod Khargonekar was appointed by the NSF to serve as assistant director for the Directorate of Engineering (ENG) in March 2013. In this position, Khargonekar leads the ENG Directorate with an annual budget of more than \$800 million. The ENG Directorate invests in frontier engineering research and education, cultivates an innovation ecosystem, and develops the next-generation of engineers. Khargonekar has held faculty positions at the University of Florida, University of Minnesota, and University of Michigan. He was chairman of the Department of Electrical Engineering and Computer Science from 1997 to 2001 and also held the position of Claude E. Shannon Professor of Engineering Science at the University of Michigan. From 2001 to 2009, he was dean of the College of Engineering and is currently Eckis Professor of Electrical and Computer Engineering at the University of Florida. He also served briefly as deputy director of technology at ARPA-E, U. S. Department of Energy in 2012–13. Khargonekar’s current research and teaching interests include systems and control theory, machine learning, and applications to smart electric grid and neural engineering. He has authored more than 130 refereed journal publications and 150 conference publications. He has been recognized as a Web of Science Highly Cited Researcher. He is a recipient of the NSF Presidential Young Investigator Award, the American Automatic Control Council’s Donald Eckman Award, the Japan Society for Promotion of Science fellowships, the IEEE W. R. G. Baker Prize Award, the IEEE CSS George Axelby Best Paper Award, the Hugo Schuck ACC Best Paper Award, and the Distinguished Alumnus and Distinguished Service Awards from the Indian Institute of Technology, Bombay. He is a Fellow of IEEE. At the University of Michigan, he received the Arthur F. Thurnau Professorship.

Adah Leshem

Program Director, Pre-College Education, NSF Engineering Research Center for Biorenewable Chemicals

The main objectives Adah Leshem focuses on are how to engage the community at large in engineering and science. This involves working closely with school districts in Iowa, providing science teachers with enriching professional development programs at Iowa State University, bringing opportunities to K–12 students that will help them become more interested in and connected to Science, Technology, Engineering and Mathematics (STEM) fields, and finally, helping engineering and science graduate students become successful communicators of their research program. These objectives will hopefully

support the growth of a more scientifically literate society that will support the development of new technologies to meet the challenges of the 21st century. Leshem received her BS in Environmental Science, her MPhil in Applied Biology, and her PhD in Environmental Physiology.

Greg Pearson

Senior Program Officer, National Academy of Engineering

Greg Pearson is a senior program officer with the National Academy of Engineering (NAE) in Washington, D.C. Pearson currently serves as the responsible staff officer for the NSF-funded project Changing the Conversation: From Research to Action and the project Changing the Conversation: Building the Community, supported by the United Engineering Foundation. He is also study director for the public- and private-sector-funded study Integrated STEM Education: Developing a Research Agenda. He was the study director for the project that resulted in the publication of *Standards for K–12 Engineering Education?* (2010) and *Engineering in K–12 Education: Understanding the Status and Improving the Prospects* (2009), an analysis of efforts to teach engineering to U.S. school children. Pearson oversaw the NSF-funded project that resulted in the 2008 publication *Changing the Conversation: Messages for Improving Public Understanding of Engineering* and was co-editor of the reports *Tech Tally: Approaches to Assessing Technological Literacy* (2006) and *Technically Speaking: Why All Americans Need to Know More About Technology* (2002). In the late 1990s, Pearson oversaw NAE and National Research Council reviews of technology education content standards developed by the International Technology Education Association. Pearson has degrees in Biology and Journalism.

Cary Sneider

Associate Research Professor, Portland State University

Cary Sneider is an associate research professor at Portland State University in Oregon, where he teaches courses in research methodology in a Master of Science Teaching degree program. He also serves as a consultant on diverse issues in STEM education, such as youth programs at science centers, educational standards, and assessment. Sneider is currently a member of the writing team for Achieve, Inc., and is working on the *Next Generation Science Standards*. He is a member of the National Assessment Governing Board, which sets policy for the National Assessment of Educational Progress (NAEP), also known as “The Nation’s Report Card.” Until 2007, Sneider served as vice president for educator programs at the Museum of Science in Boston, and prior to that, he served as director of astronomy and physics education at the Lawrence Hall of Science at the University of California, Berkeley. Sneider’s curriculum development and research interests have focused on helping students unravel their misconceptions in science, on new ways to link science centers and schools to promote student inquiry, and on integrating engineering and technology education into the K–12 curriculum. In 1997, he received the Distinguished Informal Science Education award from the National Science Teachers Association, and in 2003, he was named National Associate of the National Academy of Sciences. Sneider earned a BA in Astronomy from Harvard College, and an MA and PhD in Science Education from the University of California at Berkeley.

Marion Usselman

Principal Research Scientist and Associate Director for Federal Outreach and Research, Center for Education Integrating Science, Mathematics and Computing (CEISMC), Georgia Institute of Technology

Marion Usselman leads a team of educators and educational researchers who are exploring how to integrate science, mathematics, and engineering within authentic middle school contexts and researching the nature of the resultant student learning. The Science Learning Integrating Design, Engineering and Robotics (SLIDER) NSF DR K–12 project has designed and implemented a project-based eighth-grade physical science curriculum that addresses core science practices and disciplinary ideas

through engineering design challenges and LEGO Mindstorm robotics. The Advanced Manufacturing and Prototyping Integrated To Unlock Potential (AMP-IT-UP) NSF Mathematics and Science Partnership project is creating curricula for the engineering and technology pathway in grades 6–9. The materials promote STEM academic engagement through manufacturing-focused design/build activities that are situated within an engineering design learning arc, stressing prototyping, iterative testing, data analysis, and redesign. Both SLIDER and AMP-IT-UP are being implemented and studied in low-income Georgia public schools. Usselman co-directed the Student and Teacher Enhancement Partnership (STEP) in NSF's Graduate STEM Fellows in K-12 Education (GK-12) Program that created mutually beneficial partnerships between Georgia Tech and metro-Atlanta high schools, anchored by graduate student fellows and partner teachers. She also provided leadership in developing online teacher professional development courses for the Georgia Tech-based NASA Electronic Professional Development Network (ePDN), and in promoting K–12 teaching as a career option through Georgia Tech's Tech to Teaching program. Usselman holds a BA in Physics from the University of California, San Diego and a PhD in Biophysics from Johns Hopkins University.

Darryl Williams

Associate Dean for Recruitment, Retention, and Community Engagement and Director of the Center for STEM Diversity, School of Engineering, Tufts University

Darryl N. Williams joined Tufts in April 2013 as associate dean for recruitment, retention, and community engagement and director of the Center for Science, Technology, Engineering and Math (STEM) Diversity in the School of Engineering. Williams came to Tufts from his former position as a program officer at the NSF, focusing on engineering education. He is a chemical engineer by formal training, receiving his doctorate from University of Maryland, College Park. He received a postdoctoral fellowship from the National Institutes of Health to conduct research in magnetic nanoparticle uptake in mammalian cells at The Children's Hospital of Philadelphia. After the conclusion of his fellowship, Williams focused on creating opportunities in STEM for underrepresented communities in the Philadelphia area. He served as executive director of iPRAXIS, a nonprofit organization that seeks to support minority scientists to take ideas from the bench to business. He also acted as a consultant to the STEM Technologies nonprofit group that facilitates the building of partnerships among industry, academia, and the community at large to strengthen STEM learning networks. Since 2009, Williams had served as an NSF program officer overseeing the grants administration in the Division of Research on Learning in Formal and Informal Settings (DRL) for programs such as Discovery Research K–12 (DR K–12), Innovative Technology Experiences for Students and Teachers (ITEST), National Robotics Initiative (NRI), and Advanced Technological Education (ATE).

BREAKOUT SESSION PRESENTERS BIOGRAPHICAL INFORMATION

Brenda Capobianco

Associate Professor of Science Education and Engineering Education, Purdue University

Brenda Capobianco is an associate professor of science education in the Department of Curriculum and Instruction and holds a courtesy appointment in the School of Engineering Education and an affiliated appointment in Women's Studies at Purdue University. She serves as the co-director of the Science Learning through Engineering Design (SLED) Partnership, a Mathematics and Science Partnership focused on improving science achievement among students in grades 3–6 in four partnering Indiana school districts. Her research interests include girls' participation in science and engineering, teachers' engagement in action research, and science teachers' integration of the engineering design process to

improve science learning. Most recently, Capobianco successfully designed and implemented an integrated STEM methods course for prospective elementary school science teachers by incorporating the tenets of the SLED Partnership with the practice of partnering inservice teachers. In 2011, Capobianco was awarded Purdue University's Faculty Scholar for the Department of Curriculum and Instruction and later served as the interim director of Purdue University's Hall of Discovery Learning Research Center. She holds a BS in Biology from the University of Alaska, Fairbanks; an MS in General Science from Connecticut Central State University; and an EdD from the University of Massachusetts, Amherst. Prior to earning her doctorate degree, Capobianco taught middle school science in Farmington, Conn., for more than 10 years and was awarded Connecticut Science Teachers Association's Excellence in Science Teaching at the Middle Level Award, Connecticut Education Association's Susan B. Anthony Award for Creative Leadership in Women's Rights, and Connecticut State Department of Education's Celebration of Excellence Award.

Jessica Chin

Research Engineer, Northeastern University

Jessica Chin has served as the lead research assistant for an NSF ITEST grant to design, develop, and implement the CAPSULE (CAPstone Unique Learning Experience) project. CAPSULE was a three-year study to teach engineering-based learning (EBL) to K–12 teachers. For the past four years, Chin has assisted K–12 teachers in the development and implementation of EBL in their classrooms. Her work has been published in various education and engineering journals and conferences. She regularly speaks to K–12 students about how and why engineering impacts their lives and the various paths to becoming an engineer. Chin also talks to students about how her interest in engineering stemmed from her love of photography and how one can love and continue both art and science as an adult. She assists K–12 classrooms with the introduction to Solidworks™ and 3D modeling as well. In addition to EBL, Chin's dissertation work is on the development of a predictive model for chronic wound tracking. She has been collaborating with leading research and development laboratories including the Modeling, Analysis, and Prediction (MAP) Laboratory and the Center for STEM Education, both at Northeastern University in Boston, Mass. Chin will receive her PhD in Industrial Engineering from Northeastern University in August 2013. She received her MS in Technological Entrepreneurship from Northeastern University, and her BS in Mechanical Engineering and Biomedical Engineering from Rensselaer Polytechnic Institute.

Melissa Dean

Assistant Director of Engaging Youth through Engineering, Mobile Area Education Foundation

Melissa Dean serves as assistant director of the Engaging Youth through Engineering (EYE) Program at the Mobile Area Education Foundation. In that capacity, she has coordinated the development and implementation of a series of STEM modules for middle school grades that truly integrate science, technology, engineering and mathematics learning in the classroom. Dean is an experienced science educator, having led the development of informal curricula and programs for science centers in Alabama and Louisiana for many years. In addition, she has helped lead STEM curriculum development programs, conducted pilot engineering design lessons, and provided STEM professional development for all middle school teachers in the 17 middle schools in the Mobile County Public School System. Dean received her BS from Louisiana State University in Shreveport and is currently working toward her graduate degree in Instructional Design and Development at the University of South Alabama in Mobile.

Heidi Diefes-Dux

Associate Professor and Director for Teacher Professional Development, Institute for P–12 Engineering Research and Learning (INSPIRE), College of Engineering, Purdue University

Heidi Diefes-Dux leads an NSF DR K–12 project focused on elementary engineering education. The

research questions guiding this project are: What is desired student KAB (knowledge, attitudes, behaviors) as a result of integrating engineering into formal elementary education? What teacher KAB are necessary for successful and sustained integration of engineering in elementary classrooms? What attributes of quality professional development and teacher community support are needed to sustain integration of engineering for desired student achievement? The INSPIRE project has provided professional development to more than 150 teachers in the Arlington Independent School District (Texas), impacting more than 1,000 students this year alone. Diefes-Dux coordinates and teaches within a required first-year engineering course in the First-Year Engineering Program at Purdue University, which engages over 1,850 students annually in open-ended problem solving and design. Her research focuses on the development, implementation, and assessment of model-eliciting activities with realistic engineering contexts. Diefes-Dux was a co-investigator for an NSF Gender in Science and Engineering (GSE) project that looked at the impact of engineering instruction on elementary school girls' perceptions of engineering and career aspirations. Diefes-Dux is a committee member for the National Academy of Engineering (Exploring Content Standards for Engineering Education in K–12, 2008–2010) and the Indiana Department of Education (Revision of Science Standards, 2008–2009). She received her BS and MS in Food Science from Cornell University and her PhD in Food Process Engineering from the Department of Agricultural and Biological Engineering at Purdue University.

Judy Duke

Engaging Youth through Engineering (EYE) Middle Grades Coordinator, Mobile Area Education Foundation

Judy Duke is a retired elementary and middle-grades classroom teacher. She is currently working for the Mobile Area Education Foundation as a member of the EYE Modules' writing team and as the middle grades coordinator of EYE, a K–12 STEM initiative centered on workforce development. Duke served as a master teacher for the Southeastern Consortium for Minorities in Engineering (SECME) Summer Institute for two years and as a middle-grades mathematics coach for the Mobile Mathematics Initiative for four years. She received an undergraduate degree in Elementary Education from Mobile College and a master's degree in Middle School Mathematics Education from the University of South Alabama.

Cheryl Farmer

Program Manager and Project Director, University of Texas at Austin

Cheryl Farmer is the founding program manager and project director of UTeachEngineering. Headquartered at The University of Texas at Austin, UTeachEngineering was the first engineering education program funded by the NSF's Mathematics and Science Partnership program. Under Farmer's direction, UTeachEngineering has created an innovative, research-based high school engineering design and problem-solving course, *Engineer Your World*; designed a professional development and instructional coaching model to support *Engineer Your World* teachers; and developed partnerships with national organizations to support the expansion of *Engineer Your World* opportunities for students across the nation. In addition, UTeachEngineering has designed and implemented a variety of professional programs for preservice and inservice teachers seeking to add engineering to their teaching portfolios. Prior to her role in launching UTeachEngineering, Farmer's work in higher education included the development of multidisciplinary collaborations to create support programs for university freshmen and the creation of K–12/higher education partnerships to support the integration of science and mathematics instruction through engineering-inspired applications. Before entering higher education, she worked as a project manager in the environmental field. Farmer is a recipient of the Dodd Teaching Excellence Award from the Department of Mathematics at The University of Texas at Austin. Her education includes graduate work in mathematics and business administration, and a BA in Mathematics and Liberal Arts, with highest honors, from The University of Texas at Austin.

Erin Fitzgerald

Senior Professional Development/Curriculum Associate, Museum of Science, Boston

Erin Fitzgerald is a senior professional development/curriculum associate on the Engineering is Elementary (EiE) Professional Development team, and a representative of the NSF-funded project, Engineering is Elementary: Engineering and Technology Lessons for Children. Prior to joining EiE, Fitzgerald was a corps member in Teach for America. While at Teach for America, she taught high school math in Milwaukee, Wis., in both the public and private school systems and led trainings for first- and second-year Milwaukee math teachers. She received her SB from MIT where she studied mechanical engineering and literature, and received her MEd from Marquette University in Educational Policy and Leadership with a focus in secondary math education.

Aran Glancy

Graduate Research Assistant, STEM Education Center, University of Minnesota, Twin Cities

Aran Glancy is currently the lead graduate researcher on the EngrTEAMS project. This project aims to work with practicing teachers to develop high-quality integrated STEM curricula through engineering design. The project will also investigate the effects of these curriculum units on student learning, teacher pedagogy, and teacher beliefs. In addition, Glancy is currently investigating the ways in which STEM schools interpret STEM education and integration and, as a 3M-STEM Fellow, is working with three middle school mathematics teachers to implement STEM-related activities within their mathematics classrooms. Previously, Glancy helped develop a *Framework for Quality K–12 Engineering Education* and investigated the ways in which state academic standards addressed the indicators within the *Framework*. Glancy is currently pursuing a PhD in STEM Education with an emphasis in Mathematics at the University of Minnesota, Twin Cities. He has an MEd with a focus in secondary science teacher from Lehigh University in Bethlehem, Penn. He has bachelors' degrees in Physics and Mathematics from Pennsylvania State University.

David Hammer

Professor of Education and Physics, Chair of Education, and Co-Director of the Center for Engineering Education and Outreach, Tufts University

David Hammer is chair of education, professor of education and physics, and co-director of the Center for Engineering Education and Outreach at Tufts University. He is a co-principal investigator of Integrating Engineering and Literacy, his first project in engineering education. Hammer leads the education research component on this project, which is largely focused on the dynamics of students' and teachers' framing what it is they are doing. The majority of Hammer's research concerns the learning and teaching of science (focused mostly on physics) from elementary school through university, with particular emphases on students' intuitive epistemologies, how instructors interpret and respond to student thinking, and resource-based models of knowledge and reasoning. Recently, Hammer served on the National Research Council Committee on Undergraduate Physics Education Research and Implementation. He received his BA in Physics from Princeton University and his MA from the University of California, Berkeley. He received his PhD in Science and Mathematics Education from the University of California, Berkeley.

Karen Keene

Assistant Professor of Mathematics Education, North Carolina State University

Karen Keene is a co-principal investigator of the MINDSET Project, an NSF DR K–12 project that is developing and testing the use of industrial engineering and operations research tools to teach high school mathematics. Her primary areas of interest are teaching and learning mathematics at the high school and university levels. She is particularly interested in the integration of engineering and

mathematics. She also studies secondary teachers' mathematical knowledge and its relationship to good teaching. Keene has collaborated with faculty at Michigan State University who are seeking to understand and define mathematical knowledge necessary for teaching algebra, as well as designing and facilitating professional development for middle school and high school teachers for the Promoting Rigorous Outcomes in Mathematics and Science Education (PROM/SE) project. She is an author of *Contemporary Calculus*, a reform textbook written in the 1990s at the North Carolina School of Science and Mathematics, and authored the instructor's guide for the text *Contemporary Precalculus with Applications*. Keene taught high school in regular and specialized schools for 15 years and has extensive experience in professional development for high school teachers. She earned her Bachelor's and Master's degrees in Mathematics from Butler University in Indianapolis, Ind., and her PhD in Mathematics Education from Purdue University.

Tamara Moore

Executive Co-Director of the STEM Education Center and Associate Professor of Mathematics/Engineering Education, University of Minnesota, Twin Cities

Tamara Moore's research focuses on the creation and implementation of engaging and interactive learning experiences for students through curriculum innovation. She is currently working on three NSF-supported projects. The goal of the CAREER: Implementing K–12 Engineering Standards through STEM Integration project is to implement K–12 engineering standards through STEM integration by understanding and identifying the ways in which teachers and schools implement engineering and engineering design in their classrooms. The goals of the Modeling: Elicitation, Development, and Integration & Assessment (MEDIA) project are to research the development and perception of model-eliciting activities (MEAs); research the implementation of MEAs within the electrical and computer engineering domain and within all domains that heavily use thermodynamic theories; and rewrite MEAs for application in K–12 settings. The Engineering to Transform the Education of Analysis, Measurement, and Science (EngrTEAMS) project will provide summer professional development and curriculum writing workshops to allow teachers to design curriculum units focused on science concepts, meaningful data analysis, and measurement. Moore is the co-chair of Focus on Engineering, Writing Team for the National Association for Research in Science Teaching (NARST) Position Paper for the *Next Generation Science Standards*. She was the 2006 Sloan New Faculty Fellow for the Frontiers in Education Conference in San Diego, Calif. She was also a former high school mathematics teacher. Moore received her PhD and MEd in Engineering Education and Mathematics Education, respectively, from Purdue University. She also holds a BS in Mathematics and Interdisciplinary Engineering from Purdue University.

Forster Ntow

Graduate Research Assistant, STEM Education Center, University of Minnesota, Twin Cities

Forster Ntow is a graduate research assistant (GRA) at the STEM Center at the University of Minnesota, Twin Cities. As a GRA, he has been involved in writing a curriculum aimed at integrating science, literacy, and mathematics using the engineering design process at the elementary level. He has also been a mathematics teacher at the K–12 level for nearly eight years. He is currently pursuing a PhD in Mathematics Education at the University of Minnesota.

Chell Nyquist

Project Manager, Science Learning through Engineering Design Partnership, Purdue University

Chell Nyquist is the project manager for the Science Learning through Engineering Design (SLED) Partnership, a targeted Mathematics and Science Partnership that focuses on improving science achievement among students in grades 3–6 in four partnering Indiana school corporations. Prior to joining the project, he was the instructional laboratory coordinator for the First-Year Engineering

Program at Purdue University. He was responsible for the coordination and administration of two introductory engineering courses involving 1,800 students. Nyquist earned his MS in Engineering from Purdue University and received BS degrees in Physiology and Bioengineering from the University of Illinois, Urbana-Champaign.

David Peth

Digital Media Producer and Learning Designer, WGBH

David Peth is the founder of Symbolic Studio, a digital media consulting and production company that designs learning experiences and through which Peth currently works on WGBH's Design Squad. Previously, he served as senior producer of digital media at WGBH Boston, one of the largest producers of digital and broadcast media for PBS. While at WGBH, he led the development of digital projects for Web and mobile platforms for *Curious George*, *NOVA*, *Martha Speaks*, *Design Squad Nation*—for which he received an Emmy—and others. David holds a BA from Cornell University in Developmental Psychology and Interactive Media, and an MEd from Harvard University in Technology in Education.

Susan Pruet

Director of Engaging Youth through Engineering, Mobile Area Education Foundation

Susan Pruet has been actively involved in STEM education as a teacher, teacher educator, and director of reform initiatives for more than 30 years. Since 1998, she has directed two STEM reform initiatives for the Mobile Area Education Foundation (MAEF): the Maysville Mathematics Initiative and, most recently, Engaging Youth through Engineering (EYE), a K–12 workforce development and STEM initiative in Mobile, Ala. Both initiatives involve valuable partnerships with the Mobile County Public School System, the University of South Alabama, and area business and industry. Pruet has served on a number of education boards and committees. As vice chairperson of the Alabama Mathematics, Science, Technology, and Engineering Coalition (AMSTEC), she has worked for systemic change in STEM education. She also served on the Executive Board for the American Society of Engineering Educators' (ASEE) K–12 Division. Recently, Change the Equation, a non-partisan, CEO-led commission focused on mobilizing business committees to improve the quality of STEM learning in America, recognized the Engaging Youth through Engineering modules as one of Change the Equation's STEMWorks Programs. Pruet received her undergraduate degree in Mathematics from Birmingham-Southern College, her master's degree in Secondary Education from the University of Alabama, Birmingham, and her PhD in Mathematics Education from Auburn University.

Amy Schiebel

Associate Professor in the Natural Sciences, Science Outreach Director, and K–16 Science Director, Edgewood College

Amy Schiebel's work focuses on increasing the quality of science instruction from kindergarten through college in formal and informal settings. She directs programs that create collaborations for teaching and learning science. She has worked as a curriculum design consultant for the Lawrence Hall of Science, Lab-Aids, and the Iowa City and Madison Metropolitan School Districts. Recently she has been working on a project designed to increase the accessibility of science to groups that are currently underrepresented in STEM fields. The ROSE (Resources and Opportunities in Science) Project provides programming for parents and children in the target groups. Schiebel teaches in the Biological Sciences and Chemistry, Geoscience, and Physics Departments; the School of Education; the School of Integrative Studies; and the Graduate and Professional School at Edgewood College. She runs numerous inservice workshops and sessions on effective science teaching strategies. Her most recent work is centered on the appropriate implementation of the new *Next Generation Science Standards*, with a special focus on the inclusion of engineering. She has created engineering-centered inservice programs for the Madison

Metropolitan School District and private schools in the Madison area. Schiebel holds an MAT and PhD in Science Education from the University of Iowa and a BS and MS in Geology. Prior to joining the faculty at Edgewood College, she taught science in public schools for 10 years.

Christian Schunn

Senior Scientist and Professor of Psychology, Learning Sciences and Policy, and Intelligent Systems, University of Pittsburgh

Christian Schunn is a senior scientist at the Learning Research and Development Center and a professor of psychology, learning sciences and policy, and intelligent systems at the University of Pittsburgh. He directs a number of research projects in science, engineering, and mathematics education. The BLOOM project, one of his current NSF-funded grants, brings engineering-based modules—focused on core biology topics—into mainstream high school biology instruction. The modules, designed for large-scale urban settings, will be developed by a collaborative team that brings expertise in learning sciences, engineering education, mathematics education, and biology. The project studies the ways in which teacher materials and various Web-based tools can support high-quality implementation at scale. In the past, Schunn has developed curriculum materials that used engineering design projects to teach core high school science concepts for use in urban middle schools and high schools, including biology, chemistry, and physics. He has also worked for many years with the Robotics Academy at Carnegie Mellon University on the design and evaluation of robotics curricula that teach mathematics concepts in middle school and early high school. Schunn was made a fellow of the American Association for the Advancement of Science in 2011, and served on the National Research Council and National Academy of Engineering committees for K–12 Engineering Education and K–12 Engineering Education Standards. He is also the current chair of the executive committee of the International Society for Design and Development in Education. Schunn received his BS in Psychology from McGill University and both his MS and PhD in Psychology from Carnegie Mellon University.

Kristina Tank

Graduate Research Assistant, STEM Education Center, University of Minnesota, Twin Cities

Kristina Tank's research interests are in teaching and learning of STEM content through the integration of these disciplines in K–12 classrooms. Additionally, she is researching how literacy can be used to support STEM integration in elementary classrooms. Tank is currently working as a graduate research assistant on the NSF-funded CAREER award: Implementing K–12 Engineering Standards through STEM Integration, which examines the implementation of engineering into K–12 classrooms through STEM integration. This work has led to the development of the *Framework for Quality K–12 Engineering Education*, which has been used as a tool for evaluating the degree to which academic standards, curricula, and teaching practices address the important components of a quality K–12 engineering education. Through a university-industry-school partnership, Tank has had the opportunity to work on the development and piloting of the PictureSTEM project, which provides a model of STEM integration in which literacy and engineering design facilitate meaningful learning of science and mathematics content. Tank is completing her PhD in Science Education at the University of Minnesota, with a focus in STEM integration. She has an MEd in Elementary Education from the University of Minnesota and a BS in Biopsychology and Cognitive Sciences from the University of Michigan. Tank is also a former elementary teacher.

Jessica Watkins

Postdoctoral Research Associate, Tufts University

Jessica Watkins is a postdoctoral scholar in the Department of Education and Center for Engineering Education and Outreach at Tufts University. As a researcher on the Integrating Engineering and Literacy

project, she examines how students begin to take up engineering practices and how these practices are connected to their designing. Her previous research has also focused on interdisciplinary learning environments, looking at instructional tasks and student reasoning at the intersection of physics and biology. Watkins studied Physics as an undergraduate at Rice University and completed her PhD in 2010 studying Undergraduate Physics Education at Harvard University.

Amy Wendt

Professor, University of Wisconsin-Madison

Amy Wendt is a professor of electrical and computer engineering at the University of Wisconsin, Madison. Her research focus is ionized gas discharges for a growing array of technological applications. Understanding the behavior of plasmas, how they interact with materials substrates, and implications for process and system design are the primary goals of her research. She is principal investigator of the project, Society's Grand Challenges for Engineering as a Context for Middle School STEM Instruction, an NSF-supported research effort to examine a strategy for increasing the representation of women and other underrepresented groups in college-level STEM programs. She is also the co-director of the Women in Science and Engineering Leadership Institute at the University of Wisconsin-Madison. Wendt received her PhD in Electrical Engineering and Computer Science from University of California, Berkeley, and her BS in Engineering from the California Institute of Technology (Caltech).

Robert Young

Professor of Industrial and Systems Engineering, North Carolina State University

Robert Young is the principal investigator of the MINDSET Project, an NSF DR K-12 project that is developing and testing the use of industrial engineering and operations research tools to teach high school mathematics. His interests are in fuzzy mathematics, database applications, and information system design for manufacturing. He has worked extensively with electronic and aerospace industries, both as a consultant and full-time, when on leaves of absence from academia. He has been a guest professor at universities in Denmark, Germany, and Austria, and has given workshops in Brazil, Venezuela, Germany, Russia, and South Africa. He has been working in the area of computer technology for more than 45 years and in manufacturing systems since 1975. He has published several book chapters, four books, and more than 80 articles on various aspects of manufacturing. In 1982, he was named a Young Manufacturing Engineer of the Year by the Society of Manufacturing Engineers. In 1978, he was a University Fellow with the U.S. Air Force's Integrated Computer-Aided Manufacturing (ICAM) Program, and subsequently worked on many of its projects. He is a past director of the Computer and Information Systems Division of the Institute of Industrial Engineers (IIE), in which he is a senior member. He is also a senior member of the Society of Manufacturing Engineers. He is a licensed engineer in the State of Texas. He received his BS in Engineering from the University of California, Los Angeles, and his PhD and masters' degrees in Industrial Engineering from Purdue University.