The National Academies of
SCIENCES • ENGINEERING • MEDICINE

Enhancing Science and Engineering in Prekindergarten through Fifth Grades

Meeting 1 Open Agenda

May 6, 2020

Additional information regarding the project can be found here: https://www.nationalacademies.org/our-work/enhancing-science-in-prekindergarten-through-fifth-grade

Zoom Info:
https://nasem.zoom.us/j/393915118?pwd=SmI2Q2s0SGNLT1FZd2lmYnRSMWpPQT09
Meeting ID: 393 915 118
Password: 585986

11:30 am	**Welcome and Overview of the Study** *Heidi Schweingruber*, Director, Board on Science Education *Betsy Davis*, Study Chair *Amy Stephens*, Study Director
11:45 am	**Discussion of the Charge with the Sponsors** Moderator: *Betsy Davis*, Study Chair *Jim Short*, Program Director, Leadership and Teaching to Advance Learning, Carnegie Corporation of New York *Steven Azeka*, Computational Thinking Program Officer, Robin Hood Learning + Technology Fund
12:45	**Stretch/Snack Break** If you would like a breakout room to have conversations, let staff know
1:00 pm	**Elementary Science Education: A Look at the Numbers** http://horizon-research.com/NSSME/wp-content/uploads/2019/05/2018-NSSME-Status-of-Elementary-Science.pdf Moderator: *K. Renae Pullen*, Committee Member *P. Sean Smith*, President, Horizon Research Inc.
1:45	**Walk/Stretch Break** If you would like a breakout room to have conversations, let staff know

2:15 pm **Discussion with Committee Members from Previous NASEM Study: *Science and Engineering for Grades 6-12: Investigation and Design at the Center***
https://www.nap.edu/catalog/25216/science-and-engineering-for-grades-6-12-investigation-and-design

Moderator: *Tiffany Neill*, Committee Member

Brett Moulding (co-chair), Director, Utah Partnership for Effective Science Teaching and Learning
Nancy Songer (co-chair), Drexel University
Erin Furtak (committee member), University of Colorado Boulder
Kerry Brenner (Study Director), NASEM

3:00 **Stretch/Snack Break**
If you would like a breakout room to have conversations, let staff know

3:15 pm **Computational Thinking in Prekindergarten through Fifth Grades: Defining Computational Thinking, State of the Evidence, and Promising Practices**
Moderator: *Carla Zembal-Saul*, Committee Member

Karen Brennan, Harvard Graduate School of Education
Maya Israel, University of Florida
Hilah Barbot, KIPP Foundation (in-transition)
Aankit Patel, City University of New York

4:15 pm **Adjourn**

Presenter Bios

STEVEN AZEKA is the computational thinking program officer of the Robin Hood Learning and Technology Fund. He leads the computational thinking strategy focused on elementary grades funding partners in support of both in-service and pre-service teachers. Mr. Azeka earned a B.S. in Electrical Engineering from the California Polytechnic State University, M.A. in Educational Technology from Teachers College, Columbia University, and pursuing an Ed.D. in Instructional Technology and Media from Teachers College, Columbia University.

KAREN BRENNAN is an associate professor at the Harvard Graduate School of Education, where she directs the Creative Computing Lab. Her research is primarily concerned with the ways in which learning environments can be designed to cultivate young people's creativity and agency as learners and designers. Dr. Brennan's research and teaching activities focus on constructionist approaches to designing learning environments – encouraging learning through designing, personalizing, connecting, and reflecting to maximize learner agency. She led the design and development of ScratchEd, an online environment for educators who are interested in supporting computational literacy. Dr. Brennan also received funding from the National Science Foundation for a project that documented the concepts, practices, and perspectives kids cultivate through computational design activities with the Scratch programming language. She has a B.Sc. in computer science and mathematics, a B.Ed. in computer science and mathematics, and a M.A. in curriculum studies from the University of British Columbia. Dr. Brennan completed her Ph.D. in media arts and sciences at the MIT Media Lab, where she was a member of the team that developed the Scratch programming environment.

KERRY BRENNER is a senior program officer for the Board on Science Education at the National Academies of Sciences, Engineering, and Medicine (NASEM). She is the lead staff person for the *Roundtable on Systemic Change in Undergraduate STEM Education* and for the *Symposium on Imagining the Future of Undergraduate STEM Education*. She was the study director for projects that produced the reports *Undergraduate Research Experiences for STEM Students: Successes, Challenges, and Opportunities* (2017) and *Science and Engineering for Grades 6-12: Investigation and Design at the Center* (2019). She has led the planning of workshops on *Recognizing and Evaluating Teaching of Science in Higher Education* and one on *Service Learning in Undergraduate Geosciences Education* as well as helping to organize workshops on *Increasing Student Success in Developmental Mathematics* and a Convocation on *Integrating Discovery-Based Research into the Undergraduate Curriculum*. In her past work with the NASEM Board on Life Sciences, she served as the study director for the project that *produced Bio2010: Transforming Undergraduate Biology Education for Future Research Biologist*s. As an outgrowth of that study she participated in the founding of the National Academies Summer Institutes for Undergraduate Education. Along with other projects, she has led a standing committee for the U.S. Department of Defense on Medical Technologies, multiple studies related to microbiology and biosecurity, and one on the decision making process for reopening facilities contaminated in biological attacks. She earned her bachelors' degree from Wesleyan University in Middletown, CT and her Ph.D. in Molecular Biology from Princeton University.

ERIN MARIE FURTAK is professor of science education and associate dean of faculty in the school of education at the University of Colorado Boulder. Previously, she was a public high school biology and earth science teacher. Her current research focuses on how to support secondary science teachers in improving 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 school district. She received the Presidential Early Career Award for Scientists and Engineers in 2011 and the German Chancellor Fellowship from the Alexander von Humboldt Foundation in 2006. She served on the National Academies of Sciences, Engineering, and Medicine's committee that developed *Science and Engineering for Grades 6–12: Investigation and Design at the Center*. She earned 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 science education from Stanford University.

MAYA ISRAEL, Ph.D. is an Associate Professor of Educational Technology at the University of Florida. She is also the director of the Creative Technology Research Lab (CTRL). Prior to entering higher education, Dr. Israel was a special education teacher. Her research focuses on studying instructional practices that support students with disabilities in K-12 computer science education. She is the PI on an NSF grant examining instructional strategies that support struggling learners in engaging in computing instruction and another NSF STEM+C grant that is studying the relationship between computational thinking and elementary mathematics instruction. Dr. Israel was a writer on the Framework for K-12 Computer Science Education and the revisions of the Computer Science Teachers Association (CSTA) Standards for Computer Science Teachers. Lastly, Dr. Israel also works with multiple school districts on meaningfully including all learners in computer science education initiatives.

BRETT MOULDING is the director of the Partnership for Effective Science Teaching and Learning. He was the state of Utah science education specialist and coordinator of curriculum from 1993 to 2004 and then director of curriculum and instruction until 2008. He taught chemistry for 20 years at Roy High School in the Weber District Science and served as the district teacher leader for 8 years. He also served on the board of the Triangle Coalition, the National Assessment of Educational Progress 2009 Framework Committee, and as president of the Council of State Science Supervisors from 2003–2006. He has received the Governor's Teacher Recognition Award, the Presidential Award for Excellence in Mathematics and Science Teaching, the Award of Excellence from the Governor's Science and Technology Commission, and the National Science Teachers Association's Distinguished Service to Science Education Award. He served on the National Academies of Sciences, Engineering, and Medicine's committee that developed *the Framework for K–12 Science Education* and was co-chair for the recent consensus report on *Science and Engineering for Grades 6–12: Investigation and Design at the Center*, as well as on three committees related to education at the National Aeronautics and Space Administration. He was a member of the Board on Science Education from 2005–2011. He was a lead writer on the Next Generation Science Standards and currently provides

professional development for teachers throughout the nation. 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.

AANKIT PATEL recently joined the City University of New York (CUNY) as Director of STEM Education Programs to support the development STEM education at CUNY's fifteen senior and community college schools of education and the growth of CS education broadly at the university. Previously he was senior director of computer science academics at New York City Department of Education, leading the strategy and implementation of the $81 million dollar public-private Computer Science for All initiative to bring CS ed to every school K-12. He is co-PI on two NSF grants to bring equitable AP computer science courses to NYC high schools.

JIM SHORT is the Program Director for Leadership and Teaching to Advance Learning at the Carnegie Corporation of New York. His work focuses on building the capacity of teachers and system leaders to implement new college and career-ready standards. The portfolio invests in the development of high-quality instructional materials and curriculum-based professional learning for teachers and instructional leaders. Building on the Corporation's support for new science standards, Jim launched the OpenSciEd initiative in 2018 focused on the implementation of the Next Generation Science Standards in ten states. Prior to Carnegie Corporation, Jim was the founding Director of the Gottesman Center for Science Teaching and Learning at the American Museum of Natural History in New York City. His experience in education also includes teaching secondary science as well as graduate courses in science education, director of the National Academy for Curriculum Leadership at BSCS Science Learning, and district science coordinator for Denver Public Schools.

PATRICK SEAN SMITH is the President of Horizon Research, Inc. (HRI). Prior to joining HRI in 1991, he taught high school chemistry and physics. In addition, he was a member of the Education Studies Department at Berea College, where he taught courses in elementary science methods and the philosophical foundations of education. Smith also worked extensively on materials development for Project Earth Science, a middle-grades earth science project, authoring or co-authoring three widely used collections of earth science activities published by the National Science Teachers Association. He previously worked on the evaluation of the National Science Foundation (NSF) funded Statewide Systemic Initiatives for North and South Carolina, and was the project manager for the 2000 National Survey of Science and Mathematics Education (NSSME). He was the Principal Investigator (PI) of ATLAST (Assessing Teacher Learning About Science Teaching), a project that created instruments that are widely used by researchers and evaluators to measure teacher and student science content knowledge, and was also the PI for the NSF-funded Knowledge Assets to Support the Science Instruction of Elementary Teachers (ASSET) project. He was a co-PI on three NSF-funded projects: Assessing the Impact of the MSPs: K-8 Science (AIM: K-8 Science); Investigating Teachers' Learning, Practice, and Efficacy Using Educative Curriculum Materials (ELECTS); and the 2012 NSSME. He is currently co-PI for the 2018 NSSME+, and also leads the evaluations of several research projects in science education. Smith received a Bachelor's Degree in Chemistry, a Master's Degree in Science Teaching, and a Ph.D. in Curriculum and Instruction from the University of North Carolina at Chapel Hill.

NANCY SONGER is a distinguished university professor in the School of Education at Drexel University and a 2019-20 Fulbright Scholar with the Ministry of Science, Technology, Innovation and Communication, Brazil. Prior to this, she was a professor of science education and learning technologies at the University of Michigan for 18 years and the director of the Center for Essential Science. Her areas of expertise include international STEM education, urban education, and educational assessment. Current research focuses on the design of education innovations for promoting critical thinking, agency, and the design of environmental solutions. 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. Songer served as co-chair of the National Academies of Sciences, Engineering, and Medicine's Committee on *Science and Engineering for Grades 6–12: Investigation and Design at the Center*, and she was a member of the National Academies' committee on *Developing a Framework for the Assessment of Science Proficiency in K–12*. Songer earned a bachelor's degree in biological sciences from the University of California, Davis, master's degree in developmental biology from Tufts University, and doctorate degree in science education and learning technologies from the University of California, Berkeley.