



Briefing Book

The 2011 REESE PI Meeting provides over 200 investigators and agency staff with opportunities to share expertise and findings relevant to the achievement of the objectives of the REESE program and the research projects it supports. In response to feedback on the 2010 PI meeting, the majority of the formal program is being conducted in concurrent sessions addressing topics of particular interest to investigators and program officers. Each session is designed to provide ample time for Q&A with members of expert panels and discussion among all those present. We look forward to your active participation in the meeting, and have prepared this briefing book to stimulate your thoughts and questions. Please visit the ARC website after the meeting to access an online version of this briefing book, which will be updated to include links to copies of presentations and additional materials.

Thank you

This briefing book was prepared by:

Kevin Brown

Jen Hanis-Martin

Sarah-Kathryn McDonald

Barbara Schneider

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Agenda

DAY 1

THURSDAY October 20, 2011

8:00-8:50am	REGISTRATION & CONTINENTAL BREAKFAST	<i>2nd Floor Foyer</i>
8:50-9:15am	Welcome and Introductions	<i>Salons I & II</i>
9:15-10:15am	Plenary with Susan Carey	<i>Salons I & II</i>
10:30-12:30pm	Concurrent Sessions #1	
	What's the Score? Evidence For and Against Gaming as a Means of Learning and Motivation	<i>Diplomat Room</i>
	Mind, Brain, and Learning: Executive Function and Beyond	<i>Salons I & II</i>
	Research on Inclusion in STEM Fields	<i>Plazas C & D</i>
12:30-2:30pm	POSTER SET-UP AND LUNCH ON YOUR OWN	<i>2nd Floor Foyer & Salon III</i>
12:30-1:15pm	<i>WORKSHOP: Design and Analysis of Clustered Randomized Experiments in Education</i>	<i>Plazas C & D</i>
1:30-2:30pm	<i>WORKSHOP: The Online Variance Almanac (Web VA)</i>	<i>Diplomat Room</i>
2:30-4:30pm	Concurrent Sessions #2	
	How People Learn ... Part Two?	<i>Diplomat Room</i>
	Innovative Approaches to Assessment in STEM Education	<i>Salons I & II</i>
	Collaborations between Engineering and Cognitive Science: What Do We Have to Learn?	<i>Plazas C & D</i>
4:30-6:30pm	POSTER SESSION & RECEPTION	<i>2nd Floor Foyer & Salon III</i>

DAY 2

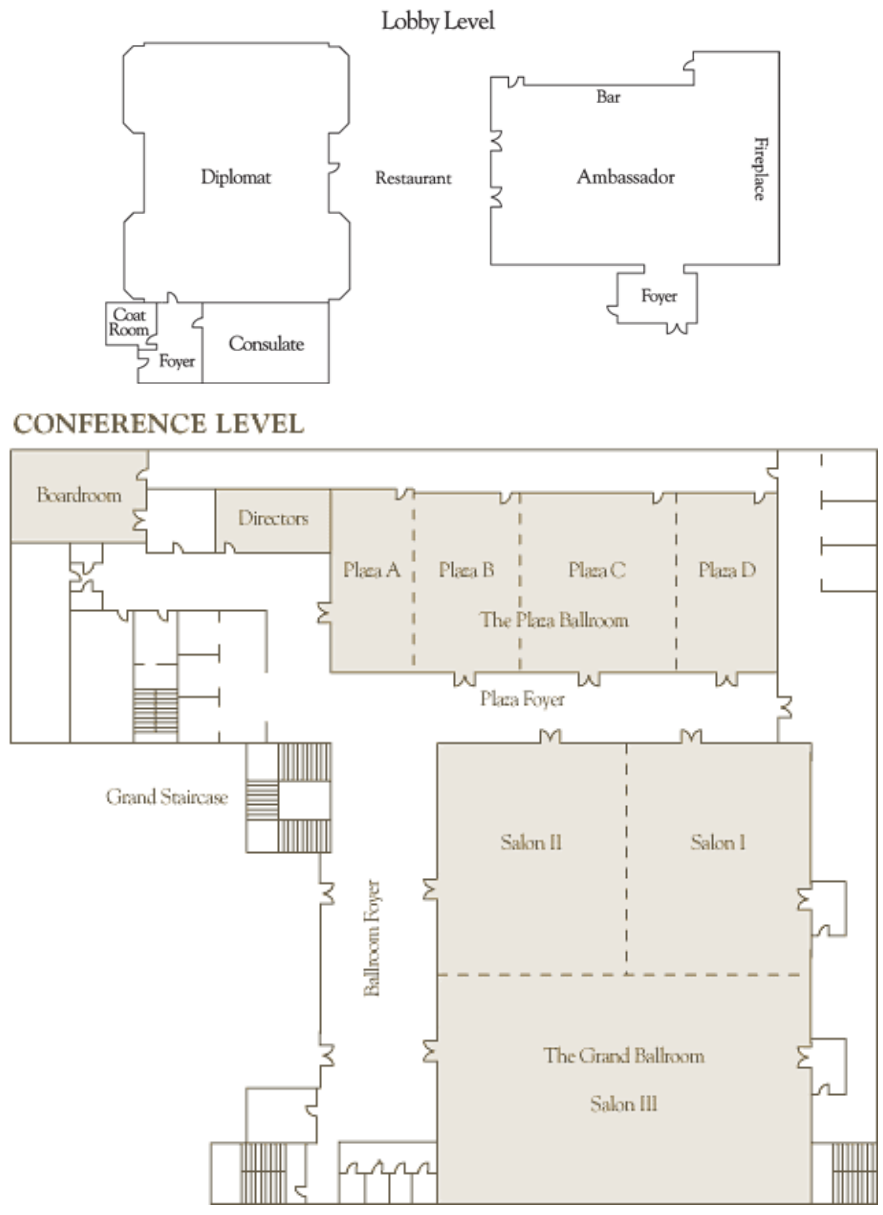
FRIDAY October 21, 2011

8:00-9:00am	REGISTRATION & CONTINENTAL BREAKFAST	<i>2nd Floor Foyer</i>
9:00am-11:00am	Concurrent Sessions #3	
	From Scientific Inquiry to Practices of Science in Science Standards	<i>Diplomat Room</i>
	Motivation, Engagement, and STEM Learning	<i>Salons I & II</i>
	Developing a World Class Workforce: Human Capacity Building in Postsecondary STEM Education	<i>Plazas C & D</i>
11:00-11:15am	BREAK	
11:15-12:30pm	Plenary with Diane Souvaine	<i>Salons I & II</i>
12:30-2:30pm	POSTER SESSION & BUFFET LUNCH	<i>2nd Floor Foyer & Salon III</i>
2:30-3:00pm	News from Washington, NSF, and the REESE Program	<i>Salons I & II</i>
3:00pm	ADJOURN	

Floor Plans

The 2011 REESE PI meeting is taking place at the Ritz-Carlton, Pentagon City. Hotel contact information and floor plans of the main meeting space were found and are also available online at <http://www.ritzcarlton.com/en/Properties/PentagonCity/Meetings/RoomDetails/Default.htm>.

The Ritz-Carlton, Pentagon City
1250 South Hayes Street
Arlington, VA 22202
USA
Phone: (703) 415-5000
Fax: (703) 415-5061
<http://www.ritzcarlton.com/en/Properties/PentagonCity/Default.htm>



PI Lounge

Plaza B

A PI Lounge is located in the *Plaza B* meeting room on the Conference level of the hotel, adjacent to the on-site meeting registration desk. The PI Lounge will be open for your use from 8:00am to 3:00pm on Thursday and Friday. Tables are provided for informal meetings with program officers and REESE colleagues.

The PI lounge is also where you will find internet availability. Several wired broadband hookups will be available but no computers are provided, so please bring your own laptop. Please note that printers are not provided in the PI Lounge; if you need to print, please use the hotel's 24 hour business center, also located on the Conference level.

Poster Hall

Salon III

About the Poster Session

A complete index of REESE posters is included in your on-site registration packet. Posters are arranged alphabetically, by *the presenter's surname*; in the case of posters with multiple authors, posters are indexed only under the first presenter's name. Each poster has been assigned a number. To facilitate communication among projects, presenters of even-numbered posters are asked to present their work for the **first** hour of each poster session, presenters of odd-numbered posters to present their work for the **second** hour of each session. Please note there is a two-hour poster reception from 4:30-6:30pm on Thursday, and a two-hour poster session and buffet lunch from 12:30-2:30pm on Friday.

Setting up posters

First authors on all posters will find their poster number assignments on the personalized agenda included in your registration packet. Upon entering Salon III, you will find numbered display boards, with low numbers located on the left side of the room (see figure below). Time is allotted on Thursday for mounting posters (during the 12:30-2:30pm lunch time break). For those who have registered for one of the Thursday workshops, the poster hall will also be available for set-up during the Thursday morning registration and breakfast period. Clear pushpins will be available in Salon III; should you require any help mounting your poster, please see a member of the ARC Team.



At the end of the Friday poster session....

In order to maximize the amount of time attendees have to learn about their REESE colleagues' work, presenters are asked to leave their posters in the hall through 2:30 p.m. on Friday, October 21st. Presenters who have to leave before the end of the conference and who wish to keep their posters should feel free to remove their posters early. **PLEASE NOTE** that any posters left in the hall after 3:30 p.m. on Friday will be discarded, and unfortunately ARC is not able to assume responsibility for shipping posters back to projects.

THURSDAY OCTOBER 20TH**8:00-8:50AM****Registration and continental breakfast**
*2nd Floor Foyer***Networking***Plaza B*

Program officers (as available) meet with PIs

8:50-9:15AM**Welcome and meeting overview***Salons I & II***Barbara Schneider**, ARC and Michigan State University

Barbara Schneider is the John A. Hannah Chair and Distinguished Professor in the College of Education and Department of Sociology at Michigan State University. Dr. Schneider is the principle investigator of the College Ambition Program (CAP), a study that tests a model for promoting a STEM college-going culture in two high schools that encourages adolescents to pursue STEM majors in college and occupations in these fields. She is also co-principal investigator of the Michigan Consortium for Educational Research (MCER), a collaboration between the Michigan Department of Education, Michigan State University, and the University of Michigan created to assess the implementation and impact of two key reforms in Michigan that were designed to work in tandem to promote college attendance and workplace success. Dr. Schneider also worked for 18 years at the University of Chicago, holding positions as a Professor in Sociology and Human Development and as a senior researcher at NORC. Currently she continues to hold an appointment as a senior fellow at NORC, where she is the principal investigator of the Center on Advancing Research in Communication in Science Technology, Engineering, and Mathematics. She uses a sociological lens to understand societal conditions and interpersonal interactions that create norms and values that enhance human and social capital. Her research focuses on how the social contexts of schools and families influence the academic and social well being of adolescents as they move into adulthood. Professor Schneider has published 15 books and over 100 articles and reports on family, social context of schooling, and sociology of knowledge. She recently was the editor of *Sociology of Education*. She received her Ph.D. from Northwestern University.

9:15-10:15AM

Plenary with Susan Carey

Bootstrapping and Conceptual Change

Salons I & II

Introduction:

Joan Ferrini-Mundy, National Science Foundation

ABOUT THE SPEAKERS:

Susan E. Carey is current Chair of the Department of Psychology at Harvard University. She received her PhD from Harvard University, taught at MIT (25 years), NYU (5 years) and joined the Harvard Psychology Department in 2001. Her research concerns conceptual development. Case studies of concepts of number, living things, matter, heat, causality, and agency have uncovered rich innate representational systems, as well as radical discontinuities in the course of knowledge acquisition. She seeks to characterize the bootstrapping processes that underlie conceptual change, and her work spans research on human infants and non-human animals, studies of typically and atypically developing children, and adults, and case studies of conceptual change in the history of science. Her work has been recognized by many honors, including election to the National Academy of Science, the receipt of the Rumelhart Prize for theoretical work in cognitive science, and the award of the APA distinguished scientist award.

Joan Ferrini-Mundy is Assistant Director of the National Science Foundation (NSF) for Education and Human Resources, a position she has held since February 2011, and is responsible for management of the NSF Directorate for Education and Human Resources. She serves as a member of the NSF senior management team and is involved in strategic planning and leadership for the scientific and education mission of the NSF. Prior to her appointment as assistant director, she had served the Foundation in a number of management capacities since 2007. In connection with her agency-wide responsibilities, Dr. Ferrini-Mundy serves as NSF's science, technology, engineering, and mathematics (STEM) workforce development goal leader for the Office of Management and Budget's Priority Goal Initiative. From 2007 through January 2010, she was a member of the National Science and Technology Council's (NSTC) Subcommittee on Education, and currently serves on two task forces of the NSTC Committee on STEM Education. She is currently a member of the Mathematics Expert Group of the Programme for International Student Assessment (PISA) commissioned by the Organisation for Economic Cooperation and Development (OECD), and in 2007-2008, representing NSF, she served as an ex officio member of the President's National Mathematics Advisory Panel, and co-chaired its Instructional Practices Task Group. Ferrini-Mundy holds an appointment at Michigan State University (MSU) as a University Distinguished Professor of Mathematics Education in the Departments of Mathematics and Teacher Education. Her research interests include calculus teaching and learning, mathematics teacher learning, and mathematics and science education policy at the K-12 level. Ferrini-Mundy holds a PhD in mathematics education

from the University of New Hampshire.

10:30AM-12:30PM

Concurrent session

MIND, BRAIN, AND LEARNING: EXECUTIVE FUNCTION AND BEYOND

Salons I & II

ABOUT THE SESSION:

This session will describe some of the exciting work of REESE PIs on the construct “Executive Function” and explore the implications it has, both near-term and far-term, for educational research and practice. In tying advances from neuroscience to computational modeling to cognitive science to assessment to science education research to practice and policy, it is a strong example of the possibilities that can arise in intellectually motivated interdisciplinary collaboration. ORGANIZER: Gregg Solomon, National Science Foundation

Panelists

Alexandre Pouget, Principal Investigator, “A Bayesian Approach to Number Reasoning”

Deborah Zaitchik, Principal Investigator, “The Role of Individual Differences in Executive Function on the Child’s Acquisition of Intuitive Biology”

David Grissmer, Principal Investigator, “New Kindergarten Readiness Indicators for Math and Science: Next Steps in Validation, Communication, and Projecting Policy Impacts”

Moderator

John Bruer, President, James S. McDonnell Foundation

ABOUT THE SPEAKERS:

John T. Bruer has been president of the James S. McDonnell Foundation in St. Louis since 1986. The foundation awards over \$25 million annually to support biomedical research, education, and international projects. Bruer holds degrees in philosophy from the University of Wisconsin- Madison, Oxford University, and Rockefeller University. Bruer’s book *Schools for Thought: A Science of Learning in the Classroom* (MIT Press, 1993) received the 1993 Quality in Educational Standards Award and the 1994 Charles S. Grawemeyer Award in Education. His book *The Myth of the First Three Years* (Free Press 1999) received the 2000 Eleanor Maccoby award from the American Psychological Association. He is Adjunct Professor of Philosophy at Washington University and a member of the National Science Board.

David Grissmer holds a Ph.D. in physics and is currently a principal scientist at the Center for Advanced Study of Teaching and Learning (CASTL). Previously he was a senior management scientist at RAND Corporation for 27 years where his focus was using quantitative techniques from statistics, econometrics, operations research and actuarial science to analyze public policy problems. His current research focuses on the developmental origins and evolution of achievement score gaps using empirical evidence from the Early Childhood

Longitudinal Survey of Kindergarteners and a Birth Cohort (ECLS-K and ECLS-B) to test hypotheses about early developmental and academic predictors of much later achievement. The results from this analysis suggesting that early fine motor skills is as strong a predictor as executive function measures for later math led to an experimental intervention testing whether improvements in fine motor skills would improve other developmental and academic measures including executive function and math. The work also involves linking evidence from neuroscience that might suggest the causal mechanisms involved in the links between early measures and later cognitive function.

Alexandre Pouget is a full professor in the department of Brain and Cognitive Sciences at the University of Rochester where he leads the computational cognitive neuroscience laboratory. His research is concerned with theories of representation and computation in neural circuits. Over the last 15 years, he has focused primarily on probabilistic theories, which posit that knowledge takes the form of probability distributions and that new knowledge is acquired via probabilistic inferences. This approach has the advantage that it allows robust computation in the presence of uncertainty, a situation that arises in almost all real-life computations. He is currently applying this framework to a wide range of topics including olfactory processing, spatial representations, sensory motor transformations, multisensory integration, perceptual learning, attentional control, decision making, causal reasoning and more recently simple arithmetic.

Deborah Zaitchik is a Research Associate in the Psychiatry dept of MGH and the Psychology Dept at Harvard, and an Asst Professor at Harvard Medical School. She is interested in conceptual change -- how concepts are acquired in early childhood, and how they are impaired in elderly and AD patients. Currently, in collaboration with Susan Carey, she is investigating the role of the Executive Functions in the development of intuitive biology.

10:30AM-12:30PM

Concurrent session

WHAT'S THE SCORE? EVIDENCE FOR AND AGAINST GAMING AS A MEANS OF LEARNING AND MOTIVATION

Diplomat Room

ABOUT THE SESSION:

This session will focus on a critical analysis of what games can and cannot do and the evidence supporting this. The foci include the role of engagement, affect and learning. ORGANIZER: James Dietz, National Science Foundation

Presenters

Robert Hone, Principal Investigator, "Optimizing Student Performance in Educational Games through Adaptive Challenges"

Jill Denner, Principal Investigator, "The Development of Computational Thinking among Middle School Students Creating Computer Games"

David Kanter, Principal Investigator, "Investigating the Capacity of Game-based Design Elements to Enhance Affective Dimensions of Genetics Learning"

Discussant

Janice Gobert, Principal Investigator, “Using Automated Detectors to Examine the Relationships Between Learner Attributes and Behaviors During Inquiry in Science Microworlds” and “AMI: ASSISTments Meets Inquiry”

Moderator

James S. Dietz, National Science Foundation

ABOUT THE SPEAKERS:

Jill Denner is a Senior Research Scientist at *Education, Training, Research Associates*, a non-profit organization in California. She earned her PhD in Developmental Psychology in 1995. She does applied research in K-12 settings, with a focus on increasing the number of women and Latino/a students in computing. Her current focus is on how middle school students learn while creating computer games, the development of computational thinking, and the role of peers and families in children’s educational pathways. As part of a long-standing commitment to bridge research and practice, her research is designed and conducted in collaboration with university-based computer scientists, schools, and community-based agencies. Dr. Denner has been PI on many NSF grants, written numerous peer-reviewed articles, and co-edited two books: *Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Gaming*, published by MIT Press in 2008, and *Latina Girls: Voices of Adolescent Strength in the US*, published by NYU Press in 2006.

James Dietz is a Program Director in the Division of Research on Learning of the National Science Foundation. His work focuses on education and learning research chiefly in the context of evaluation, policy, and sociology of education and science. Dietz joined NSF in 1989 as a Presidential Management Fellow. During this period he served as a staff member in the US House of Representatives, Committee on Science and Technology where, among other duties, he authored legislation that was signed into law by President George H.W. Bush. Dietz holds a Ph.D. from the Georgia Institute of Technology in Science and Technology Policy and a Master’s in Public Administration degree in science policy from Syracuse University’s Maxwell School for Citizenship and Public Affairs. He earned his baccalaureate in Public Policy and US History from the Rockefeller College of the University of Albany, State University of New York. Dietz’s research interests and publications focus on the sociology of science, research evaluation, diffusion of innovation and knowledge transfer, social and human capital theory, evaluation and research methods, organizational theory, and education and human resources. Dietz is past US representative to the Group of Eight Nations Working Group on Research Assessment and is a member of the Policy Board of the Association of Public Policy Analysis and Management (APPAM). He currently is an Adjunct Professor of Public Policy at the Georgia Institute of Technology.

Janice Gobert is an Associate Professor of Learning Sciences and Psychology in

the Department of Social Sciences and Policy Studies and the Department of Computer Science. She is the Co-director of the Learning Sciences and Technologies Program. Her Ph.D. from the University of Toronto (1994) is in Cognitive Science; her Masters is from McGill University, also in Cognitive Science. Her specialty is in technology-based with visualizations and simulations in scientific domains; her research areas are: intelligent tutoring systems for science, skill acquisition, performance assessment via log files, learning with visualizations, learner characteristics, and epistemology. Before coming to WPI, Janice was an Assistant Professor at Western Michigan University, a Visiting Scholar at Harvard University's School of Education, and Senior Research Scientist at the Concord Consortium (www.concord.org). Until December 2007, Janice served as North American Editor for the *International Journal of Science Education*. She has been principal investigator on many projects, which address technology-based science learning and assessment.

Robert Hone is Creative Director and President of Red Hill Studios. As Creative Director of Red Hill, Bob oversees the production and development activities of the company's portfolio of educational games, health games, and museum exhibitions. He is the Principal Investigator of four continuing grants totaling \$2.2 million from the NSF and NIH to develop serious games for education and health. He is currently conducting research on educational game design with PBSKids on *Lifeboat to Mars* – an online game at pbskids.org that allows children to design their own versions of the games (mods) for other children to play and rate. Bob is a frequent speaker on game design – presenting to diverse audiences including federal officials, informal science education specialists, game designers, physical therapists, schizophrenia researchers, and neuropsychologists investigating multiple sclerosis. He founded Red Hill Studios in 1991 after a distinguished career as an award-winning PBS science journalist (Peabody, Emmy, AAAS awards). Rob has won nearly every award possible in the field of educational software including a Codie, the Prix Mobius award, a Muse Award, several Cine Golden Eagles, Communication Arts, numerous Invision Awards, and several National Education Media Network awards. His design efforts span large-scale (5,000 sq ft) museum exhibitions, educational online games, international documentary television specials, and health games. His current energy focuses on the integration of consumer videogame design approaches with educational and health games.

David Kanter, Ph.D., joined the New York Hall of Science (NYSCI) in September of 2010 as the inaugural Director of the Sara Lee Schupf Family Center for Play, Science, and Technology Learning (SciPlay). SciPlay is an applied research center within the hands-on science museum that designs, develops, and studies environments, and curricula that harness the potential of play to enhance all students' understanding of and deeper engagement in science. Kanter joined NYSCI from Temple University where he was an Assistant Professor in Curriculum, Instruction and Technology in Education (Science Education) and in Biology. Kanter received Bachelor of Science degrees in Engineering and in Economics from the University of Pennsylvania, followed by a Ph.D. in Biomedical Engineering from the Johns Hopkins University School of Medicine.

He then received an NSF fellowship for training Ph.D. scientists in science education research, which he completed in the Learning Sciences at Northwestern University. Kanter has led several federally-funded studies on technology-enhanced project-based science curriculum design, and the pre-service and in-service teacher preparation necessary to teach such curricula. His recent work has been published in the *Journal of Engineering Education*, *New Directions in Teaching and Learning*, and *Science Education*. Kanter's new National Science Foundation-funded projects include "SciGames: A Technology-enhanced Model for Bridging Informal and Formal Science Learning" and "GenetiGames: Investigating the Capacity of Game-based Design Elements to Enhance Affective Dimensions of Genetics Learning."

10:30AM-12:30PM

Concurrent session

RESEARCH ON INCLUSION IN STEM FIELDS

Plazas C & D

ABOUT THE SESSION:

NSF strategies for broadening participation in the STEM workforce are based on innovative research and education programs. These activities emphasize equity in opportunity, eliminating stereotypes and identifying and encouraging participants with non-traditional demographics and experiences. Current research includes attention to the inclusion of the gender, race and disability in achievement and the impact of a variety of other personal and environmental factors on persistence in STEM. This session will include discussions of research across these areas and the implications of findings for transforming the diversity of STEM professionals.

Presenters

Catherine Good, Principal Investigator, "Gender Differences in the Foundations of Sense of Belonging: Effects on Achievement, Aspirations and Learning in STEM Disciplines"

Valerie Purdie-Vaughns, Principal Investigator, "Reducing the Racial Achievement Gap in STEM: A Social-Neurobiological Investigation and Values-Affirmation Intervention"

Chandra Muller, Principal Investigator, "Students with Learning Disabilities: STEM Pathways in the Social Context"

Moderator

Mark Leddy, National Science Foundation

ABOUT THE SPEAKERS:

Catherine Good is an assistant professor and the director of the Social Psychology Lab in the Department of Psychology at Baruch College, City University of New York. Dr. Good's research focuses on the social forces that shape academic achievement, intellectual performance, motivation, and self-image, particularly for females in STEM fields. In particular, her lab focuses not

only on how negative stereotypes contribute to females' underachievement and under-representation in STEM fields, but also on methods of helping females overcome vulnerabilities to the ability-impugning stereotypes. Her most recent work examines both the ways in which negative stereotypes and views about the nature of intelligence can undermine female students' sense of belonging to STEM disciplines, and also how one's sense of belonging can, in turn, affect females' achievement and intrinsic motivation. The results of this work, entitled *Why Do Women Opt Out? Sense of Belonging and Women's Representation in Mathematics*, are in press in the *Journal of Personality and Social Psychology*. She is currently expanding on these findings by investigating the foundation upon which one's sense of belonging may be based: having strong social connections, attaining high achievement, or being engaged with and putting effort into one's studies. Her research, conducted both in controlled laboratory settings and with middle school mathematics students, tests the hypothesis that a sense of belonging based on effort and engagement will be most protective against the impact of negative stereotypes and messages about the fixed nature of math intelligence.

Mark Leddy, PhD, is a Program Officer in the NSF's Division of Human Resource Development. He has led the Research in Disabilities Education (RDE) program since 2007. The RDE program has funded research and implementation awards to increase the participation and achievement of students with disabilities in science, technology, engineering, and mathematics. Dr. Leddy is currently the Co-Chair of the Interagency Committee on Disability Research's (ICDR) Interagency Subcommittee on Education. Before joining the NSF, Dr. Leddy was an Associate Scientist in the Department of Communicative Disorders at the University of Wisconsin-Madison.

Chandra Muller is a professor of sociology at the University of Texas at Austin. Her research focuses on pathways from high school through postsecondary education with an emphasis on the STEM fields. Using large-scale quantitative analyses, her goal is to understand how to increase participation and diversity—with respect to race and ethnicity, gender, disability status, and socioeconomic background—in STEM fields. In addition to her project "The STEM Pipeline and Students with Learning Disabilities," she is PI on two NSF STEP studies ("STEM in the New Millennium: Preparation, Pathways and Diversity" and "Feasibility Study of Dissemination of Knowledge from STEP Type 1 Projects") and a grant from the National Institute of Child Health and Human Development (NICHD), "Education and the Transition to Adulthood," which is collecting, coding and analyzing the college transcripts of National Longitudinal Study of Youth, 1997 sample members.

Valerie Purdie-Vaughns is an assistant professor in social psychology at Columbia University and Director of the Intergroup Relations and Diversity Laboratory (IRDL). She is also a research fellow at the Columbia University Institute for Research on African-American Studies (IRAAS). Dr. Purdie-Vaughns is recognized nationally and internationally as an expert on racial and gender achievement gaps in academic and workplace settings and how stigma undermines academic

performance. She conducts research on other forms of stigma including: stigma and LGCTQ groups, stigma of mental illness, and stigma based on multiple identities (intersectionality). Dr. Purdie-Vaughns has authored numerous publications that have appeared in journals such as *Science*, *Psychological Science*, and *Journal of Personality & Social Psychology*. She has been awarded numerous grants from the *National Science Foundation (NSF)*, *Russell Sage Foundation* and *William T. Grant Foundation*. Her most recent grant from NSF examines how stigma may affect activation of the neuroendocrine and sympathetic nervous systems, systems implicated in immune responses that affect long-term health and cognitive performance. Previously, Dr. Purdie-Vaughns served on the faculty at Yale University. She completed her doctoral work in psychology at Stanford University in 2004 as a student of Dr. Claude Steele.

12:30-2:30PM

Poster set-up and Lunch [on your own]

2nd Floor Foyer & Salon III

Networking

Plaza B

Program officers (as available) meet with PIs

Technical assistance

ARC staff are available for technical assistance consultations. Please contact ARC to schedule an appointment.

12:30-1:15PM

WORKSHOP

DESIGN AND ANALYSIS OF CLUSTERED RANDOMIZED EXPERIMENTS IN EDUCATION

Plazas C & D

ABOUT THE WORKSHOP:

In this workshop we will focus on two- and three-level cluster randomized designs (e.g., schools/clusters are randomly assigned to treatments) and we will discuss the sampling and nesting involved in such designs. As part of this discussion, we will review power analysis methods for these designs. Finally, we will briefly illustrate approaches to the analysis of two- and three-level cluster randomized data.

Presenters

Spyros Konstantopoulos, Michigan State University

Kimberly Maier, Michigan State University

ABOUT THE PRESENTERS:

Spyros Konstantopoulos is associate professor and program director of measurement and quantitative methods at the department of counseling,

educational psychology, and special education at the College of Education at Michigan State University. He received his MS in statistics and his Ph.D. in research methods from the University of Chicago. His research interests include the extension and application of statistical methods to issues in education, social science, and policy studies. His methodological work involves statistical methods for quantitative research synthesis (meta-analysis) and mixed effects models with nested structure (multilevel or hierarchical linear models). His substantive work encompasses research on class size effects, teacher and school effects, program evaluation, labor market performance of young adults, and the social distribution of academic achievement. In 2002, he received the Palmer O. Johnson Award from the American Educational Research Association, and the Harold E. Mitzel Award for meritorious contribution in educational practice through research. He is an IZA research fellow and a member of the Society for Research Synthesis. His research has been funded by the National Science Foundation and the Institute of Education Sciences. He has published in journals such as the *American Journal of Education*, the *American Educational Research Journal*, *Educational Evaluation and Policy Analysis*, the *Elementary School Journal*, *Teachers College Record*, *Journal of Research on Educational Effectiveness*, *Evaluation Review*, and *Multivariate Behavioral Research*. He serves as the associate editor of the *Journal of Research on Educational Effectiveness* and the *Journal of Research Synthesis Methods*.

Kimberly Maier is an assistant professor of Measurement and Quantitative Methods who is interested in the development of statistical models for complex data structures. Her current research focuses on the application of multilevel item response theory to educational achievement measures and attitudinal surveys. Other areas of interest include Bayesian data analysis methods for educational research, the study of family impacts on adolescent achievement and aspirations, adolescent motivation in science and mathematics education, and the application of multilevel models to policy research.

1:30-2:30PM

WORKSHOP

THE ONLINE VARIANCE ALMANAC (WEB VA)

Diplomat Room

ABOUT THE WORKSHOP:

Assigning groups to treatment conditions is increasingly common in social science research. In education, the groups assigned are often schools. Student achievement may vary systematically across schools. When it does, the intraclass correlation coefficient (ICC) measures how closely students within schools resemble each other with respect to their academic achievement. These ICCs are a key input to statistical power analyses (see Hedges & Hedberg, 2007). Developed by ARC Investigator Larry V. Hedges with support from the National Science Foundation, the *Variance Almanac of Academic Achievement (VA)* is a compendium of ICCs and related variance components from a variety of U.S. national datasets that span kindergarten through the 12th grade. This compendium provides information for designing experiments that have

adequate statistical power and precision to identify the effects of interventions on learning and instruction in specific locales. In this workshop Hedges and Eric Hedberg will provide information on how to access and use these resources to calculate statistical power for cluster randomized trials using an ARC online interface they developed, the *Web VA*.

Presenters

Larry V. Hedges, ARC and Northwestern University

Eric C. Hedberg, NORC at the University of Chicago

ABOUT THE PRESENTERS:

Eric C. Hedberg, a Research Scientist with NORC at the University of Chicago, has worked on a number of large-scale research projects in education involving analyses of: raw data from state education agencies, federal data, and survey data (including NELS-88, National Longitudinal Survey of Youth, ECLS, Trends in International Mathematics and Science Study, and the National Assessment of Educational Progress state and federal data). Eric has experience and expertise both in managing data (e.g., conditioning raw administrative data into research databases appropriate for policy analysis) and designing rigorous scientific studies of education data. A source of technical assistance for projects supported by the Interagency Education Research Initiative (through the Data Research and Development Center) and by REESE (through ARC), Eric has served as methodologist for numerous research projects, including an evaluation of the Growth Model Pilot Project conducted by NORC for the U.S. Department of Education's Office of Planning, Evaluation, and Policy Development, estimating the effect of growth models on AYP determinations for schools in nine states.

Larry V. Hedges, Co-Principal Investigator of the Center for Advancing Research and Communication in Science, Technology, Engineering, and Mathematics (ARC), is one of eight Board of Trustees Professors at Northwestern University, the university's most distinguished academic position. He holds appointments in statistics, psychology, and education and social policy. A national leader in the fields of educational statistics and evaluation, Hedges joined the Northwestern faculty in 2005. Previously, he was the Stella M. Rowley Distinguished Service Professor at the University of Chicago. Hedges' research straddles many fields—in particular those of sociology, psychology, and educational policy. He is best known for his work to develop statistical methods for meta-analysis (a statistical analysis of the results of multiple studies that combines their findings) in the social, medical, and biological sciences. It is a key component of evidence-based social research. Examples of some of his recent studies include: understanding the costs of generating systematic reviews, differences between boys and girls in mental test scores, the black-white gap in achievement test scores, and frameworks for international comparative studies on education. Widely published, he has authored or co-authored numerous journal articles and five books, including the seminal *Statistical Methods for Meta-Analysis: A Practical Guide to Modern Methods of Meta-Analysis* (with I. Olkin) and *The Handbook of Research Synthesis* (with H. Cooper and J. Valentine). He is an elected member of

the National Academy of Education and is a fellow of the American Academy of Arts and Sciences, the American Statistical Association, the American Psychological Association, and the American Educational Research Association. He is vice chair of the board of trustees of the Russell Sage Foundation and President of the Society for Research on Educational Effectiveness.

2:30-4:30PM

Concurrent session

INNOVATIVE APPROACHES TO ASSESSMENT IN STEM EDUCATION

Salons I & II

ABOUT THE SESSION:

The REESE program has invested in a variety of projects that propose innovative approaches to assessment in STEM education that go beyond the traditional multiple-choice test. These have included studies at varying grade levels, with varying subject matter, and with different foci such as content knowledge, scientific inquiry and performances, and epistemological habits of mind. In this session, three REESE PIs will report on their projects that are pushing the frontiers of assessment methodology. ORGANIZER: Gavin Fulmer, National Science Foundation

Presenters

Ross Nehm, Principal Investigator, “Transforming STEM Assessment Methodologies: Research on Cyber-enabled Measurement of Cognitive Models of Natural Selection”

Edys Quellmalz, Principal Investigator, “Foundations of 21st Century Science Assessments”

Debbie Denise Reese, Principal Investigator, “Cyberlearning through Game-based, Metaphor Enhanced Learning Objects (CyGaMEs)”

Moderator

Anthony E. Kelly, George Mason University

ABOUT THE SPEAKERS:

Anthony E. Kelly earned his doctorate in Psychological Studies in Education at Stanford University. He taught at Rutgers University and is now a professor of educational psychology at George Mason University. He served as a program officer at NSF from 1997 to 2000, and 2006-2007 in the Division for Research on Learning. He was a Fulbright Fellow in 2009-2010 on the theme of the university as an innovation driver for society. He has served on a number of editorial boards of journals and was the theme editor for special issues of the Educational Researcher on design-based research (2003), and the National Mathematics Panel report (2008). His research interests include design of assessment and research methods development, including fostering research on the neural basis of mathematics learning. He recently accepted a position as a rotator in the Office of Educational Technology in the US Department of Education.

Ross Nehm is an associate professor in the College of Education and Human Ecology and the Department of Evolution, Ecology and Organismal Biology at The Ohio State University. He holds a B.S. from the University of Wisconsin at Madison, an Ed.M. from Columbia University, and a Ph.D. from the University of California at Berkeley. He was the recipient of an NSF Early Career Award and was named an education fellow of the National Academy of Sciences. He has published widely within the fields of science education and biology. His educational research interests include evolutionary thinking and reasoning, problem solving, and assessment methodologies. His lab website is: <http://www.nehmlab.org>

Edys Quellmalz is the Director of Technology-Enhanced Assessment and Learning Systems in WestEd's Math, Science and Technology program. Quellmalz leads SimScientists projects funded by NSF and the U.S. Department of Education related to simulation-based science curricula and assessments for formative and summative assessments that can serve as components of balanced state science assessment systems. Dr. Quellmalz is recognized nationally and internationally as an expert in technology-supported assessment and has published her research widely. She co-directed the development of the framework and specifications for the 2014 National Assessment of Educational Progress for Technology and Engineering Literacy and served on the Steering Committee for the 2011 NAEP Writing Framework. She has consulted for numerous state, national, and international assessment programs. She was Associate Director of the Center for Technology and Learning at SRI International and Director of Assessment Research and Design. She served on the faculty at the Stanford School of Education as research faculty in the UCLA Graduate School of Education.

Debbie Denise Reese, Ph.D is senior educational researcher at Wheeling Jesuit University's Center for Educational Technologies® and NASA-sponsored Classroom of the Future. Reese invented the CyGaMEs approach to instructional game design and embedded assessment. CyGaMEs readies learners for academic success by translating challenging science concepts (what scientists think) into gameplay (what learners do). CyGaMEs' multi-prize-winning Selene: A Lunar Construction GaME (<http://selene.cet.edu>) tracks gameplay to assess learning and measures affect. Reese applies cognitive science theory to design learning environments and educational technologies. She is principal investigator for CyGaMEs, an NSF-funded REESE project. Reese has led design and research teams in development and study of technology tools for enhancing self-efficacy, identity, and argumentation. She conducts evaluations and needs assessments and is part of the Classroom of the Future™ team producing and conducting research using MoonWorld, a virtual world in which educators and students conduct lunar science fieldwork. Reese also leads the MoonGazers program, combining simulations and curricular activities to prepare youth and educators for a lifetime of backyard science, investigating natural phenomena with the Moon as an outdoor laboratory.

2:30-4:30PM

Concurrent session**COLLABORATIONS BETWEEN ENGINEERING AND COGNITIVE SCIENCE: WHAT DO WE HAVE TO LEARN?***Plazas C & D***ABOUT THE SESSION:**

Cognitive scientists and engineers have collaborated around studies of problem solving, concept inventories and conceptual understanding, and design cognition in engineering undergraduates. Presumably, these partnerships are mutually beneficial, contributing to knowledge bases in both cognitive science and engineering. This session explores questions such as: How do studies of engineering advance cognitive science and other STEM education fields? What does cognitive science offer engineering education? What are some of the major challenges of interdisciplinary work between cognitive science and engineering education? How might researchers overcome these challenges? ORGANIZER: Maura Borrego, National Science Foundation

Presenters

Elliot Douglas, Principal Investigator, “The Role of Epistemological Beliefs and Cognitive Processing on Engineering Students' Ability to Solve Ambiguous Problems”

Wendy Newstetter, Principal Investigator, “Transforming Text to Diagram: Investigating and Helping Students Develop Key Cognitive Strategies for Solving Engineering Problems”

Ruth Streveler, Principal Investigator, “Collaborative Research: Integrating Cognition and Measurement with Conceptual Knowledge: Establishing the Validity and Diagnostic Capacity of Concept Inventories”

Moderator

Maura Borrego, National Science Foundation

ABOUT THE SPEAKERS:

Maura Borrego is an Associate Professor and former Director of the Graduate Program in the Department of Engineering Education at Virginia Tech, currently serving as a Program Director in the Division of Undergraduate Education at the National Science Foundation. She recently held a 2010-2011 AAAS Science & Technology Policy Fellowship at the National Science Foundation. Dr. Borrego’s engineering education research awards include PECASE, CAREER, and two outstanding publication awards from the American Educational Research Association for her journal articles. Her research interests include engineering faculty development, specifically how faculty members decide to apply the results of educational research, and interdisciplinary graduate education in STEM. She is an editorial board member for *Journal of Engineering Education* and chair of the American Society for Engineering Education’s Educational Research and Methods Division. Dr. Borrego has developed and taught graduate level courses in engineering education research methods and assessment from 2005-

2010. All of Dr. Borrego's degrees are in Materials Science and Engineering. Her M.S. and Ph.D. are from Stanford University, and her B.S. is from University of Wisconsin-Madison.

Elliot P. Douglas is Associate Chair, Associate Professor, and Distinguished Teaching Scholar in the Department of Materials Science and Engineering at the University of Florida. His research activities are in the areas of active learning, problem solving, critical thinking, and use of qualitative methodologies in engineering education. Specifically, he has published and presented work on the use of guided inquiry as an active learning technique for engineering; how critical thinking is used in practice by students; and how different epistemological stances are enacted in engineering education research. He has been involved in faculty development activities since 1998, through the ExCEED Teaching Workshops of the American Society of Civil Engineers, the Essential Teaching Seminars of the American Society of Mechanical Engineers, and the US National Science Foundation-sponsored SUCCEED Coalition. He has also been active in promoting qualitative research methods in engineering education through workshops presented as part of an NSF project. He has received several awards for his work, including the Presidential Early Career Award for Scientists and Engineers, the Ralph Teetor Education Award from the Society of Automotive Engineers, being named a University of Florida Distinguished Teaching Scholar, and being named the University of Florida Teacher of the Year for 2003-04. He is a member of the American Society for Engineering Education and the American Educational Research Association, and is currently Editor-in-Chief of *Polymer Reviews*.

Wendy C. Newstetter is the Director of Learning Sciences Research in the Wallace H. Coulter Department of Biomedical Engineering at Georgia Tech. Dr. Newstetter's research focuses on understanding learning in interdisciplines with an eye towards designing educational environments that support the development of integrative problem solving. Her ethnographic investigations of three interdisciplinary research laboratories have informed the design of problem-driven learning (PDL) classrooms at Georgia Tech designed to foster integrative model-based reasoning. Dr. Newstetter has published in numerous journals and conference proceedings, including the *Journal of Engineering Education*, *Research in Engineering Design* and the *Annals of Biomedical Engineering*. She is a Senior Associate Editor and Special Issues Editor for the *Journal of Engineering Education*.

Ruth Streveler is an Assistant Professor in the School of Engineering Education at Purdue University. Before coming to Purdue in 2006 she spent 12 years at Colorado School of Mines, where she was the founding Director of the Center for Engineering Education. Dr. Streveler earned a BA in Biology from Indiana University-Bloomington, MS in Zoology from the Ohio State University, and Ph.D in Educational Psychology from the University of Hawaii at Manoa. Her primary research interests are investigating students' understanding of difficult concepts in engineering science and helping engineering faculty conduct rigorous research in engineering education.

2:30-4:30PM

Concurrent session**HOW PEOPLE LEARN ... PART TWO?***Diplomat Room***ABOUT THE SESSION:**

It has now been over ten years since the release of the influential book *How People Learn* and there has been increasing interest in the field that it is time for a follow-up. This panel will address the question of whether indeed there should be a follow up and, if so, what the charge should be, what topics and subfield should be covered, and who should be involved. ORGANIZER: Gregg Solomon, National Science Foundation

Panelists

Clark Chinn, Principal Investigator, “Promoting Conceptual Change in Reasoning”

Alan Schoenfeld, Principal Investigator, “Collaborative Research: Classroom Practices that Lead to Student Proficiency with Word Problems in Algebra”

Kurt VanLehn, Principal Investigator, “Deeper Modeling Via Affective Meta-Tutoring”

Christine Massey, Co-Principal Investigator, “Adaptive Sequencing and Perceptual Learning Technologies in Mathematics and Science”

Moderator

Susan Carey, Co-Principal Investigator, “The Role of Individual Differences in Executive Function on the Child’s Acquisition of Intuitive Biology”

ABOUT THE SPEAKERS:

Clark Chinn is an Associate Professor of educational psychology at Rutgers University. His research focuses on reasoning and argumentation, epistemic practices, conceptual change, and collaborative learning. He is the current Editor of the journal *Educational Psychologist*, and he is presently working with Ravit Golan Duncan on a REESE project to investigate methods of scaffolding the growth of scientific reasoning and content understanding among middle-school science students during model-based inquiry. He earned his Ph.D. degree at the University of Illinois at Urbana-Champaign, working with Richard Anderson and William Brewer.

Christine Massey is the Director of Research and Education at the Institute for Research in Cognitive Science at the University of Pennsylvania. She is also the Director of PENNlincs, which serves as an outreach arm of the Institute, linking recent theory and research in cognitive science to education efforts in public schools and cultural institutions. She has directed a number of major collaborative research and development projects that combine research investigating students' learning and conceptual development in science and math with the development and evaluation of new curriculum materials, learning technology, and educational programs for students and teachers. These projects include development of mathematics learning software that

incorporates principles of perceptual learning; research on science learning and science curriculum development for the preschool and early elementary years; development of a robotics curriculum for the middle grades; and kits and exhibit enhancements to support family learning in zoos and museums. Massey received her B.A. from Wellesley College with honors in psychology and a Ph.D. in psychology with a specialization in cognitive development from the University of Pennsylvania. Massey is an Eisenhower Fellow and has also been a Fellow in the Spencer Foundation/National Academy of Education's Postdoctoral Fellowship program.

Alan Schoenfeld is Elizabeth and Edward Conner Professor of Education at the University of California, Berkeley. Schoenfeld is past president of the American Educational Research Association and past vice president of the National Academy of Education; he is a Fellow of The American Association for The Advancement of Science and a Laureate of Kappa Delta Pi. He has served as Senior Advisor to the Education and Human Resources Directorate of the National Science Foundation, and was writing group leader for grades nine to twelve for the National Council of Teachers of Mathematics' Principles and Standards for School Mathematics. Schoenfeld received his BA from Queens College and his MS and PhD from Stanford University. Books he has written or edited include *Mathematical Problem Solving*, *Cognitive Science and Mathematics Education*, *Mathematical Thinking and Problem Solving*, and four volumes of *Research in Collegiate Mathematics Education*. His most recent book, *How We Think: A Theory of Goal-Oriented Decision-Making and its Educational Applications*, lays out a theory of human decision-making and its educational applications.

Kurt VanLehn is a Professor in the School of Computing, Informatics and Decision Science Engineering at Arizona State University. He received a Ph. D. from MIT in 1983 in Computer Science, was a post-doc at BBN and Xerox PARC, joined the faculty of Carnegie-Mellon University in 1985, moved to the University of Pittsburgh in 1990 and joined ASU in 2008. He founded and co-directed two large NSF research centers (Circle; the Pittsburgh Science of Learning Center). He has published over 125 peer-reviewed publications, is a fellow in the Cognitive Science Society, and is on the editorial boards of *Cognition and Instruction*, and the *International Journal of Artificial Intelligence in Education*. Dr. VanLehn's research focuses on applications of artificial intelligence to education. Some of his projects are, starting from the most recent ones: LAITS, a system to help student learn by authoring intelligent tutoring systems; AMT, a meta-tutoring system combined with an affective learning companion; Why2-Atlas and Cordillera, two intelligent tutoring systems that pioneered the use of natural language dialogues for science teaching and have been shown to be just as effective as expert human tutors; Pyrenees, an intelligent tutoring system that successfully caused inter-domain transfer by implicitly teaching a meta-cognitive strategy; Andes, an intelligent tutoring system for a full year of college/high school physics that improves students grades by approximate a letter grade and is in daily use around the world; and Cascade, a highly accurate cognitive model of human students learning physics that accounts for the interaction of self-

explanation and analogy.

4:30-6:30PM

Poster session & reception

2nd Floor Foyer & Salon III

FRIDAY OCTOBER 21ST

8:00-9:00AM

Registration and Continental breakfast

2nd Floor Foyer

Networking

Plaza B

Program officers will be available to meet with PIs on a drop-in basis in the PI Lounge.

9:00-11:00AM

Concurrent session

FROM SCIENTIFIC INQUIRY TO PRACTICES OF SCIENCE IN SCIENCE STANDARDS

Diplomat Room

ABOUT THE SESSION:

In 1996, the National Science Education Standards (NRC) referred to scientific inquiry as both the set of diverse ways that scientists study the natural world and as a central principle of instruction in science that would engage students in developing knowledge and understanding of science. Now more than 15 years later, research shows that inquiry instruction is generally effective but that few classroom teachers actually engage in inquiry instruction. However, NSES distinguished scientific inquiry as a pedagogical principle from the specific content to be taught. In the NRC's recent Framework for Science Education—which is leading directly to the development of Next Generation Science Standards—the focus has shifted to practices of science, which allows more particular focus on scientific methods and the connection to specific science content. This shift motivates the following questions: What is the current understanding of inquiry-based science instruction? What are the implications of this shift toward practices of science from scientific inquiry for teacher education, curriculum development, and school policy? What are the implications for STEM educational researchers? What should be the research agenda regarding practices of science for the next 15 years? ORGANIZERS: Celeste Pea and Gavin Fulmer, National Science Foundation

Panelists

Bobby Jeanpierre, Principal Investigator, "CAREER: Inquiry Teaching and Learning: Connecting Research and Practice"

Betsy Davis, Principal Investigator, “STEM Teaching and Learning - Investigating Teachers' Learning, Practice, and Efficacy Using Educative Curriculum Materials”

Daphne Minner, Abt Associates

Moderator

Martin Storksdieck, Principal Investigator, “Planning Process on Core Ideas for K-12 Standards in the Behavioral and Social Sciences”

ABOUT THE SPEAKERS:

Elizabeth A. Davis is a science educator and teacher educator whose research interests include teacher and student learning. Some particular interests include beginning and experienced elementary teachers, teachers learning to engage in investigation-oriented science teaching, and the roles of curriculum materials and teacher education in promoting teacher learning. One major focus of Davis's work is a National Science Foundation-funded project called ELECTS, for Elementary Educative Curricula for Teachers of Science. Co-directed with Annemarie Palincsar and Sean Smith, the project explores the use of educative curriculum materials in supporting elementary teachers in inquiry-oriented science teaching. The project uses existing, high-quality science curriculum materials for upper elementary grades, and is developing additional educative supports to promote further teacher learning. The research explores the overarching research question: How does teacher use of educative curriculum materials relate to (a) teachers' learning, (b) teachers' practice (and thus students' opportunities to learn), and (c) students' learning of science content and about scientific practices across scientific disciplines? Another major focus of Davis's work is grounded in UM's Elementary Teacher Education program. The School of Education and the Teacher Education Initiative have been working for several years to reimagine teacher education. The work on the new program is driven by the desire to have a more deliberate and detailed focus on practice. Davis has published in a wide range of journals and serves as a co-editor for the *Elementary School Journal*.

Bobby Jeanpierre is an Associate Professor of Middle School Science Education at the University of Central Florida, Orlando. She joined the College of Education at the University of Central Florida in August, 2001. Dr. Jeanpierre earned a B.S. in secondary biology from Southern University in Baton Rouge, Louisiana, a Master's of Arts in Education with a specialization in gifted education from St. Thomas University in St. Paul, Minnesota, and a Ph. D. in Curriculum and Instruction with a double-focus in science education and program evaluation from the University of Minnesota, Minneapolis, Minnesota. She is a National Science Foundation 2005 CAREER AWARD recipient. Dr. Jeanpierre's CAREER AWARD research focused on how teachers in K-8 settings implemented inquiry-based science instruction, particularly in schools that have diverse, low socioeconomic student populations. Her research passion is to inquire into ways we can improve science teaching and learning by connecting research and practice.

Daphne Minner, Ph.D., is Senior Associate at Abt Associates. Dr. Minner’s research has focused on articulating, operationalizing, and measuring the components of science instruction as it is conducted in the U.S. The respective foci of her recent research projects has been to develop research tools for describing scientific inquiry instructional practices, to investigate the impact of science instruction on student outcomes using secondary data analysis techniques, and to examine how educators apply their science and special education knowledge through collaboration to improve teaching practices in inclusive middle school science classrooms. Her work has an equal emphasis on refining the theoretical and conceptual foundations that shape science teaching practice and creating research tools to aid in understanding that practice. She has developed and validated several research tools including:

- Inquiring Into Science Instruction Observation Protocol (ISIOP)
- Operationalizing the Coding of Research Rigor, Context, and Study Findings
- Standards of Evidence for Empirical Research
- Environmental Education Materials Evaluation Questionnaire (EEMEQ)

Martin Storksdieck is the director of the Board on Science Education at the National Academy of Sciences/National Research Council where he oversees studies that address a wide range of issues related to science education (e.g., climate change education, science learning from games and simulations, developing a conceptual framework for new science education standards, discipline-based education research). Martin's areas of interest include factors that influence what and how we learn when we do so voluntarily and how this “learning” is connected to our behaviors, identities and beliefs; the role of personal and perceptual filters in science learning, particularly of controversial topics such as climate change or evolution; and how schools and out-of-school learning can be mutually enhancing in creating and sustaining lifelong interest in (science) learning. He holds a Masters in Biology from the Albert-Ludwigs University (Freiburg, Germany), a Masters in Public Administration from Harvard University, and a Ph.D. in education from Leuphana University (Lüneburg, Germany).

9:00-11:00AM **Concurrent session**
MOTIVATION, ENGAGEMENT, AND STEM LEARNING
Salons I & II

ABOUT THE SESSION:
This session will focus on the roles of motivation and engagement in STEM learning. REESE PIs will discuss their recent work as well as their roots in a variety of literatures, capturing what the relevant issues are and what theoretical and empirical questions remain to be addressed. ORGANIZER: Gregg Solomon, National Science Foundation

Presenters
Sara Rimm-Kaufman, Principal Investigator, “Classroom Processes, Students’

Engagement in Mathematics Instruction, and Mathematics Achievement”
Roger Azevedo, Principal Investigator, “Detecting, Tracking, and Modeling Cognitive, Affective, and Metacognitive Regulatory Processes to Optimize Learning with MetaTutor”

Sian Beilock, Principal Investigator, “CAREER: Women in the Math and Sciences: Counteracting the Impact of Negative Group Stereotypes on Performance”

Discussant

Judith Harackiewicz, Principal Investigator, “Parents, Utility Value, and Motivating Adolescents in Mathematics and Science”

ABOUT THE SPEAKERS:

Roger Azevedo holds a Canada Research Chair in Metacognition and Advanced Learning Technologies. Dr. Azevedo received his Doctorate in Educational Psychology/Applied Cognitive Science from McGill University in 1998 and completed his postdoctoral training in Cognitive Psychology at Carnegie Mellon University. He is a Professor in the Department of Educational and Counselling Psychology at McGill University. He is a Fellow of the American Psychological Association and the recipient of the prestigious Early Faculty Career Award from the National Science Foundation. His main research area includes examining the role of cognitive, metacognitive, affective, and motivational self-regulatory processes during learning with computer-based learning environments. His interdisciplinary research focuses on designing and testing the effectiveness of adaptive learning environments that are capable of detecting, tracking, modeling, and fostering complex learning processes in the biological and medical sciences. He is the director of the Laboratory for the Study of Metacognition and Advanced Learning Technologies (<http://smartlaboratory.ca/>) at McGill University. He has published over 100 peer-reviewed papers in the areas of educational, learning, cognitive, and computational sciences. He serves on the editorial board of several top-tiered international psychology and learning science journals (*Journal of Educational Psychology, Educational Psychologist*). His research is funded by the National Science Foundation, National Institutes of Health, Social Sciences and Humanities Research Council of Canada, and the Canadian Foundation for Innovation.

Sian Beilock is an Associate Professor in the Department of Psychology at the University of Chicago. Her research sits at the intersection of cognitive science and education. She explores the cognitive and neural substrates of skill learning as well as the mechanisms by which performance breaks down in high-stress academic situations. Beilock’s research is funded by NSF and IES and in 2011 she received the Janet Taylor Spence Award for Transformative Early Career Contributions from the Association for Psychological Science (APS).

Judith Harackiewicz is Professor of Psychology at the University of Wisconsin-Madison. She received a Spencer Fellowship from the National Academy of Education, and the University of Wisconsin Chancellor's Award for Distinguished Teaching. She has been studying intrinsic motivation and interest for 30 years, conducting experimental and longitudinal studies of goals, competition, and performance evaluation in academic contexts, including randomized interventions in college courses. Her most recent research concerns the role of parents in communicating the value of academics to their teens. Judith recently completed a term as Editor of *Personality and Social Psychology Bulletin*. She is a Fellow of the American Psychological Association, the Association for Psychological Science, and the Society for Personality and Social Psychology.

Sara Rimm-Kaufman conducts research on classroom social processes and their influence on children's social and academic growth in the early years of school. Her research is interdisciplinary, drawing from the fields of psychology and education. Rimm-Kaufman trained as a developmental psychologist and received her Ph.D. from Harvard University in 1996. She has been at the University of Virginia since that point, first in the role of post-doctoral fellow and now as an [Associate Professor](#). Currently, she is the Director of the [Educational Psychology-Applied Developmental Science Program](#). She has been the PI of two grants from NSF, both of which have focused on teachers' interactions with children and the ways in which these interactions contribute to the development of engagement, self-control, and achievement. Her research, funded by NSF, IES, among other agencies, uses multiple methods to enhance understanding of the mechanisms within classrooms that produce student change.

9:00-11:00AM

Concurrent session

DEVELOPING A WORLD CLASS WORKFORCE: HUMAN CAPACITY BUILDING IN POSTSECONDARY STEM EDUCATION

Plazas C & D

ABOUT THE SESSION:

Over time, there has been growing attention to how future faculty and those pursuing industry careers are educated and socialized into graduate studies and their early careers. This session will focus on the development of postsecondary students' identity, social networks, and research and teaching skills. ORGANIZER: James Dietz, National Science Foundation

Presenters

Jenefer Husman, Principal Investigator, "Connecting with the Future: Supporting Identity and Career Development in Post-secondary Science and Engineering"

Julia Melkers, Principal Investigator, "Breaking through the Reputational Ceiling: Professional Networks as a Determinant of Advancement, Mobility, and Career Outcomes for Women and Minorities in STEM"

David Feldon, Principal Investigator, “Effects of Inquiry-Based Teaching Experiences on Graduate Students’ Research Skill Development”

Discussant

Bianca Bernstein, Principal Investigator, “Large Empirical Emerging Topics: CareerWise II: Enhanced Resilience Training for STEM Women in an Interactive, Multimodal Web-Based Environment”

Moderator

James S. Dietz, National Science Foundation

ABOUT THE SPEAKERS:

Bianca L. Bernstein, Ph.D. is Professor of Counseling and Counseling Psychology at Arizona State University and affiliate faculty in the School of Social Transformation and the Mary Lou Fulton’s Teacher’s College. Dr. Bernstein is Principal Investigator of the CareerWISE research program, supported by the National Science Foundation since 2006. Her over 250 publications and presentations and over \$3.4 M in external support have focused on the application of psychological science to the career advancement of women and underrepresented minorities and the development of effective learning environments for graduate education. She has served as the Dean of ASU’s Graduate College, Director of NSF’s Division of Graduate Education, leader of ASU’s extensive Preparing Future Faculty Program, innovator of ASU’s Preparing Future Professionals Program, President of the Western Association of Graduate Schools, member of the Board and Executive Committee of the Council of Graduate Schools, and Visiting Scholar at the Carnegie Foundation for the Advancement of Teaching at Stanford University. She has won a number of awards for her work on equity and inclusiveness including the ASU Faculty Women’s Association Achievement in Gender Equity Award, the ASU Black Caucus Award for Contributions to Diversity, and the Arizona Governor’s Spirit of Excellence Award. Dr. Bernstein holds a bachelor’s in psychology from the University of California at Berkeley and graduate degrees in Counseling Psychology from the University of California at Santa Barbara.

David F. Feldon, Ph.D. is an Assistant Professor of STEM Education and Educational Psychology in the Curry School of Education at the University of Virginia. He is also the Associate Director for STEM Initiatives in the Center for the Advanced Study of Teaching and Learning in Higher Education (CASTL-HE). His research examines the development and instruction of research skills in STEM disciplines using mixed methodologies. Most of his studies focus on students at the undergraduate and graduate levels, because it is commonly at this level that disciplinary lenses are developed and refined. Using a cognitive framework, this work entails performance-based assessments of authentic STEM tasks (e.g., written laboratory reports or research proposals) to track the development of skill as a function of instruction or other preparatory experiences.

Jenefer Husman received a doctoral degree in Educational Psychology from the University of Texas at Austin, in 1998. She served as an Assistant Professor at the University of Alabama from 1998 to 2002, when she moved to Arizona State University. In 2008 she was promoted by ASU to Associate Professor. In 2006 she was awarded the U.S. National Science Foundation CAREER grant award and received the Presidential Early Career Award for Scientists and Engineers from the President of the United States. Dr. Husman currently serves as the Director of Education for the Quantum Energy and Sustainable Solar Technology Center - an NSF funded Engineering Research Center. She publishes regularly in peer-reviewed journals and books, and has held both elected and appointed offices in the American Psychological Association (APA). Dr. Husman was a founding member and first President of the Southwest Consortium for Innovative Psychology in Education. She currently serves as the elected Co-Coordinator of the Motivation Special Interest Group of the European Association for Research on Learning and Instruction.

Julia Melkers is Associate Professor of Public Policy at Georgia Tech. Her current research addresses capacity development, collaboration patterns, social networks and related outcomes of science, with a special focus on women and underrepresented minorities. She is currently principal investigator with Co-PI's Eric Welch (UIC) and Monica Gaughan (UGA) on a REESE/NSF-funded project to examine the characteristics and role of social and research networks for academic scientists and engineers ("Empirical Research: Breaking through the Reputational Ceiling: Professional Networks as a Determinant of Advancement, Mobility, and Career Outcomes for Women and Minorities in STEM"). Before joining the faculty at Georgia Tech in 2007, she was previously was on the faculty of the University of Illinois at Chicago, Georgia State University, and the University of Alaska. She earned her PhD in Public Administration at the Maxwell School at Syracuse University in 1993. Her publications may be found in journals such as *Review of Policy Research*, *Public Administration Review*, *Urban Studies Review*, *Policy Studies Journal*, *Public Budgeting and Finance*, *Journal of Public Administration Research and Theory*, *Journal of Technology Transfer and Evaluation and Program Planning*. Dr. Melkers also serves on the editorial boards of *Research Evaluation*, *Evaluation and Program Planning*, and *Economic Development Quarterly*, and on the American Association for the Advancement of Science Committee on Science, Engineering and Public Policy (COSEPP).

11:00-11:15AM

Break

11:15AM- 12:30PM

Plenary with Diane Souvaine**STEM Education: Integrating Policy, Research, and Practice***Salons I & II**Introduction*

Barbara M. Olds, National Science Foundation

ABOUT THE SPEAKERS:

Barbara M. Olds is Acting Deputy Assistant Director and Senior Advisor to the Directorate for Education and Human Resources (EHR) of the National Science Foundation. She previously served in EHR as an Expert/Consultant on education issues, as Division Director for the Division on Research, Evaluation and Communication, and as Acting Division Director for the Division of Elementary, Secondary, and Informal Education. She served two terms on the International Advisory Committee for NSF and chaired the Committee of Visitors for NSF's international activities in 2008. Dr. Olds is Professor Emerita of Liberal Arts and International Studies at the Colorado School of Mines. During her long career there, she served in many capacities, most recently as the Associate Provost for Educational Innovation. She has been active in the engineering education research and evaluation communities. She is a Fellow of the American Society for Engineering Education, a Senior Editor for the *Journal of Engineering Education*, and was a Fulbright lecturer/researcher in Sweden. She holds an undergraduate degree from Stanford University and an M. A. and Ph.D. from the University of Denver, all in English.

Diane Souvaine is currently serving a six-year term on the National Science Board, the governing board of the National Science Foundation (NSF) and an advisory body to the President and Congress. From 2002-2009, she served as Chair of the Department of Computer Science at Tufts University where she continues as Professor of Computer Science, with a secondary appointment in Mathematics. Previously, she spent twelve years on the faculty of Rutgers University, serving 2.5 years in the directorate of DIMACS, a cross-institution NSF Science and Technology Center on Discrete Mathematics and Theoretical Computer Science. She holds an A.B. degree from Harvard University and a Ph.D. from Princeton University. She taught high school mathematics for seven years before earning her doctorate. Since then, she has continued to conduct activities to enhance pre-college mathematics education and to encourage the advancement of women and persons of other underrepresented groups in mathematics, science, and engineering, in concert with colleagues in child development, education, and mathematics.

12:30-2:30PM

Poster session & buffet lunch*2nd Floor Foyer & Salon III*

2:30-3:00PM

Closing Plenary

NEWS FROM WASHINGTON, NSF AND THE REESE PROGRAM

Salons I & II

John Cherniavsky, DRL Division Director (Acting) and **Gregg Solomon**, REESE Cluster Coordinator

ABOUT THE SPEAKERS:

John Cherniavsky is the Acting Division Director of the Division of Research on Learning in Formal and Informal Environments. Before that he has held a number of senior positions in the Education and Human Resources Directorate and in the Computer, Information Sciences and Engineering Directorate. His research interests are in Theoretical Computer Science, Software Engineering, and Learning Technologies. He received his undergraduate degree from Stanford University in Mathematics and his Master's and Ph.D. from Cornell University in Computer Science. He has taught at SUNY Stony Brook and was the founding chair of the Department of Computer Science at Georgetown University.

Gregg Solomon is currently a Program Director at the National Science Foundation in the Division of Research on Learning where he participates in REESE, CAREER, and other learning and education research programs. His own research focuses on the nature of expertise, conceptual change in understandings of biology, matter, and rational number, cross-cultural studies of race and social identity, and investigations of interdisciplinarity. He received his Ph.D. from the Department of Psychology at Harvard University and was a postdoctoral fellow in the Department of Brain and Cognitive Sciences at MIT. He later taught at both institutions and was a research scientist in the Centre de Recherche en Epistemologie Appliquee (CREA) at the Ecole Polytechnique in Paris.

3:00pm

Adjourn

Local Restaurants



The Ritz-Carlton, Pentagon City

FYVE (American Continental)
Daily 6:30am-9:30pm
Brunch 11:00am-3:00pm

FYVE LOUNGE
Light fares available for lunch and dinner.
Afternoon tea is served Saturday and Sunday



Pentagon City Mall Restaurants

JOHNNY ROCKETTS
(American 50's Diner)
Metro Level/703-415-3510
Mon-Sat 10:00am-9:30pm

HARRY'S TAP ROOM
Metro Level
703-416-7070

Pentagon Row



RISTORANTE MURALI (Italian)
1201 South Joyce St
703-415-0411
Mon-Thurs 11-2:30pm ,5:30-10pm
Fri-Sat 11:30-11pm
Sun 11am-9:30pm



ASIA BISTRO (Asian)
1301 South Joyce St
703-413-2002
Pentagon Row
11:00am-10:00pm



LA CREPERIE (French)
1201 South Joyce St
703-415-0560
Daily 10:00am-9:00pm
Weekends 10:00am-10:00pm



SINE (Irish Pub)
1301 South Joyce St
703-415-4420
Daily 11:00am-1:30am



LEBANESE TAVERNA (Lebanese)
1101 South Joyce St
703-415-8681
Mon.-Fri 11:30am-2:30pm
Mon.-Thu. 5:00pm-10:30pm



SAIGON-SAIGON (Vietnamese)
1101 South Joyce St
703-412-0822
Mon-Fri. 11:00-10:00
Sat 11:00-11:00, Sun 12:00-10:00



CHAMPPS (American Sports Bar)
1201 South Joyce St
703-414-3601
Mon.-Sat. 11:00am-2:00am
Sunday 11:00am-midnight



THAIPHOON (Thai)
1301 South Joyce St
703-413-8200
Sun-Thu 11:30-10:30
Fri-Sat 11:30-11:00

PENTAGON ROW DIRECTIONS

Go out to the mall, down the escalator to the ground level. Make a left, walk all the way to the end of mall, past the parking Lot. Walk up a short flight of steps and walk over onto Pentagon Row.

Across the Street from the Hotel



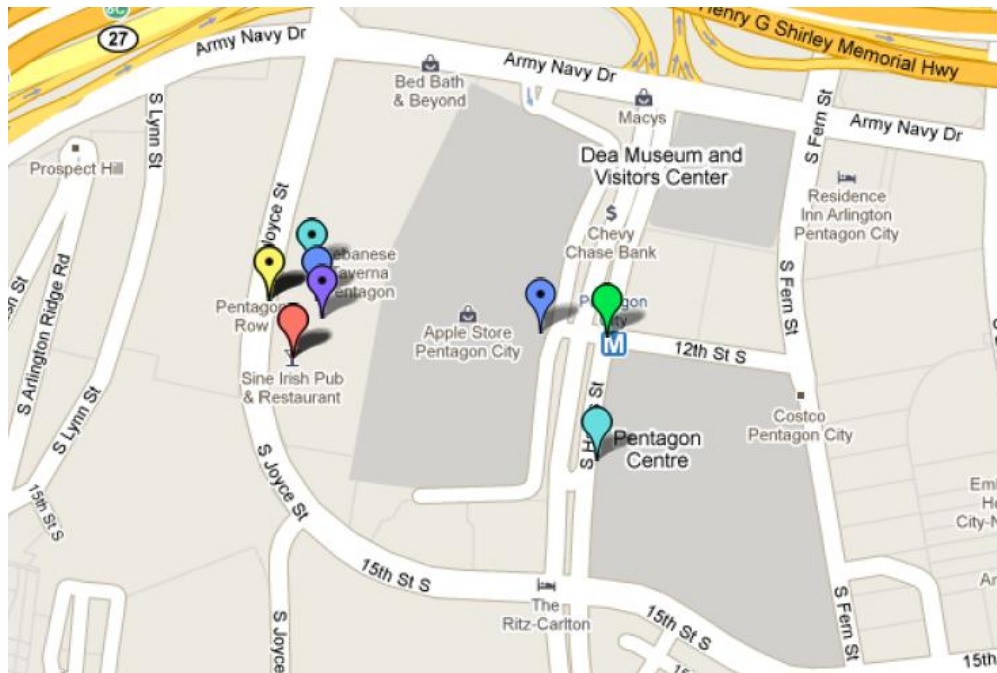
CHEVY'S FRESH MEX (Mexican)

1201 South Hayes St
703-413-8700
Mon.-Sun. 11:00am-10:00pm



CALIFORNIA PIZZA KITCHEN

1201 South Hayes St
703-412-4900
Mon.-Sun. 10:00am-10:00pm



Supporting the REESE Program: PI Assessments of What the Program Needs

ARC was established as a research and technical center to support investigators conducting research funded by the National Science Foundation's *Research and Evaluation on Education in Science and Engineering* (REESE) program. As a technical center, ARC works with members of the REESE community and NSF program officers to identify and address challenges faced by investigators advancing "research at the frontiers of STEM learning, education, and evaluation" as they work to "provide the foundational knowledge necessary to improve STEM teaching and learning at all educational levels and in all settings," (NSF 10-586, online at <http://www.nsf.gov/pubs/2010/nsf10586/nsf10586.pdf>). In addition, ARC is responsible for assisting REESE PIs, their projects, and program officers in accumulating, synthesizing, and communicating REESE program findings.

As part of our cooperative agreement with NSF, ARC conducts "needs assessments" to learn, from a PI perspective, what supports would be helpful both to individual projects and to the program as a whole to ensure REESE achieves its goals: "(1) to catalyze discovery and innovation at the frontiers of STEM learning, education, and evaluation; (2) to stimulate the field to produce high quality and robust research results through the progress of theory, method, analysis, and human resources; and (3) to coordinate and transform advances in research and evaluation on learning and education" (NSF 10-586, p. 4). ARC staff contact investigators as new projects are awarded and offer them the opportunity to participate in in-depth personal interviews designed to learn more about the kinds of activities and services they think it most important for the REESE programmatic support center to provide.

The suggestions PIs offer are important in deciding with NSF the structure and content of future PI meetings, the development of online services to share information with and about REESE projects, and the services ARC is authorized to make available to the REESE community. Participating in these voluntary interviews is of course not the only mechanism for projects to share their views on how the REESE support center can best assist their projects and the program more generally in achieving its objectives. We welcome any comments you might have, now or in the future, about the activities that would best support you and your colleagues in achieving the objectives of the REESE program. Please contact us any time to share your thoughts with us!

Sarah-Kathryn McDonald
Executive Director, ARC
(773) 256-6199
mcdonald-sarah@norc.uchicago.edu

Kevin Brown
Associate Director, ARC
(773) 256-6024
brown-kevin@norc.org

Supporting the REESE Program: Consultations with Individual Projects

ARC works closely with NSF and REESE investigators to identify opportunities to support both individual research projects and the program as a whole. As part of our commitment to assisting REESE projects, ARC provides technical assistance (TA) to projects (through one-on-one consultations, the development of online resources, organizing webinars on methodological issues of interest to the community); offers workshops and convenes PI meetings; assists projects in sharing and archiving measures, instrumentation, and data; and implements and evaluates activities to increase awareness, accessibility, and use of the knowledge and innovations arising from the REESE program.

Individualized TA is available by appointment during the REESE PI meetings, and throughout the year. These one-on-one consultations provide an opportunity to discuss and receive assistance on a range of issues, including study design, analysis, communication, and data storage; examples of the kinds of issues on which TA is available are highlighted below. If you have any questions regarding the TA services ARC provides and/or would like to schedule a conference call or appointment with us, please contact Kevin Brown (brown-kevin@norc.org) or Jen Hanis-Martin (hanis-jen@norc.org).

In the past, the Center has worked with investigators on issues related to sample design to consider the impact of design on recruitment strategies; to build community and link investigators who work on similar issues; to develop and refine project proposals; to conduct background research on literature or theory; and to help disseminate project findings to practitioners and policymakers. Examples of the types of Technical Assistance that are available include:

Designing Studies

- Scale construction or item response theory
- Experimental or quasi-experimental design
- Longitudinal study design
- Qualitative research methods
- Collection of behavioral observation data
- Finding or designing instruments

Conducting Analysis

- Multilevel statistical methods
- Statistical methods for longitudinal studies
- Assistance with qualitative data analysis
- Analysis of behavioral observation data
- Data mining and/or exploratory data analysis
- Geographical information systems (GIS) models and/or spatial statistical analysis
- Assistance synthesizing prior research findings; e.g., meta-analysis

Disseminating Findings

- Identifying relevant stakeholder groups, specific target audiences, and appropriate channels (e.g., online, print) for disseminating information
- Communicating with state & federal policymakers, teachers, parents, and the general public

Storing Data

- Data archiving (including developing codebooks and data dictionaries)
- Data security

USING THE REESE WEBSITE

The website ARC maintains on behalf of the REESE community at <https://arc.uchicago.edu> is designed to provide resources to individual REESE projects and to share project (and program) information to the interested public.

REESE HOMEPAGE

The main page for entry into the REESE project portion of the Center website is <https://arc.uchicago.edu/reese/>. Here project summaries can be searched by filtering on various combinations of metadata provided in the structured abstracts, e.g., discipline(s) addressed, population(s) targeted, research design used, and geographical location. A general keyword search is available as well. The REESE homepage also provides links to items of potential interest to the community. Many of these same items will appear on other relevant web pages throughout the site.

PROJECT SUMMARIES

The REESE website is built around an ever-expanding database of project summaries (<https://arc.uchicago.edu/reese/projects/all>) and personal investigator pages (<https://arc.uchicago.edu/reese/investigators/principal>). Investigator pages are set up by ARC as new projects are funded, with credentials being emailed automatically to REESE PIs when an account is created. Project summaries are drafted by ARC from completed project structured abstracts and are then returned to PIs for edits and approval. Approved summaries are uploaded by ARC but can then be edited by PIs using their personal credentials.

ONLINE RESOURCES FOR THE REESE COMMUNITY

Besides providing links to new and noteworthy items, ARC collects and organizes online resources that our needs assessment interviews identify as being of general interest to the REESE community (<https://arc.uchicago.edu/reese/resources-reese-projects>). These include lists of research resources (study design and analysis, dissemination and communication, broadening participation in STEM, intellectual property, grant writing, and evaluation), a calendar of relevant conferences, and ways to link research to practice.

ARC

To learn more about the Center for Advancing Research and Communication and the services we provide, please visit the ARC portion of the website at <https://arc.uchicago.edu/about-arc>.

Achieving Broader Impacts: Structured Abstracts of REESE Projects

To help promote awareness of the REESE program and its contributions to STEM learning, ARC makes available online descriptions of the work undertaken by the projects currently supported through the REESE program. To ensure consistency in the descriptions of each project's key characteristics and major outcomes, ARC asks Principal Investigators (or, at their discretion, a member of their project teams) to provide information about their REESE projects.

The structured abstract form is available online via the ARC website (at <https://arc.uchicago.edu/reese/structured-abstract>). If you are a REESE investigator and your project has not yet submitted a structured abstract, we would appreciate your completing a form as soon as possible. ARC Associate Director Kevin Brown (brown-kevin@norc.org) would be pleased to help with any questions you might have about the process.

Once your form has been received a web-page will be prepared based on the information you provide. Before this information is posted on the ARC website (at <http://arc.uchicago.edu>) the page will be returned for your approval. PIs will then be given a credential to access their online summaries so these can be updated to reflect current project findings and reports on your work.

PIs' participation in this project is voluntary, but invaluable in helping ARC to provide both members of the REESE community and policymakers, practitioners, and the general public with the most complete information possible on the work and findings of the REESE program. If you have any questions -- or suggestions on how the structured abstract initiative might be improved -- please contact:

Sarah-Kathryn McDonald
Executive Director, ARC
(773) 256-6199
mcdonald-sarah@norc.uchicago.edu

Kevin Brown
Associate Director, ARC
(773) 256-6024
brown-kevin@norc.org

The 2011 REESE PI Meeting: Your Evaluation

Please let us know your thoughts on this meeting -- what went well, what didn't, and how future meetings can be made more helpful to you and your project. An evaluation form is included in the meeting materials; please take a few moments before you leave to fill-in the form and return it in the box provided for this purpose on the meeting registration desk. Alternatively, please visit the 2011 REESE PI Meeting online at <https://arc.uchicago.edu/reese/2011-reese-pi-meeting> to download a fillable form that you can save to your desktop and e-mail to us at arc-info@uchicago.edu.

List of Participants

a

Aleven, Vincent

Full Name: Vincent Aleven
Company: Carnegie Mellon University
Department: Human-Computer Interaction Institute
E-mail: aleven@cs.cmu.edu

Alibali, Martha

Full Name: Martha Alibali
Company: University of Wisconsin - Madison
Department: Psychology
E-mail: mwalibali@wisc.edu

Arroyo, Ivon

Full Name: Ivon Arroyo
Company: University of Massachusetts Amherst
Department: Computer Science
E-mail: Ivon@cs.umass.edu

Ater Kranov, Ashley

Full Name: Ashley Ater Kranov
Company: ABET
Department: NA
E-mail: akranov@abet.org

Azevedo, Roger

Full Name: Roger Azevedo
Company: McGill University
Department: Educational and Counselling Psychology
E-mail: roger.azevedo@mcgill.ca

b

Bang, Megan

Full Name: Megan Bang
Company: University of Washington
E-mail: mbang3@u.washington.edu

Banilower, Eric

Full Name: Eric Banilower
Company: Horizon Research, Inc.
E-mail: erb@horizon-research.com

Barrett, Jeffrey

Full Name: Jeffrey Barrett
Company: Illinois State University
Department: Mathematics
E-mail: jbarrett@ilstu.edu

Barth, Hilary

Full Name: Hilary Barth
Company: Wesleyan University
Department: Psychology
E-mail: hbarth@wesleyan.edu

Bates, Rebecca

Full Name: Rebecca Bates
Company: Minnesota State University, Mankato
Department: Computer Science
E-mail: bates@mnsu.edu

Beck, Joseph

Full Name: Joseph Beck
Company: Worcester Polytechnic Institute
Department: Computer Science
E-mail: josephbeck@wpi.edu

Becker, Betsy

Full Name: Betsy Becker
Company: Florida State University
Department: Educational Psychology and Learning Systems
E-mail: bbecker@fsu.edu

Beilock, Sian

Full Name: Sian Beilock
Company: University of Chicago
Department: Psychology
E-mail: beilock@uchicago.edu

Berk, Dawn

Full Name: Dawn Berk
Company: University of Delaware
E-mail: berk@udel.edu

Bernstein, Bianca

Full Name: Bianca Bernstein
Company: Arizona State University
Department: Counseling Psychology
E-mail: bbernstein@asu.edu

b**Bernstein, Larry**

Full Name: Larry Bernstein
 Company: RTI International
 Department: Educational Studies Division
 E-mail: lbernstein@rti.org

Blair, Kristen

Full Name: Kristen Blair
 Company: Stanford University
 E-mail: kpilner@stanford.edu

Blikstein, Paulo

Full Name: Paulo Blikstein
 Company: Stanford University
 Department: School of Education
 E-mail: paulob@stanford.edu

Bliss, Leonard

Full Name: Leonard Bliss
 Company: Florida International University
 Department: Leadership and Professional Studies
 E-mail: blissl@fiu.edu

Borrego, Maura

Full Name: Maura Borrego
 Company: NSF
 Department: Program Director
 E-mail: mborrego@nsf.gov

Brannon, Elizabeth

Full Name: Elizabeth Brannon
 Company: Duke University
 Department: Psychology and Neuroscience
 E-mail: brannon@duke.edu

Brem, Sarah

Full Name: Sarah Brem
 Company: Arizona State University
 E-mail: drbrem@ml1.net

Brown, Kevin

Full Name: Kevin Brown
 Company: NORC
 Department: ARC Management
 E-mail: brown-kevin@norc.org

Brown, Nathaniel

Full Name: Nathaniel Brown
 Company: Indiana University, Bloomington
 Department: Counseling & Educational Psychology
 E-mail: njsbrown@indiana.edu

Bruer, John

Full Name: John Bruer
 Company: McDonnell Foundation
 E-mail: Bruer@jsmf.org

Burkander, Kri

Full Name: Kri Burkander
 Company: Michigan State University
 E-mail: kriburk@msu.edu

Burke, James

Full Name: James Burke
 Company: University of Massachusetts Dartmouth
 Department: STEM Education
 E-mail: james.burke@umassd.edu

Butcher, Kirsten

Full Name: Kirsten Butcher
 Company: University of Utah
 Department: Educational Psychology
 E-mail: kirsten.butcher@utah.edu

c**Camilli, Gregory**

Full Name: Gregory Camilli
 Company: University of Colorado
 Department: Education
 E-mail: gregory.camilli@colorado.edu

Carey, Susan

Full Name: Susan Carey
 Company: Harvard University
 Department: Psychology
 E-mail: scarey@wjh.harvard.edu

Century, Jeanne

Full Name: Jeanne Century
 Company: University of Chicago
 Department: Center for Elementary Mathematics and
 Science Education
 E-mail: jcentury@uchicago.edu

c**Cherniavsky, John C.**

Full Name: John C. Cherniavsky
Company: NSF
Department: Deputy Division Director (Acting)
E-mail: jchernia@nsf.gov

Cheryan, Sapna

Full Name: Sapna Cheryan
Company: University of Washington
E-mail: scheryan@uw.edu

Chinn, Clark

Full Name: Clark Chinn
Company: Rutgers University
Department: Educational Psychology
E-mail: clark.chinn@gse.rutgers.edu

Coffman, Jennifer

Full Name: Jennifer Coffman
Company: University of North Carolina at Chapel Hill
Department: Department of Psychology
E-mail: coffman@unc.edu

Cooper, Melanie

Full Name: Melanie Cooper
Company: Clemson University
Department: Chemistry
E-mail: cmelani@clemson.edu

Corbett, Albert

Full Name: Albert Corbett
Company: Carnegie Mellon University
Department: Human-Computer Interaction Institute
E-mail: corbett@cmu.edu

Cromley, Jennifer

Full Name: Jennifer Cromley
Company: Temple University
Department: Psychological Studies in Education
E-mail: jcromley@temple.edu

Cwikla, Julie

Full Name: Julie Cwikla
Company: University of Southern Mississippi Gulf Coast
Department: Mathematics
E-mail: julie_cwikla@yahoo.com

d**Dauer, Joe**

Full Name: Joe Dauer
Company: Michigan State University
E-mail: jdauer@msu.edu

Davenport, Jodi

Full Name: Jodi Davenport
Company: WestEd
E-mail: jdavenp@wested.org

Davis, Elizabeth

Full Name: Elizabeth Davis
Company: University of Michigan
Department: School of Education
E-mail: betsyd@umich.edu

DeBoer, George

Full Name: George DeBoer
Company: AAAS
Department: Project 2061
E-mail: gdeboer@aaas.org

DeLisi, Jacqueline

Full Name: Jacqueline DeLisi
Company: Education Development Center, Inc
Department: Science and Math Programs
E-mail: jdelisi@edc.org

Denner, Jill

Full Name: Jill Denner
Company: ETR Associates
E-mail: jilld@etr.org

Didion, Catherine

Full Name: Catherine Didion
Company: National Academies
Department: Committee on Women in Science,
Engineering, and Medicine
E-mail: cdidion@nas.edu

Dietz, James

Full Name: James Dietz
Company: NSF
Department: Program Director
E-mail: jdietz@nsf.gov

d

D'Mello, Sidney

Full Name: Sidney D'Mello
Company: University of Memphis
E-mail: sdmello@memphis.edu

Dorland, Elizabeth

Full Name: Elizabeth Dorland
Company: Washington University in St. Louis
Department: Photosynthetic Antenna Research Center
E-mail: dorland@wustl.edu

Douglas, Elliot

Full Name: Elliot Douglas
Company: University of Florida
Department: Department of Materials Science and Engineering
E-mail: edoug@mse.ufl.edu

Duncan, Ravit

Full Name: Ravit Duncan
Company: Rutgers University
Department: Graduate School of Education
E-mail: ravit.duncan@gse.rutgers.edu

e

Earle, Janice M.

Full Name: Janice M. Earle
Company: NSF
Department: Program Director
E-mail: jearle@nsf.gov

Else-Quesst, Nicole

Full Name: Nicole Else-Quesst
Company: University of Maryland, Baltimore County
Department: Psychology
E-mail: nmeq@umbc.edu

Engle, Randi A.

Full Name: Randi A. Engle
Company: UC-Berkeley
Department: Graduate School of Education
E-mail: RAEngle@berkeley.edu

Ernst, Jeremy

Full Name: Jeremy Ernst
Company: Virginia Tech
Department: Teaching and Learning
E-mail: jvernst@vt.edu

f

Feldon, David

Full Name: David Feldon
Company: University of Virginia
Department: Curriculum, Instruction, and Special Education
E-mail: dff2j@virginia.edu

Ferreras, Ana

Full Name: Ana Ferreras
Company: National Academy of Sciences
E-mail: aferreras@nas.edu

Ferrini-Mundy, Joan

Full Name: Joan Ferrini-Mundy
Company: NSF
Department: Assistant Director
E-mail: jferrini@nsf.gov

Fiez, Julie

Full Name: Julie Fiez
Company: University of Pittsburgh
Department: Psychology
E-mail: fiez@pitt.edu

Fleming, Lorraine

Full Name: Lorraine Fleming
Company: Howard University
Department: Civil Engineering
E-mail: lfleming@howard.edu

Frechtling, Joy

Full Name: Joy Frechtling
Company: Westat
E-mail: joyfrechtling@westat.com

Fulmer, Gavin W.

Full Name: Gavin W. Fulmer
Company: NSF
Department: Associate Program Director
E-mail: gfulmer@nsf.gov

g**Gaydos, Matthew**

Full Name: Matthew Gaydos
Company: University of Wisconsin - Madison
E-mail: gaydos@wisc.edu

Gitomer, Drew

Full Name: Drew Gitomer
Company: Rutgers University
E-mail: drew.gitomer@gse.rutgers.edu

Gobert, Janice

Full Name: Janice Gobert
Company: WPI
Department: Social Sciences & Policy Studies
E-mail: jgobert@wpi.edu

Good, Catherine

Full Name: Catherine Good
Company: Baruch College, CUNY
Department: Psychology
E-mail: catherine.good@baruch.cuny.edu

Greene, Ruth L.

Full Name: Ruth L. Greene
Company: Johnson C. Smith University
Department: Psychology
E-mail: rgreene@jcsu.edu

Grissmer, Favid

Full Name: Favid Grissmer
Company: University of Virginia
Department: Center for Advanced Study of Teaching and Learning
E-mail: dwg7u@virginia.edu

Grouws, Douglas

Full Name: Douglas Grouws
Company: University of Missouri
E-mail: grouwsd@missouri.edu

h**Hahm, Jong-on**

Full Name: Jong-on Hahm
Company: NSF
Department: Program Manager
E-mail: jhahm@nsf.gov

Halberda, Justin

Full Name: Justin Halberda
Company: Johns Hopkins University
Department: Psychological and Brain Sciences
E-mail: halberda@jhu.edu

Hanis-Martin, Jennifer

Full Name: Jennifer Hanis-Martin
Company: NORC
Department: ARC Management
E-mail: hanis-jen@norc.org

Harackiewicz, Judith

Full Name: Judith Harackiewicz
Company: University of Wisconsin - Madison
Department: Psychology
E-mail: jmharack@wisc.edu

Hedberg, Eric

Full Name: Eric Hedberg
Company: NORC at the University of Chicago
Department: ARC
E-mail: ech@uchicago.edu

Hedges, Larry

Full Name: Larry Hedges
Company: Northwestern University
Department: Institute for Policy Research
E-mail: l-hedges@northwestern.edu

Heffernan, Neil

Full Name: Neil Heffernan
Company: Worcester Polytechnic Institute
Department: Computer Science Dept and Learning Sciences & Technologies Program
E-mail: nth@wpi.edu

h**Hegarty, Mary**

Full Name: Mary Hegarty
 Company: University of California, Santa Barbara
 Department: Psychological & Brain Sciences
 E-mail: hegarty@psych.ucsb.edu

Hill, Oliver

Full Name: Oliver Hill
 Company: Virginia State University
 Department: Psychology
 E-mail: ohill@vsu.edu

Hines, Dorothy

Full Name: Dorothy Hines
 Company: Michigan State University
 Department: Education Policy
 E-mail: hinesdor@msu.edu

Hodari, Apriel

Full Name: Apriel Hodari
 Company: CNA
 E-mail: hodaria@cna.org

Hone, Bob

Full Name: Bob Hone
 Company: Red Hill Studios
 E-mail: bobh@redhillstudios.com

Hora, Matthew

Full Name: Matthew Hora
 Company: University of Wisconsin-Madison
 Department: Wisconsin Center for Education Research
 E-mail: hora@wisc.edu

Horvat, Erin

Full Name: Erin Horvat
 Company: Temple University
 Department: Urban Education
 E-mail: horvat@temple.edu

Husman, Jenefer

Full Name: Jenefer Husman
 Company: Arizona State University
 Department: School of Social and Family Dynamics
 E-mail: jenefer.husman@asu.edu

Hyde, Daniel

Full Name: Daniel Hyde
 Company: Harvard University
 Department: Psychology
 E-mail: dchye@fas.harvard.edu

i**Ingersoll, Richard**

Full Name: Richard Ingersoll
 Company: University of Pennsylvania
 Department: Graduate School of Education
 E-mail: rmi@upenn.edu

Izsak, Andrew

Full Name: Andrew Izsak
 Company: University of Georgia
 Department: Mathematics and Science Education
 E-mail: izsak@uga.edu

j**Jacobs, Robert**

Full Name: Robert Jacobs
 Company: University of Rochester
 Department: Department of Brain & Cognitive Sciences
 E-mail: robbie@bcs.rochester.edu

Jeanpierre, Bobby

Full Name: Bobby Jeanpierre
 Company: University of Central Florida
 Department: School of Teaching, Learning and Leadership
 E-mail: Bobby.Jeanpierre@ucf.edu

Johnson, Matthew

Full Name: Matthew Johnson
 Company: Teachers College; Columbia University
 Department: Human Development
 E-mail: johnson@exchange.tc.columbia.edu

Jones, M. Gail

Full Name: M. Gail Jones
 Company: NC State University
 Department: Science, Technology, Engineering, and
 Mathematics Education
 E-mail: Gail_Jones@ncsu.edu

j**Judy, Justina**

Full Name: Justina Judy
Company: Michigan State University
E-mail: judyjust@msu.edu

k**Kalaian, Sema**

Full Name: Sema Kalaian
Company: Eastern Michigan University
Department: School of Technology Studies
E-mail: SKalaian@emich.edu

Kamens, David

Full Name: David Kamens
Company: George Mason University
Department: Public Policy
E-mail: dkamens@verizon.net

Kanter, David

Full Name: David Kanter
Company: New York Hall of Science
Department: Center for Play, Science, and Technology Learning
E-mail: dkanter@nysci.org

Kasim, Rafa

Full Name: Rafa Kasim
Company: Kent State University
E-mail: rkasim@kent.edu

Kastens, Kim

Full Name: Kim Kastens
Company: Columbia University
Department: Lamont-Doherty Earth Observatory
E-mail: kastens@ldeo.columbia.edu

Kelemen, Deb

Full Name: Deb Kelemen
Company: Boston University
Department: Psychology
E-mail: dkelemen@bu.edu

Kelly, Anthony

Full Name: Anthony Kelly
Company: George Mason University
Department: College of Education and Human Development
E-mail: akelly1@gmu.edu

Kim, Jihie

Full Name: Jihie Kim
Company: University of Southern California/Information Sciences Institute
Department: Computer Science
E-mail: jihie@isi.edu

Kirby, Sheila Nataraj

Full Name: Sheila Nataraj Kirby
Company: NORC at the University of Chicago
Department: Senior Fellow
E-mail: Kirby-Sheila@norc.org

Kloos, Heidi

Full Name: Heidi Kloos
Company: University of Cincinnati
Department: Psychology
E-mail: heidi.kloos@uc.edu

Konstantopoulos, Spyros

Full Name: Spyros Konstantopoulos
Company: Michigan State University
E-mail: spyros@msu.edu

Kraemer, David

Full Name: David Kraemer
Company: University of Pennsylvania
Department: Psychology
E-mail: dkraemer@psych.upenn.edu

Kurtz-Costes, Beth

Full Name: Beth Kurtz-Costes
Company: University of North Carolina
Department: Psychology
E-mail: bkcstes@email.unc.edu

l**Lackner, James**

Full Name: James Lackner
Company: Brandeis University
E-mail: lackner@brandeis.edu

I**Le Doux, Joseph**

Full Name: Joseph Le Doux
Company: Georgia Institute of Technology
Department: Biomedical Engineering
E-mail: joe.ledoux@bme.gatech.edu

Leddy, Mark

Full Name: Mark Leddy
Company: NSF
Department: Program Director
E-mail: mleddy@nsf.gov

Lee, Jonghwan

Full Name: Jonghwan Lee
Company: Michigan State University
E-mail: tjbshwan@gmail.com

Lee, Kiju

Full Name: Kiju Lee
Company: Case Western Reserve University
Department: Mechanical and Aerospace Engineering
E-mail: kiju.lee@case.edu

Lester, James

Full Name: James Lester
Company: North Carolina State University
Department: Computer Science
E-mail: lester@ncsu.edu

Levine, Felice

Full Name: Felice Levine
Company: American Educational Research Association
E-mail: flevine@aera.net

Levy, Abigail

Full Name: Abigail Levy
Company: Education Development Center, Inc.
E-mail: alevy@edc.org

Long, Tammy

Full Name: Tammy Long
Company: Michigan State University
Department: Plant Biology
E-mail: longta@msu.edu

Loveland, Mark

Full Name: Mark Loveland
Company: WestEd
Department: STEM
E-mail: mlovela@gmail.com

Lowe, Ming

Full Name: Ming Lowe
Company: AERA
Department: AERA Grants Program
E-mail: mlowe@aera.net

Lyons, Leilah

Full Name: Leilah Lyons
Company: University of Illinois at Chicago
Department: Computer Science, Learning Sciences
E-mail: llyons@uic.edu

m**Maher, Michelle**

Full Name: Michelle Maher
Company: University of South Carolina
E-mail: michelleanne.maher@gmail.com

Maier, Kim

Full Name: Kim Maier
Company: Michigan State University
E-mail: kmaier@msu.edu

Maloney, Erin

Full Name: Erin Maloney
Company: University of Chicago
E-mail: maloney.erina@gmail.com

Mangels, Jennifer

Full Name: Jennifer Mangels
Company: Baruch College
Department: Psychology
E-mail: jenimangels@gmail.com

Manlove, Sarah

Full Name: Sarah Manlove
Company: Indiana University
Department: Cognitive Science
E-mail: smanlove@indiana.edu

m

Marin, Ananda

Full Name: Ananda Marin
Company: Northwestern University
Department: Learning Sciences
E-mail: amarin@northwestern.edu

Marschark, Marc

Full Name: Marc Marschark
Company: Rochester Institute of Technology/National
Technical Institute for the Deaf
Department: Center for Education Research Partnerships
E-mail: memrtl@rit.edu

Mason, Geneane

Full Name: Geneane Mason
Company: NSF
Department: Program Specialist
E-mail: mmason@nsf.gov

Massey, Christine

Full Name: Christine Massey
Company: University of Pennsylvania
Department: Institute for Research in Cognitive Science
E-mail: massey@seas.upenn.edu

Matsuda, Noboru

Full Name: Noboru Matsuda
Company: Carnegie Mellon University
Department: Human-Computer Interaction Institute
E-mail: mazda@cs.cmu.edu

Maxwell, James

Full Name: James Maxwell
Company: American Mathematical Society
Department: Executive Director Department
E-mail: jwm@ams.org

Mayorova, Olga

Full Name: Olga Mayorova
Company: American Sociological Association
Department: Research and Development
E-mail: mayorova@asanet.org

McCaffrey, Carolyn

Full Name: Carolyn McCaffrey
Company: Portland State University
E-mail: carolyn.mccaffrey@gmail.com

McCormack, Jay

Full Name: Jay McCormack
Company: University of Idaho
Department: Mechanical Engineering
E-mail: mccormack@uidaho.edu

McDonald, Sarah-Kathryn

Full Name: Sarah-Kathryn McDonald
Company: NORC
Department: ARC Management
E-mail: mcdonald-sarah@norc.uchicago.edu

McNeely, Connie L.

Full Name: Connie L. McNeely
Company: George Mason University
E-mail: cmcneely@gmu.edu

McNeil, Nicole

Full Name: Nicole McNeil
Company: University of Notre Dame
Department: Psychology
E-mail: nmcneil@nd.edu

Medin, Doug

Full Name: Doug Medin
Company: Northwestern University
Department: Psychology
E-mail: medin@northwestern.edu

Mejia-Ramos, Juan Pablo

Full Name: Juan Pablo Mejia-Ramos
Company: Rutgers University
E-mail: pablo.mejia@gse.rutgers.edu

Melkers, Julia

Full Name: Julia Melkers
Company: Georgia Institute of Technology
Department: Public Policy
E-mail: jmelkers@gatech.edu

Merrill, Lisa

Full Name: Lisa Merrill
Company: University of Pennsylvania, Graduate School of
Education
E-mail: Lisa.Merrill@gmail.com

m**Merritt, Joi**

Full Name: Joi Merritt
 Company: Michigan State University
 Department: Teacher Education
 E-mail: jmerritt@msu.edu

Metz, Kathleen

Full Name: Kathleen Metz
 Company: University of California Berkeley
 Department: Graduate School of Education
 E-mail: kmetz@berkeley.edu

Meyer, Xenia

Full Name: Xenia Meyer
 Company: University of California, Berkeley
 E-mail: xenia.meyer@berkeley.edu

Miller, Jon

Full Name: Jon Miller
 Company: University of Michigan
 Department: Institute for Social Research
 E-mail: jondmiller@umich.edu

Minn, Phyliss

Full Name: Phyliss Minn
 Company: NSF
 Department: Senior Program Assistant
 E-mail: pminn@nsf.gov

Minner, Daphne

Full Name: Daphne Minner
 Company: Abt Associates
 Department: Social and Economic Policy Division
 E-mail: daphne_minner@abtassoc.com

Moher, Tom

Full Name: Tom Moher
 Company: University of Illinois at Chicago
 Department: Computer Science/Learning Sciences
 E-mail: moher@uic.edu

Muller, Chandra

Full Name: Chandra Muller
 Company: University of Texas at Austin
 Department: Sociology
 E-mail: cmuller@soc.utexas.edu

n**Nehm, Ross**

Full Name: Ross Nehm
 Company: The Ohio State University
 Department: Teaching and Learning and EEOB
 E-mail: nehm.1@osu.edu

Nemirovsky, Ricardo

Full Name: Ricardo Nemirovsky
 Company: San Diego State University
 Department: mathematics
 E-mail: nemirovsky@sciences.sdsu.edu

Neufeld, William P.

Full Name: William P. Neufeld
 Company: NSF
 Department: Associate Program Director
 E-mail: wneufeld@nsf.gov

Neufeld, William P.

Full Name: William P. Neufeld
 Company: NSF
 Department: Associate Program Director
 E-mail: wneufeld@nsf.gov

Newstetter, Wendy

Full Name: Wendy Newstetter
 Company: Georgia Tech
 Department: Biomedical Engineering
 E-mail: wendy@bme.gatech.edu

o**O'Mahony, Timothy**

Full Name: Timothy O'Mahony
 Company: University of Washington
 Department: College of Education
 E-mail: tko2@u.washington.edu

Ornstein, Peter

Full Name: Peter Ornstein
 Company: University of North Carolina at Chapel Hill
 Department: Department of Psychology
 E-mail: pao@unc.edu

p**Pea, Celestine H.**

Full Name: Celestine H. Pea
 Company: NSF
 Department: Program Director
 E-mail: cpea@nsf.gov

Penuel, William

Full Name: William Penuel
 Company: University of Colorado
 Department: School of Education
 E-mail: william.penuel@colorado.edu

Perez-Felkner, Lara

Full Name: Lara Perez-Felkner
 Company: NORC
 Department: ARC Management
 E-mail: perez-felkner-lara@norc.org

Pouget, Alexandre

Full Name: Alexandre Pouget
 Company: University of Rochester
 Department: Department of Brain and Cognitive Sciences
 E-mail: alex@bcs.rochester.edu

Purdie-Vaughns, Valerie

Full Name: Valerie Purdie-Vaughns
 Company: Columbia University
 Department: Psychology
 E-mail: vpvaughns@psych.columbia.edu

q**Quellmalz, Edys**

Full Name: Edys Quellmalz
 Company: WestEd
 Department: Science, Technology, Engineering, and
 Mathematics Program
 E-mail: equellm@wested.org

r**Rapp, David**

Full Name: David Rapp
 Company: Northwestern University
 Department: School of Education and Social Policy &
 Department of Psychology
 E-mail: rapp@northwestern.edu

Rebello, Sanjay

Full Name: Sanjay Rebello
 Company: Kansas State University
 Department: Physics
 E-mail: srebello@phys.ksu.edu

Reese, Debbie Denise

Full Name: Debbie Denise Reese
 Company: Wheeling Jesuit University
 Department: Center for Educational Technologies
 E-mail: debbie@cet.edu

Reichsman, Frieda

Full Name: Frieda Reichsman
 Company: The Concord Consortium
 E-mail: freichsman@concord.org

Remillard, Janine

Full Name: Janine Remillard
 Company: University of Pennsylvania
 E-mail: janiner@gse.upenn.edu

Rimm-Kaufman, Sara

Full Name: Sara Rimm-Kaufman
 Company: University of Virginia
 E-mail: serk@virginia.edu

Rittle-Johnson, Bethany

Full Name: Bethany Rittle-Johnson
 Company: Vanderbilt University
 Department: Psychology and Human Development
 E-mail: bethany.rittle-johnson@vanderbilt.edu

Rivet, Ann

Full Name: Ann Rivet
 Company: Teachers College Columbia University
 E-mail: rivet@tc.columbia.edu

r**Rolandi, Marco**

Full Name: Marco Rolandi
Company: University of Washington
Department: Materials Science and Engineering
E-mail: rolandi@uw.edu

Rose, Carolyn

Full Name: Carolyn Rose
Company: Carnegie Mellon University
Department: Language Technologies Institute/ Human-
Computer Interaction Institute
E-mail: cprose@cs.cmu.edu

Rowley, Stephanie

Full Name: Stephanie Rowley
Company: University of Michigan
Department: psychology
E-mail: srowley@umich.edu

Ruiz-Primo, Maria Araceli

Full Name: Maria Araceli Ruiz-Primo
Company: University of Colorado Denver
Department: School of Education and Human Development
E-mail: maria.ruiz-primo@ucdenver.edu

S**Sadler, Philip**

Full Name: Philip Sadler
Company: Harvard-Smithsonian Center for Astrophysics
Department: Science Education Department
E-mail: psadler@cfa.harvard.edu

Santagata, Rossella

Full Name: Rossella Santagata
Company: University of California Irvine
E-mail: r.santagata@uci.edu

Sarnecka, Barbara

Full Name: Barbara Sarnecka
Company: University of California, Irvine
Department: Cognitive Sciences
E-mail: sarnecka@uci.edu

Schley, Sara

Full Name: Sara Schley
Company: Rochester Institute of Technology
Department: National Technical Institute for the Deaf
E-mail: sxsdor@rit.edu

Schmidt, William

Full Name: William Schmidt
Company: Michigan State University
Department: College of Education
E-mail: bschmidt@msu.edu

Schneider, Barbara

Full Name: Barbara Schneider
Company: Michigan State University
Department: College of Education & Department of
Sociology
E-mail: bschnied@msu.edu

Schoenfeld, Alan

Full Name: Alan Schoenfeld
Company: University of California, Berkeley
Department: Education
E-mail: alans@berkeley.edu

Scott, Darla

Full Name: Darla Scott
Company: Howard University/ Capstone Institute
E-mail: dar_scott@howard.edu

Shechtman, Nicole

Full Name: Nicole Shechtman
Company: SRI International
Department: Center for Technology in Learning
E-mail: nicole.shechtman@sri.com

Shen, Ji

Full Name: Ji Shen
Company: The University of Georgia
E-mail: jishen@uga.edu

Shin, Jean

Full Name: Jean Shin
Company: American Sociological Association
Department: Minority Affairs Program
E-mail: shin@asanet.org

S**Shultz, Mary Jane**

Full Name: Mary Jane Shultz
Company: Tufts University
Department: Chemistry
E-mail: mary.shultz@Tufts.edu

Shusterman, Anna

Full Name: Anna Shusterman
Company: Wesleyan University
Department: Psychology
E-mail: ashusterman@wesleyan.edu

Silberglitt, Matt

Full Name: Matt Silberglitt
Company: WestEd
Department: STEM
E-mail: msilber@wested.org

Skaggs, Gary

Full Name: Gary Skaggs
Company: Virginia Tech
E-mail: gskaggs@vt.edu

Smith, Jack

Full Name: Jack Smith
Company: Michigan State University
E-mail: jsmith@msu.edu

Solem, Michael

Full Name: Michael Solem
Company: Association of American Geographers
E-mail: msolem@aag.org

Solomon, Gregg

Full Name: Gregg Solomon
Company: NSF
Department: Cluster Coordinator, Knowledge Building
Cluster
E-mail: gesolomo@nsf.gov

Sonnert, Gerhard

Full Name: Gerhard Sonnert
Company: Harvard University
Department: Harvard-Smithsonian Center for Astrophysics
E-mail: gsonnert@cfa.harvard.edu

Souvaine, Diane

Full Name: Diane Souvaine
Company: Tufts University / National Science Board
Department: Computer Science / CSB, CPP, and EHR
E-mail: dls@cs.tufts.edu

Spalter-Roth, Roberta

Full Name: Roberta Spalter-Roth
Company: American Sociological Association
Department: Research and Development
E-mail: spalter-roth@asanet.org

Spears, Jacqueline

Full Name: Jacqueline Spears
Company: Kansas State University
Department: Center for Science Education
E-mail: jdspears@ksu.edu

Stahl, Gerry

Full Name: Gerry Stahl
Company: Drexel University
Department: College of Informaion Science
E-mail: Gerry.Stahl@drexel.edu

Staples, Megan

Full Name: Megan Staples
Company: University of Connecticut
Department: Curriculum & Instruction
E-mail: megan.staples@uconn.edu

Storksdieck, Martin

Full Name: Martin Storksdieck
Company: National Research Council
Department: Board on Science Education
E-mail: mstorksdieck@nas.edu

Streveler, Ruth

Full Name: Ruth Streveler
Company: Purdue University
Department: Engineering Education
E-mail: streveler@purdue.edu

Subotnik, Rena

Full Name: Rena Subotnik
Company: American Psychological Association
Department: Center for Psychology in Schools and
Education
E-mail: rsubotnik@apa.org

S**Sztajn, Paola**

Full Name: Paola Sztajn
 Company: NCSU
 Department: Elementary Education
 E-mail: paola_sztajn@ncsu.edu

T**Tan, Hong**

Full Name: Hong Tan
 Company: Purdue University
 E-mail: purdue@gmail.com

Thames, Mark

Full Name: Mark Thames
 Company: University of Michigan
 E-mail: mthames@umich.edu

Thompson-Schill, Sharon

Full Name: Sharon Thompson-Schill
 Company: University of Pennsylvania
 Department: Psychology
 E-mail: thompson@psych.upenn.edu

Timmerman, Briana

Full Name: Briana Timmerman
 Company: University of South Carolina
 Department: Office of Research and Graduate Education
 E-mail: timmerman@sc.edu

Trochim, William

Full Name: William Trochim
 Company: Cornell University
 Department: Policy Analysis & Management
 E-mail: wmt1@cornell.edu

Tyson, Will

Full Name: Will Tyson
 Company: University of South Florida
 Department: Sociology
 E-mail: wtyson@usf.edu

V**VanLehn, Kurt**

Full Name: Kurt VanLehn
 Company: Arizona State University
 Department: Computing, Informatics and Decision Systems
 Engineering
 E-mail: kurt.vanlehn@asu.edu

Viarouge, Arnaud

Full Name: Arnaud Viarouge
 Company: Vanderbilt University
 Department: Psychology and Human Development
 E-mail: arnaud.via@gmail.com

W**Walcott, Crystal**

Full Name: Crystal Walcott
 Company: Indiana University
 Department: Education
 E-mail: walcottc@iupuc.edu

Warren, Sierra

Full Name: Sierra Warren
 Company: NSF
 Department: Program Assistant
 E-mail: swarren@nsf.gov

Waxman, Sandra

Full Name: Sandra Waxman
 Company: Northwestern University
 Department: Psychology
 E-mail: s-waxman@northwestern.edu

Weis, Lois

Full Name: Lois Weis
 Company: University at Buffalo
 E-mail: weis@buffalo.edu

Wiebe, Eric

Full Name: Eric Wiebe
 Company: North Carolina State University
 Department: Science, Technology, Engineering and
 Mathematics Education
 E-mail: eric_wiebe@ncsu.edu

W**Williams, Dawn**

Full Name: Dawn Williams
Company: Howard University
Department: Educational Administration and Policy
E-mail: dgwilliams@howard.edu

Williams, Michelle

Full Name: Michelle Williams
Company: Michigan State University
Department: Teacher Education
E-mail: mwilliam@msu.edu

Wilson, Denise

Full Name: Denise Wilson
Company: University of Washington
Department: Electrical Engineering
E-mail: denisew@u.washington.edu

Wimberly, George

Full Name: George Wimberly
Company: American Educational Research Association
E-mail: gwimberly@aera.net

Woolums, Lucas

Full Name: Lucas Woolums
Company: NORC at the University of Chicago
Department: Center for Advancing Research and
Communication in Science, Technology,
Engineering, and Mathematics (ARC)
E-mail: lwoolums@urbanneeds.org

y**Yang, Yan**

Full Name: Yan Yang
Company: Arizona State University
Department: School of Mathematical and Statistical
Sciences
E-mail: yy@math.asu.edu

Young, Imanuel

Full Name: Imanuel Young
Company: NSF
E-mail: iyoung@nsf.gov

Z**Zachary, Joseph**

Full Name: Joseph Zachary
Company: University of Utah
Department: School of Computing
E-mail: zachary@cs.utah.edu

Zaitchik, Deborah

Full Name: Deborah Zaitchik
Company: Massachusetts General Hospital
E-mail: dzaitchiksamet@partners.org



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Categories

ARC Team Members at the 2011 REESE PI Meeting

Kevin Brown

ARC Associate Director
NORC at the University of Chicago

Kri Burkander

Michigan State University

Jennifer Hanis-Martin

ARC Research Analyst
NORC at the University of Chicago

Eric Hedberg

Consultant
NORC at the University of Chicago and
Arizona State University

Larry V. Hedges

ARC Co-Principal Investigator
Northwestern University

Dorothy Hines

Michigan State University

Justina Judy

Michigan State University

Spyros Konstantopoulos

Consultant
Michigan State University

Jonghwan Jay Lee

Michigan State University

Kim Maier

Consultant
Michigan State University

Sarah-Kathryn McDonald

ARC Executive Director and Co-Principal
Investigator
NORC at the University of Chicago

Lara Perez-Felkner

ARC Research Coordinator and Task
Leader, Participation of
Underrepresented Groups
NORC at the University of Chicago

Barbara Schneider

ARC Principal Investigator
NORC at the University of Chicago and
Michigan State University

Lucas Woolums

ARC Research Assistant
NORC at the University of Chicago