imbes

international mind, brain and education society

COLLABORATION, ADVANCEMENT AND TRANSLATION IN MIND, BRAIN AND EDUCATION

2014 CONFERENCE
NOVEMBER 6-8, 2014
FORT WORTH, TEXAS

UNIVERSITY OF TEXAS ARLINGTON

EXPLORING THE BIOLOGY OF LEARNING

The International Mind, Brain and Education Society facilitates cross-cultural collaboration in biology, education, and the cognitive and developmental sciences. We invite researchers and practitioners at all levels of education to explore the questions and proposed solutions that emerge at the intersection of mind, brain and education.

TEN YEARS OF PROGRESS IN EDUCATION

Rare events are those when we find ourselves in a context with the right partners, resources, initiative and opportunity to make a difference. This year's conference, with all of you, is one of those moments.

IMBES was founded in 2004, and 2007 marked our initial conference. It was our first attempt to fulfill a major focus of the society's mission: collaboration across the disciplines. The 2014 conference is our fourth, and this year also marks IMBES' 10th anniversary as a society. Both events bracket important periods in the evolution of the society. This conference not only features speakers from a number of countries, but more importantly, a unique conference model. The conference framework begins with researchers and educators sharing new research in both symposia and workshops, but also includes opportunities to transition to the important conversations necessary to assess educational implications. We want to explore the degree to which scientific ideas are ready for the classroom, the extent to which further educational research is required, the potential of current research to meaningfully shape pedagogy and, finally, to recognize and profit from opportunities to use the classroom to challenge the robustness of research.

Many of us leave conferences feeling energized, but without the structure and focus to use that energy in constructive ways. Here in Fort Worth you will experience our attempt to provide structure and focus for your future. Every symposium and workshop includes both a moderator and facilitator. While the moderator focuses on the conceptual or technical issues raised in every session, the facilitator will begin a new conversation, one that explores how ideas raised during the session can be expanded, challenged, integrated or explored in educational contexts. The facilitators have the important role of helping you identify steps forward, both modest and robust, that can organize your time and focus between this conference and the next. If you find that the action steps generated by the facilitated conversations lead to meaningful work, the society wants to hear about it. And IMBES want to support that work. If your initiative leads to a poster presentation at the next conference, IMBES will look for the very best representation of research that builds on ideas generated at this conference, and support your initiative with one of our new awards. You will hear more about IMBES's newest awards at our awards luncheon on Friday.

This conference represents 10 years of investment and growth by IMBES. The board and membership have worked hard to craft a vision of collaboration to inspire and guide you. We endeavored to create an experience where working together is more than a momentary event, but one that can continue over time. Think of this conference as the beginning of a conversation that continues at the next conference. I look forward to being part of that conversation, and hearing about your collaborative efforts in 2016.

Marc Schwartz
President
International Mind, Brain and Education Society

KEYNOTE SPEAKERS

Sian Beilock, Ph.D., is a professor in the Department of Psychology and the Committee on Education at the University of Chicago. Her research sits at the intersection of cognitive science and education, and 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. In addition to answering basic questions about cognition, the goal of her research program is to inform educational practice and policy. Beilock has authored a bestselling book, *Choke: What the Secrets of the Brain Reveal About Getting It Right When You Have To.* Her research is funded by the National Science Foundation and the U.S. Department of Education.

David B. Daniel, Ph.D., is a professor in the Department of Psychology at James Madison University. He is also the managing editor of Mind, Brain and Education, the journal of the International Mind, Brain and Education Society. Dr. Daniel is the recipient of the Robert S. Daniel Teaching Excellence Award from the American Psychological Association Division 2. He was featured in Princeton Review's 300 Best Professors and is author of "Promising principles: Translating the science of learning to educational practice" (2012, Journal of Applied Research in Memory and Cognition).

Fumiko Hoeft, M.D., Ph.D., is a cognitive neuroscientist, director of the Laboratory for Educational Neuroscience (brainLENS.org), and associate professor of child and adolescent psychiatry at the University of California, San Francisco. Her main passion lies in thinking about ways that neuroimaging can be useful in clinical and educational practices. To this end, she is interested in: 1) predicting outcome and improving identification of children with special needs using neuroimaging in populations such as dyslexia and autism, 2) understanding interaction between academic achievement, cognitive abilities, external environment, and "internal environment" such as resiliency, self-esteem, grit and motivation, and 3) how genetic, pre- and post-natal environments influence the development of brain networks. Dr. Hoeft trained in medicine and psychiatry at Keio Univ in Tokyo, Japan, neurophysiology with Alvaro Pascual-Leone at Harvard, system neuroscience with Shinsuke Shimojo at Caltech, and developmental cognitive and clinical neurosciences with John Gabrieli and Allan Reiss at Stanford. She has won numerous awards from organizations such as the World Psychiatric Association, Biological Psychiatry, Mind Science Foundation, Lucile Packard Foundation, and the Brain & Behavior Research Foundation. She has been selected as the Norman Geschwind Memorial Lecturer at the International Dyslexia Association's 2014 Annual Conference. She has been at UCSF since January of 2012, and also holds appointments at Haskins Laboratories at Yale and Keio, and at the Center for Childhood Creativity as scientific advisor.

David Rose, Ph.D., is a developmental neuropsychologist and educator whose primary focus is on the development of new technologies for learning. The co-founder of CAST and Universal Design for Learning, he has also taught at Harvard's Graduate School of Education for almost 30 years. Dr. Rose, a frequently published writer, was one of the authors of the recent National Educational Technology Plan. He has testified before the U.S. Senate and helped to lead the development of the National Instructional Materials Accessibility Standard. Among his many awards are a recent honor bestowed by the White House as a "Champion of Change." Rose holds a B.A. in psychology from Harvard College, a master's in teaching from Reed College, and a doctorate from the Harvard Graduate School of Education.

SPEAKERS

Tandra Allen is head of virtual training programs and leads the social cognition research at the Center for BrainHealth at The University of Texas at Dallas. The social cognition research at the center evaluates viable behavioral and fMRI imaging assessments as well as social-reasoning training programs across pediatric and adult populations with social deficits such as autism. With more than 10 years of clinical experience as a speech-language pathologist, Allen oversees and administers state-of-the art virtual reality social cognition training both locally in Dallas as well as remotely to participants living outside of the state. In past roles, Allen has led a post-acute clinical brain injury team as well as provided brain-injury education to families, teachers and school administrators.

Bradford Allison is passionate about bringing mind-brain science to the classroom so all children can learn at their highest levels. He has been a teacher, principal, and large city superintendent, and is now a professor of educational administration. His Ph.D. is from the University of Wisconsin.

Doris Alvarez is currently the director of The Educator Network located on the campus of the University of California San Diego's Temporal Dynamics of Learning Center. She brings together educators and scientists in monthly meetings to discuss how laboratory findings can be translated to the classroom. A K-12 educator for over 25 years, Alvarez was a high school principal and the founding principal of a 6-12 charter school on the campus of the University of California San Diego. She is a member of the Executive Committee of the Temporal Dynamics of Learning Center, was the 1997 National Principal of the Year, and presently serves as vice president of IMBES.

Daniel Ansari is a full professor and Canada Research Chair in Developmental Cognitive Neuroscience in the Department of Psychology at the University of Western Ontario in Canada, where he heads the Numerical Cognition Laboratory (www.numericalcognition.org). Ansari and his team explore the developmental trajectory underlying both the typical and atypical development of numerical and mathematical skills, using both behavioral and neuroimaging methods. He serves as an associate editor of the peer-reviewed journals, *PLoS ONE, Developmental Science,* and *Mind, Brain and Education.* Ansari has received the Early Career Contributions Award from the Society for Research in Child Development and the Boyd McCandless Early Researcher Award from the American Psychological Association.

Reuven Babai is engaged in secondary and high school science and mathematics education in the Department of Science Education, School of Education, and the Sagol School of Neuroscience, Tel Aviv University. For the past 10 years, his research has focused on students' reasoning and conceptions in science and mathematics. Specifically, his interest is in cognitive development and its acceleration, and the interference of intuitive reasoning with analytic reasoning. Dr. Babai's research employs cognitive and neuroscience techniques such as reaction time measurements and brain imaging.

Daphne Bavelier is an expert on how humans learn. In particular, she studies how the brain adapts to changes in experience, either by nature (for example, deafness) or by training (for example, playing video games). Initially trained in biology at the 'Ecole Normale Superieure de Paris', she then received a Ph.D. in Brain and Cognitive Sciences from MIT and trained in human brain plasticity at the Salk Institute. Her work shows that playing fast-paced, action-packed entertainment video games typically thought to be mind-numbing actually benefits several aspects of behavior. Exploiting this counterintuitive finding, her lab now investigates how new media, such as video games, can be leveraged to foster learning and brain plasticity.

Stephanie Bugden, M.Ed., is a Ph.D. candidate working under the supervision of Dr. Daniel Ansari in the Numerical Cognition Laboratory at the University of Western Ontario, Canada. She obtained her Master of Education focusing on special education and educational psychology in 2010 from the University of Western Ontario and is set to defend her Ph.D. next month. Her research focuses on the development of early numeracy skills in typically developing and atypically developing school children. Her primary interests include uncovering the neurobiological, as well as cognitive mechanisms that contribute to poor arithmetic abilities in children who have a specific mathematics learning disability known as developmental dyscalculia. She is also the student representative on the board of directors of the IMBES society.

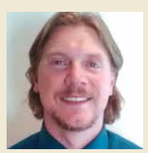
Silvia Bunge is a professor in the Department of Psychology and the Helen Wills Neuroscience Institute at the University of California, Berkeley. Dr. Bunge directs the Building Blocks of Cognition Laboratory, which draws from the fields of cognitive neuroscience, developmental psychology, and education research. Researchers in the laboratory examine developmental changes and neural plasticity in cognitive control and reasoning skills in healthy and neurologically impaired children and adults. The laboratory seeks to better understand both negative and positive environmental influences on brain and cognitive development.

Marcelo Cavazos started his teaching career as an English teacher in the Mission Consolidated ISD in 1990. In 1992, he moved to McAllen ISD where he taught English and government. He was named the secondary language arts supervisor for Mercedes ISD in 1993 and became associate adviser for San Benito Consolidated ISD in 1995. Dr. Cavazos went to work for the Texas Education Agency Department of School Finance and Support in 1998. He joined the Arlington ISD in 1999 as associate superintendent for instruction and served as interim deputy superintendent for seven months before being named

deputy superintendent in February 2009. Cavazos served as interim superintendent for six months before being named superintendent Dec. 6, 2012.

Debbie Cockerham has taught children with learning and attentional differences for more than 20 years. Her work with ADHD and ASD students has focused on connections between communication skills and the fine arts, and she has further explored children's social responses through EEG studies on autism and the interpretation of emotional cues. Cockerham has presented workshops at the International Learning Disabilities Association, the National Council of Teachers of Mathematics, Colorado Dyslexia Center, Association of Texas Professional Educators, the Learning Disabilities Association of Texas, and other educational forums. She is a graduate of UTA's MBE program, and currently directs the Research and Learning Center at the Fort Worth Museum of Science and History.

Michael W. Connell, M.Ed., holds a doctorate in education from Harvard University and an M.S. in computer science from MIT. He has been a software design engineer at Microsoft Corporation, Sunburst Communications, Inc., and Lexia Learning Systems, Inc.; an instructor at the Harvard Graduate School of Education; a visiting assistant professor in the Educational Neuroscience program at Dartmouth College; and an educational consultant to schools, nonprofit organizations, the federal government, and corporations. He is currently CEO of Native Brain, Inc., which produces evidence-based, 21st century math curricula. He has authored numerous articles on learning, motivation, and education, including "Foundations of Educational Neuroscience: Integrating Theory, Experiment, and Design" and "Bridging Between Brain Science and Educational Practice with Design Patterns."



Case Copeland, a Texas A&M University graduate, has worked in education for 15 years, teaching students at elementary, middle, and high school levels. In Irving ISD, he was hired as the mathematics instructional specialist in special education but now serves as the district's Math RtI (Response to Intervention) coordinator. This K-12 role oversees intervention programs and recovery environments while working to train teachers in effective differentiated instruction practices. Now in his second year in the MBE program, he is conducting a research experiment on the impact of a formative assessment design that aims to build students' recognition of errors. Although math has always been his venue, he aspires to improve practices for educators that develop learners more effectively.

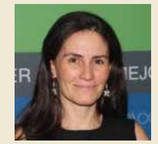
Laurie E. Cutting, Ph.D., is an endowed chair at Vanderbilt University. She is the Patricia and Rodes Hart Professor of Education and Human Development, Radiology, and Pediatrics. She is also head of the Vanderbilt Kennedy Center Reading Clinic, which serves children in need of tutoring in reading, including those with dyslexia. She is also a senior scientist at Haskins Laboratories and a member of the Vanderbilt Brain Institute, as well as the Center for Cognitive and Integrative Neuroscience at Vanderbilt University. Her work and NIH-funded projects encompass both applied and theoretical underpinnings of reading development, comprehension, and disorders. She focuses on brain-behavior relations in children and adolescents, with a particular emphasis on reading disabilities, language, and executive function.

Theo Dawson, Ph.D., is the founder and managing director of Lectica, Inc. Her research has focused on developing methods for building an alternative assessment infrastructure and the technologies to support it, and her writings on human development have been published in both cognitive and statistical journals. Dr. Dawson has run several successful organizations, including Lectica, Inc., and its predecessor, the Developmental Testing Service, LLC. She has held appointments at the University of California at Berkeley, Hampshire College, the Medical Center at Louisiana State University, and the Graduate School of Education at Harvard University. She also has served as a consultant to the U.S. federal government and a variety of businesses and schools, both in the U.S. and abroad.

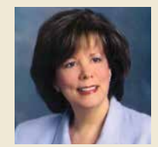
Bert De Smedt is a tenure-track assistant professor in educational neuroscience at the Faculty of Psychology and Educational Sciences at the University of Leuven, Belgium. He received his Ph.D. in educational sciences from the University of Leuven in 2006. Until 2010, he was a postdoctoral research fellow of the Research Foundation Flanders and a visiting scientist at the University of Western Ontario. He uses behavioral and brain imaging methods to understand how children develop arithmetical skills, what neurocognitive mechanisms underlie this typical and atypical development, and how this development can be fostered. Dr. De Smedt is the coordinator of the EARLI Special Interest Group on Neuroscience and Education and secretary of the International Mind, Brain and Education Society.

Janet M. Dubinsky, Ph.D., professor of neuroscience at the University of Minnesota (UMN), directs the BrainU professional development program for secondary science teachers (www.brainu.org) and teaches graduate and undergraduate neuroscience. Winner of the 2009 Society for Neuroscience Science Educator Award, she serves on the Society's Public Education and Communication Committee. In 2008, she co-chaired the Minnesota P-16 Education Partnership Science Postsecondary and Workforce Readiness Working Group, aligning K-12 Science Standards with expectations of the workforce and higher education. Her research program investigates metabolic compromise in neurodegenerative disease. She chairs the UMN Neuroscience Outreach Committee, which runs the Brain Awareness Week and Minnesota Brain Bee. Her most recent publication addresses the need for both pre-service and in-service teacher training in neuroscience,

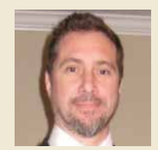
Jacquelyn Gamino is the director of the BrainHealth Adolescent Reasoning Initiative at UT Dallas. Dr. Gamino is an expert in advanced reasoning and has served as a member of educational reform think tanks for both the George W. Bush Middle School Matters Initiative and the Laura and John Arnold Comprehensive Education Reform Initiative. Her primary focus is in strategic thinking and critical reasoning. With her team, Gamino has reached over 30,000 adolescents in public middle schools. In the last three years, she has received more than $10 million in educational research funding to advance reasoning in youth across America. She is an invited national speaker and has published evidence-based practices regarding maximizing adolescent brain potential.



Eugenia Garduño holds a master's degree in international education policy and is a doctoral candidate at the Harvard Graduate School of Education. She has worked at the Mexican Ministry of Public Education (in an initiative to foster collaboration among higher education institutions in North America) and at the Latin American Institute for Educational Communication (in the development of the national distance education program). She coordinated the design of institutional development projects at the National Teaching University and also participated in research and evaluation projects at Harvard University and CIDE (public research center in Mexico City). Since September 2013 she has been the head of the OECD Mexico Centre for Latin America.



Jeanne Marcum Gerlach is UT Arlington's associate vice president of K-16 initiatives and has served as dean of the College of Education since 1997. In addition to providing leadership to the college, Dr. Gerlach also directs University-wide efforts for K-16 education. Her work has focused on increasing success rates and closing the gaps in achievement among all students, kindergarten through graduate school, with emphasis on providing access and success for low-income African-American and Latino students. Awards include Outstanding Woman in English Education, Outstanding Woman Leader in Fort Worth, Outstanding Philanthropic Award, and Outstanding Alumni Awards from both West Virginia University and the University of North Texas.

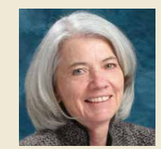


T. Sigi Hale, Ph.D., is a founding member of UCLA's Mindful Awareness Research Center (MARC) and an assistant professor in the Psychiatry Department of UCLA's Semel Institute. His research explores the implications of human beings possessing two distinct and specialized brain hemispheres. In particular, he studies how variability in functional cerebral asymmetry contributes to diversity of intelligence types, as well as imbalanced brain function. Outside of science, he is a musician, a lifelong practitioner of various mindfulness practices, and a husband and father. In addition to his academic pursuits, he also is working to apply neuroscientific knowledge to help evolve the fields of education, psychology, cognitive-training, and self-regulation. He believes that a growing understanding of human brain function diversity is elucidating new and better ways for individuals and groups to realize their potential and wants to help make that happen.

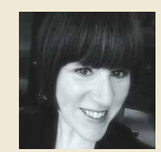
Suzanne Hidi was associate professor of the Graduate Faculty, University of Toronto, and is now a founding member of the Senior College, University of Toronto. Her research and publications focus on reasoning and academic writing, followed by investigations of students' motivation and interest. Recently, she has been linking research of educational/social psychologists with those of neuroscientists in the area of motivation and emotions. Hidi is one of the three editors of the *Handbook Interest and Learning in K-16, Mathematics and Science Learning* (in press), sponsored by the American Educational Research Association. Her paper, "The Four-Phase Model of Interest Development" (2006), co-authored by Ann Renninger, is used as a framework for ongoing research both in school and out of school settings.

Edward M. Hubbard is an assistant professor in the Department of Educational Psychology, Neuroscience Training Program, and Waisman Center at the University of Wisconsin-Madison, where he directs the Educational Neuroscience Lab. His research focuses on the neural basis of numerical cognition, synesthesia, and multisensory integration. After completing his Ph.D. in 2004, he held post-doctoral appointments with Stanislas Dehaene and Bruce McCandliss before moving to Madison in 2012. He is the author of more than 30 publications, including articles in *Neuron*, *Nature Reviews Neuroscience*, and *Science* and is the co-editor of the *Oxford Handbook of Synesthesia*.

Mary Helen Immordino-Yang, Ed.D., is an affective neuroscientist and human development psychologist who studies the neural, psychophysiological, and psychological bases of social emotion, self-awareness, and culture and their implications for development and schools. She is an associate professor of education, psychology, and neuroscience at the University of Southern California. She completed her doctorate at Harvard University in 2005 and was the 2014 recipient of early career awards from the American Educational Research Association and the American Association for the Advancement of Science.



Terry Jernigan is a professor of cognitive science, psychiatry, and radiology, and director of the Center for Human Development at UC San Diego. She trained as a clinical and experimental neuropsychologist and since the late 1970's has studied the human brain using imaging. This work has focused on brain development and aging, neurodevelopmental disorders, neuropsychiatric and substance use disorders, and neurodegenerative disorders. Since 2008 her central research interest has been the developing human mind and brain, and she has pursued this interest in collaboration with an interdisciplinary team. She is a member of the National Advisory Board on Drug Abuse and serves on the scientific advisory boards of several research organizations in the U.S. and Europe.



Layne Kalbfleisch, M.Ed., Ph.D., is an associate professor of educational psychology and cognitive neuroscience, the founder of George Mason University's KIDLAB, and on the pediatrics faculty of The George Washington School of Medicine and Health Sciences. She is chair of the Brain, Neuroscience, and Education special interest group of the American Education Research Association and a founding associate editor of *Frontiers in Educational Psychology*. Her recent guest-edited volume of *Roeper Review* covers the topic of visual spatial talent. Kalbfleisch's research examines the relationship between talent and disability in autism and attention disorders and uses neuroimaging to study how physical aspects of the environment, emotion, and social organization influence problem-solving and inform our understanding of constructivist learning, or learning by experience.

SPEAKERS

Rockey Knox is currently a doctoral candidate in special education and disability studies at the George Washington University. Her dissertation research focuses on the hermeneutic implications of interpretation and experience in transdisciplinary knowledge development in the field of Mind, Brain and Education. She has a B.S. in journalism from Boston University and a M.Ed. from the University of Hawaii, Manoa.

Yulia Kovas is a professor of genetics and psychology at Goldsmiths, University of London, where she is also the director of InLab (International Laboratory for Interdisciplinary Investigations into Individual Differences in Learning (www.inlab.co.uk). She also directs the Laboratory for Cognitive Investigations and Behavioural Genetics at Tomsk State University and co-directs the Russian-British Laboratory of Behavioural Genetics (Goldsmiths & Psychological Institute of the Russian Academy of Education, Moscow). Her research program involves international, interdisciplinary investigations into individual differences in learning, with particular focus on mathematical ability and other STEM fields within education. She leads the genetically informative research into mathematical development in the Twins Early Development Study (TEDS) at King's College, London, and directs the Russian School Twin Registry.

Woogul Lee is a research professor at the Brain and Motivation Research Institute (bMRI) of Korea University and received his Ph.D. from the University of Iowa. His research interests concern human motivation and its influences on cognition and emotion from an interdisciplinary perspective. Recently, he has sought to extend understanding of human motivation from a neural perspective by identifying the neural basis of intrinsic motivation using the fMRI technique.

Lin Lin, Ph.D., is an associate professor of learning technologies at the University of North Texas. Her research lies in the intersection of technology, cognition, and education. She has conducted research on the impact of new media and technologies on the brain, cognition, and learning, specifically in media multitasking, online learning, and game-based learning. Lin received her doctoral degree from Columbia University and has published in dozens of academic journals, including the *Proceedings of the National Academy of Sciences*. She has been cited and interviewed by magazines and newspapers such as *Le Temps, Ingenioren, Scientific American,* and *Fort Worth Star-Telegram*.

Evie Malaia's research focuses on the neural mechanisms underlying higher cognition in learning. She combines computational and neuroscience (fMRI, EEG) techniques to understand how the neurotypical and special populations, such as deaf signers and children with ASD, process stimulus signals. Her work on network analysis of neural oscillations mediating behavioral outcomes is funded by the Department of Energy and National Science Foundation.

Bryan Matlen, Ph.D., is an educational researcher interested in the conditions that promote robust learning. He received his doctorate from the Department of Psychology at Carnegie Mellon University, where he served as a fellow in the Program for Interdisciplinary Education Research and the Pittsburgh Science of Learning Center. He recently completed a postdoctoral fellowship in the Department of Psychology and the Spatial Intelligence and Learning Center at Northwestern University. Matlen currently works in the Science, Technology, Engineering, and Mathematics Program at WestEd, where his research is aimed at discovering principles of learning that can support educators in making instructional design choices.

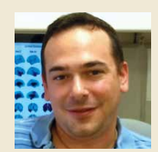
Bruce McCandliss is a professor of developmental and psychological sciences at Stanford University. He studies developmental cognitive neuroscience, with an emphasis on questions of how the neural substrates of several cognitive abilities change via learning and education, which may ultimately inform both theories of the role of educational experiences in the development of certain brain functions and drive insights into improvements in educational interventions. His laboratory employs diverse techniques (fMRI, EEG, DTI) to investigate the neural basis of experience-driven cognitive changes within reading/language development, numerical/mathematical cognitive development, and domain-general attention abilities.

Emma Meaburn joined the Department of Psychological Sciences at Birkbeck, University of London as a lecturer in 2010, where she leads the Behavioral Genomics Research Group. After obtaining a BSc in human biology and an MSc in human molecular genetics, she joined the Twins Early Development Study (TEDS) at the Institute of Psychiatry, King's College London. She completed her Ph.D. in behavioral genetics under the supervision of Professor Robert Plomin. In her postdoctoral research, she led the molecular genetic research into the identification of quantitative trait loci associated with individual differences in reading abilities in the TEDS sample. Her research aims to use measured genomic information to better understand the biological basis of individual differences in behavioral domains and psychopathologies in childhood and adolescence.

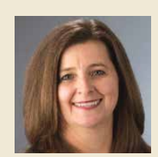
Rosalyn Moran, Ph.D., is an assistant professor at the Virginia Tech Carilion Research Institute, at the Bradley Department of Electrical & Computer Engineering at Virginia Tech, and at the Department of Psychiatry & Behavioral Medicine at Virginia Tech Carilion School of Medicine. Her lab employs both theoretical and empirical neuroscientific approaches to understand the principles of functional integration in the brain, examining how neurotransmitters and neuromodulatory systems shape the dynamics of neuronal communication. Her work involves the development of Bayesian approaches to neuroimaging data analysis and the use of computational generative models such as dynamic causal modeling (DCM) to understand brain connectivity and biophysical models to address how pharmacological interventions interrupt neuronal dynamics.

Yuko Munakata is a professor in the Department of Psychology and Neuroscience at the University of Colorado Boulder. She received her Ph.D. from Carnegie Mellon University in 1996, did her postdoctoral work at MIT, and served as an assistant and associate professor at the University of Denver. Her work investigates executive function and its development, using behavioral, computational, and neuroimaging approaches. She has co-authored two editions of a *Computational Cognitive Neuroscience* textbook, and her work has been funded by the NIH since 1998. She served as an associate editor of *Psychological Review* and a member of the NIH Biobehavioral and Behavioral Processes study section. She is a Fellow of the APA and APS, and a recipient of the APA Boyd McCandless Award.

Kou Murayama, who earned his Ph.D. in educational psychology, University of Tokyo, is a lecturer at the University of Reading, UK. He has been a JSPS research fellow at Tokyo Institute of Technology, University of Rochester, and University of California, Los Angeles, and Alexander von Humboldt research fellow at the University of Munich. His research focuses on human motivation, memory process, and metacognition in educational contexts, using multiple methodologies (longitudinal surveys, behavioral experiments, behavioral genetics, meta-analysis, neuroimaging, educational intervention, etc.). His expertise includes educational, cognitive, and social psychology; neuroscience; and psychometrics. Murayama received the Richard E. Snow Awards for Early Contributions from the American Psychological Association, the Distinguished Young Researcher Award for International Research from the Japanese Psychological Association, and the Marie-Curie Career Integration Grant from the European Commission.



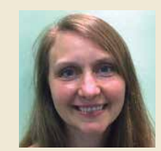
Erik Newman is a project scientist at the UC San Diego Center for Human Development (CHD). He earned his B.A. in psychology from The University of Texas at Austin and his Ph.D. in clinical psychology from Fairleigh Dickinson University. He completed a predoctoral internship at the UCSD/VA Psychology Internship Program and a postdoctoral research fellowship in biological psychiatry and neuroscience through the UCSD Department of Psychiatry and the CHD. His clinical expertise is in psychological assessment of children and adolescents and treatment of disruptive behavior disorders. His research focuses on cognitive and social/emotional development in typically developing children and adolescents, identification of developmental risk phenotypes for adverse academic and social/emotional outcomes, and neural architectural correlates of these risk phenotypes.



Karen Norris is a passionate advocate for high-quality education for urban children. An accomplished educator, she has taught in elementary school and collegiate environments in Dallas. Norris earned her Ph.D. from the University of North Texas with a focus on curriculum, instruction, and administration. She currently directs curriculum development and professional learning at Momentous Institute and Momentous' educational outreach with public and private schools, colleges, and universities.

Steve Palko, co-founder of XTO Energy Inc., began his career as a petroleum engineer with Exxon Corporation. He served as XTO's president for 19 years, leading the company to become a successful independent oil and gas exploration/production company, and eventually sold the company to ExxonMobil Corporation. Palko earned his Ph.D. in education from Texas Christian University, where he has served as assistant professor of educational leadership since 2009. He has served as a school board trustee for the Fort Worth Independent School District and is currently a board member of the Fort Worth Museum of Science and History, Performing Arts Fort Worth (Bass Hall), and the Committee for Economic Development.

Mohan Dev Pant is an assistant professor of research methodology in the Department of Curriculum and Instruction at The University of Texas at Arlington, where he teaches courses on educational research. He received his Ph.D. in statistics and measurement and M.S. in mathematics from Southern Illinois University at Carbondale in 2011 and 2006, respectively. He has taught courses on statistics there as well. His main research interests are in the fields of applied mathematics and statistics, statistical computing techniques, simulating non-normal distributions, multilevel modeling, and Bayesian inference. His research articles have been published in the journals such as *Statistica Neerlandica, Applied Mathematical Sciences, ISRN Applied Mathematics, ISRN Probability and Statistics*, and *Journal of Statistical and Econometric Methods*.



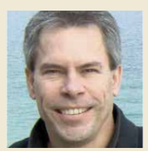
E. Juliana Paré-Blagoev, Ed.D., is an applied developmental psychologist working at the intersection of education and neuroscience. At George Washington University, she is a Senior Research Scientist and Director of the Center for Applied Developmental Science and Neuroeducation. Previous positions include Director of a multi-district, interdisciplinary research-practice partnership at the Strategic Education Research Institute (SERP) Institute and Research Scientist at the Mind Research Network (MRN). At SERP, she created and tested an innovative STEM curriculum based on established cognitive science findings and informed by teachers' expertise. At MRN, Juliana conducted pediatric neuroimaging studies on educationally relevant issues. A founding member of the International Mind, Brain and Education Society, she received her Ed.D. at the Harvard Graduate School of Education.

Heekyeong Park is an assistant professor of psychology at The University of Texas at Arlington. She is a cognitive neuroscientist by training. She has studied human memory and cognition with neuroimaging methods such as fMRI, EEG, and fNIRS, along with behavioral/pharmacological methods. Her research interests include the effects of task processing in memory, neural correlates of associative memory, content-specific encoding/retrieval of associative memory, and pre-stimulus neural activity predicting subsequent memory performance. She is interested in the involvement of left inferior prefrontal cortex in the formation of associative memory and the role of the medial temporal lobe in content-selective processing for successful associative memory.

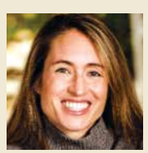
Thomas D. Parsons, Ph.D., is associate professor of psychology and director of clinical neuropsychology and simulation at the University of North Texas. Before joining UNT, he was an assistant professor and research scientist at the University of Southern California's Institute for Creative Technologies. In addition to his patent for eHarmony.com's matching system, he has invented multiple adaptive virtual environments for neuropsychological assessment. He has more than 100 publications and has been PI of 17 grants. He is associate editor for *Frontiers in Human Neuroscience* and serves on the editorial boards of *Assessment*, *Cyberpsychology*, and *Psychological Assessment*. He received the 2013 National Academy of Neuropsychology Early Career Award. In 2014, he received Fellow status in the National Academy of Neuropsychology.

Diane Patrick, Ph.D., serves as vice chair of the Texas House of Representatives Higher Education Committee. Elected in 2006, Dr. Patrick also serves on the Appropriations Committee, and Rules and Regulations. Holding degrees from the University of North Texas and Baylor University, she has been a teacher, university professor, State Board of Education member, Arlington School Board president, and Public Education Committee member.

Renee O. Pope is the director of curriculum and instruction in the Arlington Independent School District in Texas. Her job entails overseeing the math, English language arts, science and social studies departments, curriculum development, and the implementation of the AISD instructional model. Prior to this position, she served as the K-12 Science and Health Coordinator for nine years. Pope is a founding member of the executive council of the Mind, Brain and Education Research Schools Network at The University of Texas at Arlington. She has been active in the Research Schools Network under the leadership of Dr. Marc Schwartz since 2009.



Johnmarshall Reeve is a professor in the Department of Education at Korea University in Seoul, South Korea. While in the U.S., he received his Ph.D. from Texas Christian University and completed postdoctoral work at the University of Rochester. Professor Reeve's research interests center on the empirical study of all aspects of human motivation and emotion with particular emphases on teachers' motivating styles, students' motivation and engagement during learning activities, and the neuroscience of intrinsic motivation. He has published 50 articles on motivation in journals such as the *Journal of Educational Psychology*, 20 book chapters, and three books, including *Understanding Motivation and Emotion*. Since 2011, Dr. Reeve has served as editor-in-chief of the journal *Motivation and Emotion*.



Lindsey Richland is associate professor in the Department of Comparative Human Development and the Committee on Education at the University of Chicago. Dr. Richland investigates children's reasoning development, with a focus on the relationships between children's maturing cognitive system and optimal instructional practices for fostering children's deep reasoning in the disciplines of mathematics and science. Her work has been supported by a CAREER award from the National Science Foundation as well as grants from the Institute of Education Sciences, the Office of Naval Research, and the Spencer Foundation. In 2008, she was awarded a National Academy of Education/Spencer Foundation Postdoctoral Fellowship. Dr. Richland received her Ph.D. in developmental psychology and cognitive science from the University of California, Los Angeles.

Miriam Rosenberg-Lee is a developmental cognitive neuroscientist at Stanford University. After completing a bachelor's degree in mathematics at McGill University, she received a Ph.D. in cognitive psychology from Carnegie Mellon University, and additional neuroscience training at the University of Pittsburgh. Her research sits at the intersection of education and neuroscience, addressing how the brain acquires and masters complex formal systems, like mathematics and how that process may be perturbed in children with mathematical learning disabilities and autism spectrum disorders. Recent research has focused on the neuroplastics changes that accompany successful learning, with a view to developing and augmenting effective instructional approaches. Dr. Rosenberg-Lee's research and training have been supported by the NIH (U.S.) and the NSERC (Canada).

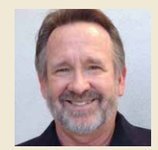
Marc Schwartz is a professor and director of the Southwest Center for Mind, Brain and Education at The University of Texas at Arlington. His principle work is in developing an MBE Research Schools Network and master's degree in MBE. He studies and develops organizational systems that can support promising research agendas at the intersection of the fields of mind, brain and education, and also supports educators in becoming effective consumers and producers of knowledge in this new field. The Research Schools Network seeks to increase collaboration between researchers, practitioners, and policymakers by offering a forum where ideas are welcomed and at the same time critically and rigorously examined with tools and models emerging at the interface of education, cognitive science, and neuroscience.

Peggy Semingson is an associate professor of curriculum and instruction (with a focus on literacy studies) at The University of Texas at Arlington. Her master's degree is in reading education from Texas State University, San Marcos. Her Ph.D. is from The University of Texas at Austin in language and literacy studies. Prior to her career in academia, she was a bilingual elementary teacher and bilingual reading specialist for eight years. She currently studies the ways that we can use digital pedagogies to engage pre-service and in-service teachers to most effectively help them to teach literacy in their current and future classroom contexts.

Bei Song, Ph.D., is an associate professor at Harbin Normal University of China. Her work focuses on the relation between cognitive neuroscience and music education. She is the author of *The Inspiration of Music Education to the Plasticity of the Brain*, essays that focus on the impact of music training on neural development. Her new book, *Implications of Educational Neuroscience for Music Education*, is in press. Dr. Song has worked as a visiting fellow in the United Kingdom and is active in international associations associated with music education and cognitive neuroscience.

Firat Soylu is an assistant professor of educational psychology and neuroscience at the University of Alabama. He is interested in the embodiment of STEM learning cognition. His previous work involves behavioral and neuroimaging investigations on mathematical cognition and design-based research on science and mathematics learning with computational tools. He was a postdoctoral fellow in the Center for Connected Learning and Computer Based Modeling at Northwestern University between 2011 and 2014. He completed his doctoral work in the Cognitive Neuroimaging Lab at Indiana University in 2011 and received a joint Ph.D. in instructional systems technology and cognitive science.

Henderien W. Steenbeek studied developmental psychology at the University of Groningen, where she defended her Ph.D. thesis in 2006. The subject of her thesis was modeling dyadic child-peer interactions during play. She currently works as associate professor at the Department of Developmental Psychology at the same university. In addition, she works as a professor at Teacher College at the University of Applied Sciences in Groningen. She focuses on child-adult and child-child interaction in play-educational settings. Her research themes are children's learning processes in primary education (with a focus on children with special needs and excellent performing children) and the dynamics of children's play. Most studies are focused on the observation of interaction behaviors in naturalistic circumstances.



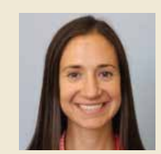
Steve Stringer is a staff member at Los Alamos National Laboratory in the technology transfer function. He represents Los Alamos science and technology capabilities to U.S. companies, translating business needs into actionable scientific research and development requirements. For Stringer, the interface between industry and science became the genesis for "thinking about education in a modeling way." This led to an assembly of multi-disciplinary expertise to articulate an education modeling project, including early childhood development and language comprehension. The neural, behavioral, and social factors of special education present a novel challenge to a general model of education. Stringer is currently enrolled as a doctoral student at the University of New Mexico in the College of Education.

Lori Takeuchi, senior director and research scientist at the Joan Ganz Cooney Center, oversees the center's research program. A learning scientist by training, she conducts research on how children use digital media across the various settings of their lives and the implications these tools hold for their learning and development. She created several of the center's distinguishing initiatives, including Print vs. E-books, The New Coviewing, and Aprendiendo Juntos, and is a founding PI of the Families and Media Project. Before earning her Ph.D. from Stanford, she designed science simulation and visualization software for BBN Educational Technologies, Logal Software, and WorldLink Media. She began her career managing the Instructional Television Department at Thirteen/WNET. She holds an A.B. in Communication from Stanford and an Ed.M. from Harvard.

Dustin Thoman is an associate professor in the Department of Psychology at California State University, Long Beach. His research focuses on understanding how and why people come to develop interest and sustain motivation for specific academic domains, careers, and other lifelong pursuits. He explores how intrinsic motivation develops through self-regulation processes, as well as how motivation is influenced by one's social identity and social interactions. Dr. Thoman's applied work focuses on designing and evaluating educational intervention programs, particularly those aiming to broaden participation and increase educational access. His research primarily intersects social and educational psychology and is funded by the National Science Foundation and National Institutes of Health.

Michael Thomas is a professor of cognitive neuroscience at Birkbeck, University of London. He has been director of the University of London Centre for Educational Neuroscience since 2010 (www.educationalneuroscience.org.uk/). The CEN is a tri-institutional research center that aims to further translational research between neuroscience and education and to develop practical applications of neuroscience within education. In 2003, he established the Developmental Neurocognition Laboratory (www.psyc.bbk.ac.uk/research/DNL/) within Birkbeck's world-leading Centre for Brain and Cognitive Development. The focus of his laboratory is the use of multidisciplinary methods to understand the brain and cognitive bases of cognitive variability, including behavioral studies, brain imaging, computational modeling, and genetics. He is a chartered psychologist and Fellow of the British Psychological Society.

Richard Tibbles is a Ph.D. student in the Department of Cognitive Science at the University of California, San Diego. His research focuses on how to motivate and engage learners and how to impact the design of online learning platforms. He is the developer for a choice-driven online platform for undergraduate classes and a developer for KA Lite, an offline platform for Khan Academy content. He previously spent three years teaching secondary science in the United Kingdom and two years training teachers in the U.S. in problem-based learning, educational technology, and student-centered teaching. Tibbles holds an M.A. in physics and philosophy from the University of Oxford and an M.A. in philosophy from Birkbeck College, University of London.



Miriam Tillinger is an associate research scientist at CAST, a nonprofit research and development organization that works to expand learning opportunities for all individuals through Universal Design for Learning. Dr. Tillinger's research focuses on the role of motivation and engagement in learning for students with disabilities. Before joining CAST, she was a Fellow in the Leadership Education in Neurodevelopmental and Related Disabilities Program at Boston Children's Hospital, an instructor in the Applied Psychology and Human Development Program at the Lynch School of Education at Boston College, and a behavioral therapist working with children and adolescents with developmental disabilities.

SPEAKERS

Andy Tolmie, chair of psychology and human development at the Institute of Education, University of London, is also deputy director of the IOE/UCL/Birkbeck Centre for Educational Neuroscience. He was editor of the *British Journal of Educational Psychology* from 2007 to 2012. He is a developmental psychologist with longstanding interest in the growth of children's conceptual representations and behavioral skills and the relationships between these, particularly in primary school children. His work has focused on educationally relevant topics, emphasizing primary school science, the acquisition of road-crossing skills among children, and the use of ICT to support learning. He was recently a member of a Royal Society working group reporting on science and mathematics education between 5 and 14 years.

Jodi Tommerdahl is an associate professor at The University of Texas at Arlington and one of the founding members of the Center for Mind, Brain and Education. Her work focuses on the interfaces between language, cognition, and education. Her recent work involves using neurophysiological techniques in exploring the brain's reasoning systems and the use of linguistic corpora to examine the development of language in early childhood. She is the author of the book *The Day the Letters Flew,* designed to support children who need language support, along with over 30 other peer-reviewed publications. She has served as a faculty member in France, the UK, and the U.S. and is active in international associations associated with education and neuroscience.

M. Shane Tutwiler served in the United States Navy as a radiation health physicist and nuclear water chemist aboard fast-attack submarines before transitioning to a career in science education and earning an M.Ed. from the Harvard Graduate School of Education, where he was the recipient of the Intellectual Contribution and Faculty Tribute Award. He then taught high school math and science before returning to Harvard to pursue his doctorate in human development and education, focusing his research on the modeling of human causal understanding of complex systems within multi-user virtual environments. Through his doctoral research, Tutwiler hopes to inform the design of virtual and real-world field trips, lab-based instruction, and other inquiry-based science learning environments.

Paul van Geert, who earned a Ph.D. from the University of Ghent, is a professor of developmental psychology at the University of Groningen, Netherlands. He has pioneered the application of dynamic systems theory to developmental areas such as early language development and second language acquisition; cognitive development in learning-teaching processes; and social interaction and identity. His aim is to better understand the general nature of developmental dynamics that drive and shape a developmental process in an individual, as the individual, given his or her biological properties and potentialities, interacts with his or her actively explored and transformed environment. He has been a Fellow at the Center for Advanced Studies in the Behavioral Sciences and has held visiting professorships at universities around the world.

Mike Vendetti, Ph.D., is a cognitive neuroscientist interested in understanding the role of lateral frontoparietal networks in relational reasoning. He received his doctorate from the Department of Psychology at the University of California, Los Angeles, where he worked with Drs. Keith Holyoak and Barbara Knowlton on research related to relational reasoning and memory. He currently is a postdoctoral researcher at the Helen Wills Neuroscience Institute at the University of California, Berkeley, where he works in Dr. Silvia Bunge's Building Blocks of Cognition lab. His current research uses eye tracking and behavioral methods in healthy young adults and children with pediatric-acquired brain injury to study the unique contributions of left and right prefrontal and parietal cortex for relational reasoning.

Kenneth Williford is an associate professor and chair of the Department of Philosophy and Humanities at The University of Texas at Arlington. He works primarily in the philosophy of mind and the history of modern philosophy. His research interests include epistemology and logic, and the history and philosophy of neuroscience.

Jiaxian Zhou, an associate professor at the Center for Educational Neuroscience, East China Normal University, uses fMRI to study the effects of literacy learning on human brains. She authored the book *Introduction to Educational Neuroscience* (2009), which was awarded the Shanghai Municipal Education Commission Prize. Her book, *Educational Neuroscience: The Construction of a New Field and the Innovation of Education* is in press. Zhou heads a group that is translating key books on educational neuroscience into Chinese. Four of these books have been recognized in "100 books that influence teachers in China." She serves as associate editor for the *Journal of Bio-Education*, as editorial board member for *Trends in Psychology in China*, and on the International Mind, Brain and Education Society board.

SCHEDULE

DAY ONE — THURSDAY, NOVEMBER 6, 2014

2 p.m.-5 p.m. *Foyer* — **REGISTRATION**

5:15 p.m.-5:30 p.m. *Pecos* — **WELCOME:** Jeanne Gerlach
Dean, College of Education, The University of Texas at Arlington

5:30 p.m.-6 p.m. *Pecos* — **CONFERENCE OVERVIEW:** Marc Schwartz
President, IMBES

6 p.m.-7:15 p.m. *Pecos* — **KEYNOTE ADDRESS**

Preaching about teaching: Translating Mind, Brain and Education to the classroom

Presented by: David Daniel, James Madison University

What level of empirical evidence should teachers require before adopting teaching strategies or technologies that are claimed to be effective? What methodological questions should researchers address before making such claims? The field of Mind, Brain and Education offers great promise to both educators and researchers. Yet, the trend to prematurely convert laboratory findings into classroom interventions is increasingly popular and fraught with potential peril. Efforts to form collaborations between educators and researchers have thus far proven to be of limited utility. This talk focuses upon the translational process required, but presently absent in the field, to safely bring promising findings from science to the classroom.

7:30 p.m.-9:30 p.m. *Grand Ballroom* — **RECEPTION**
Host: Jeanne Gerlach
Dean, College of Education, The University of Texas at Arlington

DAY TWO — FRIDAY, NOVEMBER 7, 2014

7 a.m. *Foyer* — **BREAKFAST**

7:45 a.m. *Pecos* — **KEYNOTE ADDRESS**

Math anxiety: who has it, why it develops, and how to guard against it

Presented by: Sian Beilock, University of Chicago

Basic math skills are important for success in school and everyday life. Yet many people experience apprehension and fear when dealing with numerical information, termed math anxiety. In this talk, I explore the cognitive, neural and social antecedents and consequences of math anxiety, revealing some surprising insights into its onset, risk factors, and remediation.

This presentation is supported by NSF award #1434973 Research on Evaluation and Learning (REAL) to UT Arlington.

9 a.m. — **BREAK**

9:20 a.m.-11:30 a.m. ▸ **CONCURRENT SYMPOSIA** 1 2 3 4 5

▸ SYMPOSIUM #1: REASONING

Pecos 1

Leader: Silvia Bunge, University of California, Berkeley

Panel: Bryan Matlen, Northwestern University; **Lindsey Richland,** University of Chicago; **Michael Vendetti,** University of California, Berkeley

Facilitator: Ken Williford, The University of Texas at Arlington

Analogical reasoning: Development, neural basis, and relevance for education

Picture yourself in a classroom, listening to a dry lecture about a complex topic. You struggle to maintain focus and grasp the unfamiliar concepts. Then, the teacher draws an analogy between this new material and something that you already know and care about. You perk up your head with interest and delight in exploring the parallels between the two domains. At first blush, it seems intuitive that educators can use analogies to facilitate learning. However, there are many important questions to consider. What is the evidence that analogical reasoning facilitates learning? How early in development can children grasp analogies, and how and why does this ability change with age? Is it possible to improve childrens' analogical reasoning? This symposium features three of the most promising scholars in the area of reasoning to discuss these and other questions.
This symposium is supported by NSF award #1434973 Research on Evaluation and Learning (REAL) to UT Arlington.

▸ SYMPOSIUM #2: SPECIAL EDUCATION

Pecos 2

Leader: Jodi Tommerdahl, The University of Texas at Arlington

Panel: Steve Stringer, Los Alamos Laboratories

Facilitator: Peggy Semingson, The University of Texas at Arlington

MBE and special education

The study of cognitive functions in typically developing humans has regularly been informed by the nature of atypical development. For example, the study of children with dyslexia helps us better understand typical reading processes. The same is true of aphasia and oral language. In an attempt to better understand how typically developing children learn, new light is shed on what hinders their learning as well. This symposium will examine advances in knowledge and practice resulting from brain research. Particular focuses is on language development, autism, motor development and dyslexia.

▸ SYMPOSIUM #3: PEDAGOGY & NEUROSCIENCE

Post Oak

Leader: Layne Kalbfleisch, George Mason University

Panel: Reuven Babai, Tel Aviv University; **Laurie Cutting,** Vanderbilt University

Facilitator: Lin Lin, University of North Texas

Fine-tuning "fuzzy" points in learning & knowing when to change the gain

This title is a double entendre to encompass the notion that there are often times "fuzzy" moments during learning where the teacher has a particular opportunity to deepen knowledge and understanding. Some of these moments occur in the face of undoing 'old' learning, while others are influenced by external factors in the physical and social environment. This panel examines ways in which neuroscience may sharpen our intuition and knowledge about identifying and sharpening pedagogy and instruction to optimize student learning.

▸ SYMPOSIUM #4: SYMBOLIC LEARNING

Elm Fork

Leader: Evie Malaia, The University of Texas at Arlington

Panel: Heekyeong Park, The University of Texas at Arlington; **Firat Soylu,** University of Alabama

Facilitator: Case Copeland, Irving ISD

Contribution of executive and memory systems to symbolic learning in STEM

Recent advances in understanding of diverse executive processes that assist in management of working and long-term memory (e.g. distraction protection, attention shifting, manipulation vs. retention of working memory contents, accessing long-term memory, etc.) highlight the importance of understanding, how learners develop different strategies for managing memory resources for higher cognitive processing. The symposium will focus on shared and unique resources of linguistic, spatial, and numeric processing, and strategies of optimizing memory use for individual learner ability and task demands.
This symposium is supported by NSF award #1434973 Research on Evaluation and Learning (REAL) to UT Arlington.

▸ SYMPOSIUM #5: EMBODIED COGNITION AND NEUROSCIENCE

Bur Oak

Leader: Mary Helen Immordino-Yang, University of Southern California

Panel: Sigi Hale, UC Los Angeles; **Yuko Munakata,** University of Colorado

Facilitator: Debbie Cockerham, Research and Learning, Fort Worth Museum of Science and History

Developmental benefits of unstructured time? Cognitive, affective and neurobiological bases of "constructive internal reflection"

Today's youth are living in an age marked by unprecedented access to entertainment and educational technology, and in which many children spend more time in adult-led activities. Academic instruction also emphasizes children's ability to maintain focus on predetermined and highly structured tasks, often with little opportunity for students to direct their own learning or to reflect on what they have learned. How do these conditions shape children's social and intellectual development? Convergent evidence from psychology and neuroscience suggests that the current focus on directed tasks may have costs for children's and adolescents' development of (1) self-directed executive functioning (Barker & Munakata); (2) social emotions and morality (Immordino-Yang), and (3) creativity and divergent thinking (Hale). Discussions will focus on the possible links between psychological and neurobiological mechanisms in typically developing and ADHD youth, and on implications for education.

11:30 a.m. ▸ **BREAK**

11:45 a.m.-1:15 p.m. ▸ **LUNCH (PROVIDED BY IMBES)**
Brazos Room

2014 AWARDS PRESENTATION

The Mind, Brain and Education Society Early Career Awards
Dr. Melissa Libertus, Assistant Professor of Psychology, University of Pittsburgh, USA
Dr. Bert De Smedt, Assistant Professor Psychology and Educational Sciences, University of Leuven in Belgium

The Mind, Brain and Education Society Translation Award
Dr. Dan Willingham, Professor of Psychology, University of Virginia, USA

Award for Exemplifying the Mission of the Mind, Brain and Education Society
The Latin American School for Education, Cognitive, and Neural Sciences

1:30 p.m.-3:40 p.m. ▸ **CONCURRENT SYMPOSIA** 1 2 3 4 ▸ **CONCURRENT WORKSHOPS** 1 2

▸ SYMPOSIUM #1: MATH

Pecos 1

Leader: Bert De Smedt, Katholieke Universiteit

Panel: Stephanie Bugden, University of Western Ontario; **Edward Hubbard,** University of Wisconsin at Madison; **Miriam Rosenberg-Lee,** Stanford University

Facilitator: Mike Connell, CEO, Native Brain

Combining mind, brain and education to understand individual differences in mathematical development: On the importance of representing number

This symposium seeks to understand the origins of individual differences in mathematical development. Such knowledge is educationally highly relevant as it forms the basis for effective teaching and remediation methods that are optimally tailored to fit with these individual differences. The four presentations in this symposium examine this outstanding question by combining perspectives from biology, cognitive and educational sciences. In particular, they point to the ability to represent number as a major determinant of mathematical development. The first paper investigates how children's approximate representations of number are shaped by acquiring number symbols through education in grades K-3 and how these approximate and exact representations, as measured through behavioral and brain imaging data, contribute to educational outcomes. The second paper builds on this by investigating not only the brain activity during the processing of non-symbolic and symbolic number and its associations with mathematics achievement, but also how this brain activity is changed through a 4-week training program. The third paper investigates these issues in children with developmental dyscalculia, a learning disability that hampers the acquisition of mathematical skills. The final paper narrows down the focus to one particular aspect of mathematical development and investigates longitudinally how numerical processing contributes to individual differences in developing arithmetical facts.
This symposium is supported by NSF award #1434973 Research on Evaluation and Learning (REAL) to UT Arlington.

▸ SYMPOSIUM #2: VIDEO GAMES

Pecos 2

Leader: Daphne Bavelier, University of Geneva and University of Rochester

Panel: Bruce McCandliss, Stanford University; **Lori Takeuchi,** Joan Ganz Cooney Center at Sesame Workshop

Facilitators: Lin Lin, University of North Texas; **Thomas Parsons,** University of North Texas

New media and new insights into the brain mechanisms of learning

The advent of new media is creating many new opportunities for learning. By affording a fail-safe environment in which the learner can explore different worlds and acquire new knowledge, for example, video games provide a new way to immerse oneself in learning. In addition to their attractive pull, some computer games can also be seen to enhance basic cognitive and brain mechanisms that are central to learning, such as attention, control and decision making. While it is clear that new technologies provide new opportunities for learning in specific content domains, it remains that integrating new media successfully into education poses significant challenges. This symposium will discuss paths to make the most of the available technology to enhance learning across a variety of learning settings, from school to entertainment.

▸ SYMPOSIUM #3: GENETICS

Post Oak

Leader: Michael S.C. Thomas, Birkbeck, University of London

Panel: Yulia Kovas, Goldsmiths, University of London; **Emma Meaburn,** Birkbeck, University of London

Moderator: Andy Tolmie, Institute of Education, University of London

Facilitator: E. Juliana Paré-Blagoev, George Washington University

What can the study of genetics offer to educators?

This symposium explores the potential contribution of modern genetic methods and findings to education. It is familiar to hear that the 'gene' for this or that behavior has been discovered, or that certain skills are 'highly heritable'. How can this help educators? The broad functions of genes will be described, as well as the methods used to relate genetic variation to individual differences in high-level behaviors such as academic skills. Methods include twin studies and genome-wide association studies. The key question is what genetic data imply about the ability of educators to optimize educational outcomes for children across the range of abilities. The symposium will comprise presentations from three leading researchers: Professor Michael Thomas, Director of the London Centre for Educational Neuroscience, who works on neuroscientific approaches to cognitive variability; Dr. Emma Meaburn, an expert in the use of genomic information to understand the biological basis of individual differences and psychopathologies in childhood and adolescence; and Dr. Yulia Kovas, an expert in behavior genetics, who uses twin studies to investigate gene-environment interplay in shaping individual variation in mathematics interest, ability, and achievement. This will be followed by a discussion moderated by Professor Andrew Tolmie, a psychologist specializing in the development of children's conceptual representations and behavioral skills.

▸ SYMPOSIUM #4: BAYESIAN NETWORKS & STEM

Elm Fork

Leader: Kenneth Williford, The University of Texas at Arlington

Panel: Rosalyn Moran, Virginia Tech University; **Shane Tutwiler,** Harvard University

1:30 p.m.-3:40 p.m. *Pecos* — **CONCURRENT SYMPOSIA** 1 2 3 4 — **CONCURRENT WORKSHOPS** 1 2

Facilitator: Mohan Pant, The University of Texas at Arlington

Educating the Bayesian brain

This symposium aims to bring together researchers working in the emerging "Bayesian Brain" paradigm in neuroscience (e.g., Karl Friston), theorists of knowledge working in Bayesian Epistemology (e.g., Luc Bovens and Stephan Hartmann), and MBE students and researchers. Bayesian epistemology provides a deep and unified framework for thinking about the basic problems of the theory of knowledge and the philosophy of science: rational belief change, the relation between theory and observation, theory convergence, perceptual judgment, and judgment under uncertainty. In recent years, thanks to the work of E.T. Jaynes, Karl Friston, and others, very natural connections between Bayesian epistemology and neuroscientific models of brain functioning have been developed. This work is exciting because it promises to allow us to unify our ordinary experience of ourselves as knowers and learners with a powerful framework for understanding probabilistic and scientific inference, on the one hand, and with our emerging neuroscientific picture of ourselves, on the other.

WORKSHOP #1: HIERARCHICAL ASSESSMENT

Bur Oak

Leader: Theo Dawson, CEO, Lectica, Inc.

Facilitator: Renee Pope, Arlington ISD

From research to practice: Supporting the development of reflective judgment skills in the classroom

In this workshop, we will be working together to translate some of what Lectica has learned about the development of reflective judgment into lesson plans and learning resources for the classroom. We will begin with an overview of three research findings that have important implications for teaching and learning.

- The wide range of student capabilities within classrooms
- Patterns in the use of evidence and induction
- The role of perspective seeking and coordination in fostering life-long learning

We will then break into groups to develop ideas for lesson plans and learning resources that leverage these findings to support optimal learning.

WORKSHOP #2: DYNAMIC SYSTEMS

Live Oak V

Leaders: Paul van Geert, University of Groningen; **Henderien Steenbeek,** University of Groningen

Facilitator: Steve Palko, Texas Christian University

A complexity approach toward MBE; challenges and opportunities in educational intervention and research

In the context of an educational or clinical intervention, we often ask questions such as "How does this intervention influence the task behavior of autistic children", or "How does working memory influence inhibition of immediate responses?" What do we mean by the word influence here? In this workshop, we introduce the framework of complex dynamic systems to disentangle the meaning of words such as "influence", and to discuss the issue of education and intervention as something that takes place in the form of complex, real-time situated processes. What are the applied implications of such an analysis? Can we use it to improve education? As a practical exercise, the workshop will begin with a short case study of an educational intervention. Participants will have the opportunity to make comparable analyses of their own case studies, and differences in standard analyses will be highlighted.
This workshop is supported by NSF award #1434973 Research on Evaluation and Learning (REAL) to UT Arlington.

3:40 p.m. — **BREAK**

4 p.m.-5:15 p.m. *Pecos* — **KEYNOTE ADDRESS**

Neural networks developing in digital networks: Re-imaging education in the age of the World Wide Web

Presented by: David Rose, Harvard College

Modern technologies are challenging the ways we think about teaching and learning from two different vantages. First, advances in brain imaging technologies are radically altering our understanding of learning itself. The results have ignited the fields of cognitive and affective neuroscience, and have begun to challenge many of our fundamental assumptions about learning and its diversity. Second, modern technologies also allow us to create very new kinds of media for teaching and learning -- media that are powerful and flexible enough to challenge and support a wide range of students, including those with disabilities, and support a wide range of pedagogies and teaching techniques. This presentation will discuss the intersection of these two advances in what is called "Universal Design for Learning." Examples of new kinds of networked learning environments -- designed to be especially responsive to individual differences -- and the research which supports them will be presented.
This presentation is supported by NSF award #1434973 Research on Evaluation and Learning (REAL) to UT Arlington.

5:15 p.m.-6 p.m. *Elm Fork* — **STUDENT FORUM**
Leader: Stephanie Bugden, University of Western Ontario

6 p.m.-7:30 p.m. *Brazos Foyer* — **POSTER PRESENTATIONS**

7 p.m.-8:30 p.m. *Grand Ballroom* — **TEXAS WINE TASTING RECEPTION**

DAY THREE — SATURDAY, NOVEMBER 8, 2014

7 a.m. *Foyer* — **BREAKFAST**

8 a.m.-9:15 a.m. — **GENERAL SESSIONS** A B

GENERAL SESSION A: TRANSLATION WITH POLICY MAKERS IN MIND

Pecos 1

Leaders: Marcelo Cavazos, Superintendent, Arlington ISD; **Eugenia Garduno,** Director, Organization for Economic Co-Operation and Development, Latin America; **Diane Patrick,** Representative, District 94, Texas House of Representatives

Facilitator: Brad Allison, California State University

Opening new pathways: Policy and leadership's role in applying research to learning

How can policy makers use their leadership roles to bring research translations to school practices to improve learning? The discussion focuses on the challenge of converting research into actual practice, which is often a politically, logistically and bureaucratically difficult process to facilitate. The use of the learning sciences along with recent insights about how the brain supports this process seems to make an even more compelling call for policy makers to act quickly. Converting research into actual practice is a complex practice and one that is not politically easy.

GENERAL SESSION B: MBE GRADUATE PROGRAMS

Pecos 2

Leaders: Mary Helen Immordino-Yang, University of Southern California; **Bruce McCandliss,** Vanderbilt University; **E. Juliana Paré-Blagoev**, George Washington University

The emergence of formal graduate training programs in Mind, Brain and Education: The need, the hope, and the challenges

As a young and still-developing field, MBE has porous boundaries. Over time, the core technological, methodological, and theoretical approaches of MBE will become more defined. A critical aspect of this process is the creation of graduate training programs. The faculty who design these programs must grapple with specific questions that reflect the general issue: what is MBE and how do we support students to be successful, contributing, participants in this area? This symposium is a venue to reflect on key concerns related to designing, building, and growing effective graduate programs. We will share the stories of two graduate programs, Harvard's Mind, Brain, and Education masters program and Vanderbilt's Educational Neuroscience doctorate. Key concerns will include how programs are structured and funded, the struggle to balance training demands associated with relevant areas including but not limited to cognitive neuroscience and educational research training. Focused discussion to follow will help us to identify lessons learned about (1) the core competencies and content elements each program has pursued, (2) how their experiences resonate with or differ from those others have had, (3) how the likely career paths of program trainees should influence program design, and (4) the value added beyond currently existing training programs within the areas of neuroscience, psychology, and education.

Audience participants should come ready to share and discuss burning concerns they have about MBE graduate programs. We seek to use this session as a launching point for further collaboration that, among other ideas, may explore the potential for creative, cross-institutional opportunities for graduate students, post-doctoral fellows, and faculty.

9:20 a.m.-11:30 a.m. — **CONCURRENT SYMPOSIA** 1 2 3 — **WORKSHOPS SESSIONS** 1 2 3

SYMPOSIUM #1: BRAIN MATURATION

Pecos 1

Leader: Terry Jernigan, University of California, San Diego

Panel: Erik Newman, University of California, San Diego; **Richard Tibbles,** University of California, San Diego

Facilitator: Doris Alvarez, University of California

An integrative science of the developing mind and brain: Focus on learning

In this symposium the speakers will describe a new, highly multidimensional, "big-data" paradigm for developmental science. The impact of this new, more integrative, approach to the study of the developing human mind could be great, but each relevant subdiscipline must adopt new approaches to ensure that this science addresses its questions and concerns. Discussion will focus on new roles for educators and education leaders: What change avenues are available for educator leaders to integrate learning-relevant "big data" into pedagogical practices? How can we improve the dynamic intellectual space between scientists and educators?

SYMPOSIUM #2: INTRINSIC – EXTRINSIC MOTIVATION

Pecos 2

Leader: Kou Murayama, Reading University

Panel: Suzanne Hidi, University of Toronto; **Woogul Lee,** Korea University; **Johnmarshall Reeve,** Korea University; **Dustin Thoman,** California State University

Facilitator: Mary Helen Immordino-Yang, University of Southern California

Critical roles of intrinsic interest in education: Theoretical and empirical advances

Intrinsic interest (or intrinsic motivation) is conceptualized as a cognitive or affective willingness to engage in a specific activity in the absence of any extrinsic incentives. The importance of nurturing interest in classrooms has been repeatedly emphasized in education; enhancing student interest has been one of the primary goals in many educational programs. Recently, academic research on intrinsic interest has gained considerable attention from various fields, including cognitive science, learning science, psychology, and neuroscience, providing a number of new insights into education. The core objective of this symposium is to bring together leading researchers on intrinsic interest from different fields, and to discuss the recent theoretical and empirical advances on this topic in relation to education.

9:20 a.m.-11:30 a.m. ▸ **CONCURRENT SYMPOSIA** 1 2 3 ▸ **WORKSHOPS SESSIONS** 1 2 3

▸ SYMPOSIUM #3: NEURODEVELOPMENTAL DISORDERS

Elm Fork II

Leader: Thomas Parsons, University of North Texas

Panel: Tandra T. Allen, The University of Texas at Dallas; **Jacquelyn F. Gamino,** The University of Texas at Dallas; **Lin Lin,** University of North Texas

Facilitators: Rockney Knox, George Washington University; **Juliana Paré-Blagoev,** George Washington University

Ecological validity in research: Virtual environments for assessment, intervention, training, and learning

The assessment and treatment of neurocognitive deficits require measures and learning approaches that can differentiate overlapping symptoms. Previous research has most often relied on paper-and-pencil assessments of cognitive functions. Although these approaches provide highly systematic control and delivery of performance challenges, they have also been criticized as limited in the area of ecological validity. In addition, the cognitive models tested in the lab settings have been criticized as limiting the credibility or robustness of findings across contexts. The traditional research methods, qualitative or quantitative, often capture short-term snapshots of people's physical and mental states rather than providing a holistic picture of the complex issues. Assessing and improving one's knowledge, skills, and thinking are complex processes, esp. when learners involved suffer cognitive deficits. In this panel, we will discuss novel technologies and approaches to assessment, intervention, training, and learning that may extend ecological validity in studying learners.

▸ WORKSHOP #1: NEUROSCIENCE AND TEACHER PROFESSIONAL DEVELOPMENT

Post Oak

Leader: Janet Dubinsky, University of Michigan

Facilitator: David Daniel, James Madison University

Does understanding the neurobiology of learning change teachers' beliefs about pedagogy?

As we bring contemporary neuroscience concepts to teachers' attention, how does this information change their views of their profession? Does neuroscience just confirm their understanding of student behaviors developed from educational psychology and experience? Or do experiments that combine neurobiology and behavior speak to some deeper explanatory need regarding how students learn? How does neuroscience influence teachers' views of each student's potential to achieve? How does understanding the neurobiology of learning and memory influence their teaching practices? In this workshop, we will share the aggregated ideas from teachers who have participated in BrainU, an intensive professional development workshop combining neuroscience and inquiry pedagogy at the secondary level. We will illustrate brain plasticity with a classroom experiment and explore how this lesson can be used to stimulate student motivation to learn. Lastly we will discuss how to probe the impact of such neuroscience learning on pedagogical practices.

▸ WORKSHOP #2: CASE STUDIES IN NUMEROSITY

Elm Fork I

Leader: Mike Connell, CEO, Native Brain

Facilitator: Daniel Ansari, University of Western Ontario

How we can create usable knowledge in MBE: A case study with number sense

The purpose of this session is to engage participants–teachers and researchers alike–in a dialogue about the promise and challenge of translating insights about the Mind and Brain into usable knowledge in Education. The format is a case study in the subject area of number. The goal is to use the case study format to establish a shared experience among participants that can be used to surface important issues that arise at each stage of the process and across role boundaries (e.g., researcher and practitioner roles).

This workshop is supported by NSF award #1434973 Research on Evaluation and Learning (REAL) to UT Arlington.

▸ WORKSHOP #3: MOTIVATION AND ENGAGEMENT IN READING

Bur Oak

Leader: Miriam Tillinger, Center for Applied Special Technology

Facilitator: Karen Norris, Momentous Institute

The power of choice: Supporting student autonomy to foster reading motivation and engagement

This workshop will focus on the importance of providing opportunities for choice and autonomy around students' reading activity, to foster their reading motivation and engagement. The positive impact of promoting student autonomy through the provision of meaningful and personally-relevant choice has been demonstrated across a range of academic outcomes and student populations. To illustrate an example of how student choice can be optimized to support motivation and engagement in the context of reading, Udio, a CAST-developed online reading environment will be demonstrated. This environment combines rich online content in a network designed to re-engage struggling readers. Udio supports motivation, engagement, and independence in reading by providing students with authentic choices in content and activities, as well as a variety of supports and scaffolds. Participants will have the opportunity to try Udio and discuss the practical implications of the program's approach, including ways to extend the concept of supporting choice and autonomy to their own classrooms.

11:30 a.m.-12:30 p.m. *Brazos Foyer* ▸ **POSTER PRESENTATIONS**

12:30 p.m. ▸ **LUNCH (ON YOUR OWN)**

Explore the variety of cuisines in Sundance Square!

12:30 p.m.-1:30 p.m. ▸ **ROUNDTABLE: CHINESE LEARNING AND MUSIC**

Post Oak

Presented by: Jiaxian Zhou, East China Normal University; **Bei Song,** Harbing Normal University

With the development of new techniques and methods, the relationship between music training and language learning is causing more and more interest of researchers. This symposium will examine how Chinese learning, a unique culture activity, recycles the common and specific cortical areas and erodes deep into the visual, temporal, frontal regions in the brain by comparing Chinese literates and illiterates with fMRI. We will also discuss the effect of music training experience on tone recognition among Chinese native speakers and other nontone language speakers, to find out the effect of music training on the tonal processing of language, especially the relationship between absolute pitch (AP) ability and tone perception of Chinese. Effective instruction pays great attention to the universality and particularity of language learning.

▸ ROUNDTABLE: NATIONAL SCIENCE FOUNDATION DIVISION OF RESEARCH ON LEARNING (NSF-DRL) FUNDING OPPORTUNITIES FOR MIND, BRAIN AND EDUCATION RESEARCH

Elm Fork

Presented by: Evan Heit, Program Director, Directorate of Education and Human Resources and Directorate of Social, Behavioral, and Economic Sciences; **Soo-Siang Lim,** Program Director, Directorate of Social, Behavioral, and Economic Sciences

This roundtable will provide information related to applying for National Science Foundation (NSF) funding for the Mind, Brain and Education research community. Details regarding a range of grant programs will be covered, including cognition, development, education, neuroscience, and the science of learning. There will also be an Ask a Program Officer session for questions about specific programs as well as the NSF grant application and review process in general.

12:30 p.m.-1:30 p.m. *Bur Oak* ▸ **IMBES BOARD MEETING**

1:45 p.m. *Pecos* **KEYNOTE ADDRESS**

▸ Mind, brain and education: Studying the intersection of neurobiology, external, and internal environment of learning

Presented by: Fumiko Hoeft, University of California, San Francisco

The goal of educational practice is to maximize children's learning potential and ultimately their ability to thrive. While a very different field, medicine shares the same ultimate goal. In this talk, I discuss how the fields of neuroscience research, educational and clinical practice can mutually benefit from each other without 'medicalizing' education. I begin with examples of neuroscience research from our laboratory where we take concepts from educational practice and perform translational research, which in turn may benefit educational practice. These include studies that involve the complementary use of neuroimaging to predict future academic outcome in individual children, and to help fine-tune current criteria in identifying children with special needs. The talk highlights the importance of examining the interaction between the neurobiology of learning and the external environment (e.g., school, peers, family, prenatal, intervention) as well as the 'internal environment' to optimize learning. In the current context, 'internal environment' is defined as the environment within ourselves that interacts heavily with the society, culture and the external environment surrounding us. Motivation, resiliency, self-concept, and stereotype threat (i.e., the belief or fear of confirming a negative perception of a particular social group, e.g., racial minorities, with which one identifies) are some examples of factors contributing to 'internal environment.' I conclude by exploring how Neuroscience research may help dissect these into better-defined socio-emotional and cognitive constructs and assess their impact on learning, which may in turn lead to more targeted curricula, instructional approaches, and interventions.

3 p.m.-4 p.m. *Brazos Room* ▸ **IMBES RECEPTION**

Host: Marc Schwartz, IMBES president

Introducing: Daniel Ansari, IMBES president-elect
Dr. Jay Giedd, incoming MBE journal editor

Announcing: 2014 UTA College of Education and IMBES President Outstanding Poster Award

POSTER PRESENTATIONS

FRIDAY, NOVEMBER 7, 2014 • 6 P.M.-7:30 P.M.

COMPREHENDING DIAGRAMS: SKETCHING TO SUPPORT SPATIAL REASONING FROM DIAGRAMS

Kristin Gagnier, Kinnari Atit, Carol Ormand, and **Thomas Shipley,** Temple University

STEM disciplines commonly illustrate 3-D relationships in diagrams. Does generating a diagram of a 3-D model facilitate students understanding of diagrams that convey 3-D spatial relations? We hypothesized that sketching a diagram aligns the 3-D structure in the world with spatial structures in a diagram. Sketching creates a spatial analogy. Generating diagrams predicating the internal structure of a 3-D model led to greater improvement in diagram understanding than visualizing the interior of the model but not sketching a diagram. Additionally, we found a predictive relationship between diagram accuracy and improvement. Results suggest that sketching facilitates analogical mapping and are discussed in the context of teaching students to interpret diagrams that convey complex 3-D information.

NEUROEDUCATION: AN EDUCATOR'S PERSPECTIVE ON THE PROCESS OF TRANSLATING NEUROSCIENCE RESEARCH

Kimberley Ilosvay, University of Portland

According to Cardinali (2008), neuroscience research can provide ways of improving school performance in children and adolescence. It is important to give teachers tools to understand and implement integration between fields, rather than give them a generic, prescribed program to use for all students. This study explored what neuroscience research teachers felt was important for educational practices and what process will teachers use to validate integration of disciplinary information? This qualitative study was guided by a conceptual framework inspired by Baars and Gage (2010) and iterative design suggested by Bruer (1999). The instruments used included discussions, a teacher developed matrix, and a final presentation to document the process of aligning neuroscience and education. Through observation and open coding, the data was analyzed. Findings include information relevant to neuroeducation as well as the process used by educators to integrate information for the creation of strategies and lessons for the classroom.

LONGITUDINAL ANALYSIS OF SLEEP DISRUPTION IN PEDIATRIC SUBJECTS WITH DOWN SYNDROME: EFFECTS ON LANGUAGE AND EXECUTIVE FUNCTION

Ursula Tooley and **Dr. Jamie Edgin,** University of Arizona

Sleep plays an important role in healthy development, and previous research has shown adverse effects of sleep disruption on executive function, memory, and learning. Studies have shown that children with Down syndrome experience greater sleep disruption than typically developing children. In this study we used an objective measure of sleep, actigraphy, to investigate the longitudinal progression of sleep disruption in a group of toddlers with Down syndrome (n=9). Results indicate that the effects of disrupted sleep manifest early in development: the development of syntactic complexity is significantly affected, with children who demonstrate more fragmented sleep at the first testing experiencing smaller increases in grammatical complexity over the two-year period. More fragmented sleep at the first testing also correlates with greater impairment of executive function at both time points. These findings provide evidence that sleep disruption a t a young age influences later executive functioning and language development in this population.

DEVELOPMENT OF CHILDREN'S EVALUATION OF THE CERTAINTY OF INFERENCES BY SELF AND OTHER

Bradford Pillow and **RaeAnne Pearson,** Northern Illinois University

Children from kindergarten to fourth-grade rated the certainty of their own or another person's deductive inferences, inductive inferences, or guesses. Across a series of studies: (a) kindergarten and first-grade children rated their own deductive inferences as more certain than guesses or inductive inferences, (b) fourth-grade children differentiated among their own inferences on the basis of inductive strength, and c) children recognized differences among another person's inferences and guesses later than differences among their own, and (d) children's own knowledge about the truth of a conclusion often interferes with their ability to evaluate another person's perspective. The results have implications for children's evaluation of inferences in larger contexts, such as critically evaluating the evidence and reasoning supporting another person's argument in persuasive or expository text. Consideration of children's ability to evaluate inferences may inform pedagogy in scientific and critical thinking, as well as epistemological development.

ALGEBRA BY EXAMPLE: EFFECTIVENESS OF USING EXAMPLE-BASED ASSIGNMENTS THROUGHOUT AN ALGEBRA I COURSE

Julie Booth, Temple University; **E. Juliana Paré-Blagoev, Kenneth R. Koedinger,** and **M. Suzanne Donovan,** George Washington University

Over the course of a school year, this study examined the effectiveness of an intervention which required students to explain correct and incorrect worked examples during problem-solving practice sessions in real-world Algebra 1 classrooms. A diverse sample of students in 28 classrooms across 5 school districts completed study assignments throughout the school year. Half of the classrooms were randomly assigned to receive traditional versions of the assignments, while the other half received assignments which included correct and incorrect examples as well as problems for students to solve. Students were tested on pre-algebraic knowledge at the beginning of the year, and on core algebraic concepts and skills at the end of the year. Results indicate that students who begin the year with lower prior knowledge benefit more from the example-based assignments; lower-knowledge students in the experimental group score 10% higher than peers in the control group at posttest.

INFUSING GROUP PLAY WITH CAUSAL INFORMATION FACILITATES PRESCHOOLERS' WORD LEARNING

Amy Booth and **Lydia Moore,** Northwestern University

Can focusing on the causal properties (e.g., functions) of objects during group play facilitate word learning in preschoolers? Forty-three 3- to 4-year-olds learned novel words for novel tools introduced during a small-group play session. Half of the groups used the tools according to their intended function to construct a fruit salad. The remaining children used the same tools to decorate a castle. Although children in both conditions revealed knowledge of the novel words, learning in the Causal condition increased over time, ultimately outstripping performance in the Non-Causal condition. These results demonstrate a striking benefit of causal enrichment to word learning in a context that could feasibly be implemented in preschool classrooms, playgroups, and individual households. Highlighting the functional properties of objects during playtime can be a powerful approach to building children's vocabulary and thereby reinforcing a key foundation of early literacy and success in school.

BOTH WANT AND NOT WANT: THE EFFECTS OF EXTERNAL AND SELF-CONTROL ON CHILDREN'S REPRESENTATION OF CONFLICTING STATE OF MIND IN MORALITY

Katherine Choe, Ciara A. McAfee, Tara M. Brightbill, Michelle E.S. Tweedie, and **Danielle N. Hallacker,** Goucher College

The present study examined 4-7-year-olds' and adults' understanding of having two opposing desires in one mind in at the same time in a moral dilemma. Participants were introduced to a character who was in a moral dilemma and asked to judge the character's state of mind—wanting, not wanting to fulfill his/her desire or both at the same time--under either external or self-control situations. The data indicated a developmental difference between the two conditions. Specifically, older children and adults were more likely to choose conflicting desires in self-control while younger children preferred it in external control. Implications of the findings were further discussed in relation to children's self-regulation in daily interactions with peers and adults.

WORKING MEMORY INVOLVEMENT IN RATIONAL NUMBER PROCESSING

Sarah Cordes, Boston College

Working memory (WM) plays a crucial role in mathematical processing, with all three WM components (Baddeley & Hitch, 1974; central executive (general WM), phonological loop (verbal memory), and visual-spatial sketchpad (visual-spatial memory)) contributing to arithmetic strategies, with differential recruitment dependent upon solution type, notation, and problem structure. Using a dual-task memory interference paradigm, we investigated whether the visual-spatial and verbal components of the working memory system are differentially involved in magnitude judgments of rational numbers (fractions and decimals). In adult subjects, we found equal involvement of verbal and visual-spatial WM, regardless of notation. However, adults who relied more on visual-spatial strategies were lower efficiency in performing rational number arithmetic than those who relied on verbal strategies, suggesting verbal WM strategies may promote arithmetic processing of both fraction and decimal notation.

HOW CONTEXT CAN HELP AND HINDER SPECIAL NEEDS STUDENTS

Steffie Van der Steen, Henderien Steenbeek, and **Paul van Geert,** University of Groningen

Do standardized tests of academic performance measure what they claim? This poster focuses on two studies conducted in the domain of science and technology. Over the course of 1.5 years, a researcher worked five times with 31 individual children (3-5 years old, from Dutch regular and special primary schools for children with behavioral/psychological problems) on hands-on scientific tasks about air pressure and gravity. The results do not point to substantial differences in (the complexity of) scientific understanding between special needs and regular students during the tasks, while the regular students performed significantly better on two standardized tests of academic performance ($p < .05$). To characterize the development of scientific understanding over 1.5 years, we performed a cluster analysis. Three distinct developmental trajectories could be distinguished, which could best be predicted by interactions between the child and his or her proximal environment, but not by general standardized measures.

ENGENDERING COLLABORATION IN MIND, BRAIN AND EDUCATION

Deidre Greer, Columbus State University

This poster explores the development of teachers' knowledge of neuroscience and the collaboration between educators and scientists through a class project in a doctoral program. Seventeen letters to neuroscientists submitted by education doctoral students were reviewed and coded for instances of understanding of specific content within those fields and its connection to classroom practices. Twenty-four instances of specific content knowledge were identified in the student projects compared to twenty-six instances of connections. While the students did gain knowledge of basic ideas in cognitive neuroscience, their understanding of how neuroscience can be used to inform teaching was much stronger. Six instances of strong to moderate understanding of specific content in cognitive neuroscience were identified, and 12 instances of strong to moderate connections to practice were identified. Results can inform us about the need to continue to embolden teachers to assume a role in this work and help better engage teachers.

UP, UP, AND AWAY: HOW TEACHERS' SPATIAL LANGUAGE INFLUENCES CHILDREN'S EARLY NUMERACY AND SPATIAL SKILLS

Rosalie Odean, Carla Abad, Loreinys Perez, Lorena Perez, and **Shannon M. Pruden,** Florida International University

Previous research suggests that the amount of numeracy and spatial language used in the home predicts pre-kindergartners' numeracy/spatial skills (Gunderson & Levine, 2011; Pruden, Levine & Huttenlocher, 2011). Given the substantial amount of time pre-kindergarten children spend the classroom, the present study seeks to understand the role of educators on pre-kindergarten children's numeracy/spatial skills. Participants included 14 pre-kindergarten educators and 87 children. We recorded the educators interacting naturally with children and assessed children's numeracy/spatial skills. Transcriptions of educator talk were coded for use of numeracy/spatial language. Our prediction is that educators who utilize more numeracy/spatial talk in the classroom will lead to an increased growth in children's numeracy/spatial skills. Finding a significant relation between educator language use and pre- kindergarten children& rsquo;s numeracy and spatial skills is critical to understanding how we can ensure that pre-k children have the early school readiness skills necessary for success in the STEM disciplines.

TEMPORAL DIFFERENCES IN NEUROLOGICAL PROCESSING OF BASIC PHYSICAL CONCEPTS IN CHILDREN

Katherine Rublein, Evguenia Malaia, Deborah Cockerham, and **Marc Schwartz,** The University of Texas at Arlington

The present study investigates neural activity of children, ages 4-8 and adults in response to pictures illustrating violations of natural (physical) laws. Violations of social laws were used as a comparison in order to better understand the psychological processing of the two. Neurological data was collected using EEG (electroencephalograph) and behavioral data was collected via a push-button task in which participants viewed stimuli and indicated whether each picture was possible or impossible (normal/abnormal). We explore the presence of a pronounced N400 (a negative-going peak associated with response to meaningful stimuli that occurs about 400 ms after the stimulus onset) when participants view pictures that disobey physical laws/social norms. Preliminary results suggest differences exist in the processing of the two and early behavioral data shows participants to be more accurate with the social condition. We are currently reviewing additional data in hopes of better understanding this phenomenon.

EMPATHY PREDICTS ACADEMIC PERFORMANCE AFTER LONG-TERM EXPOSURE TO A SOCIAL-EMOTIONAL LEARNING PROGRAM

Karen Thierry, Heather Bryant, Sandy Nobles, and **Karen Norris,** Momentous Institute

Fifth grade students experienced 1, 2, or 3 years of a social-emotional learning program. Three-year-group students had higher empathy and perspective-taking scores than the 1-year group. Two-year-group students trended toward higher perspective-taking scores than the 1-year group. Empathy scores positively predicted reading outcomes for the 3-year-group only.

NEUROMYTHS: PERCEPTIONS AND PREDICTORS AMONG EDUCATORS

Lauren McGrath, American University; Alida Anderson and **Laura Germine,** Massachusetts General Hospital

Neuromyths are misconceptions about brain research (OECD, 2002). A recent study has drawn attention to the prevalence of neuromyths among educators (Dekker et al., 2012). This study is a large-scale investigation of common neuromyths endorsed by educators compared to other applied professions and the general public. A neuromyth survey adapted from Dekker et al. (2012) will be posted on a citizen science website (testmybrain.org) (Germine et al., 2012). Volunteers will complete the neuromyths survey along with a demographic assessment about educational background, interest in neuroscience, and for educators, questions about training and teaching experiences. The analytic plan will focus on 3 issues: (1) psychometric properties of the neuromyths questionnaire, (2) group comparisons of neuromyth endorsements, and (3) predictors of neuromyths among educators. This project will systematically examine neuromyths among educators and in the general population in order to provide preliminary guidance regarding optimal neuroscience modules for teacher training programs.

A COMPARISON OF TWO MODELS OF READING COMPREHENSION

Brenda Hannon, Texas A&M University, Kingsville

This study uses structural equation modelling to assess the predictive powers of two models of reading comprehension: the Simple View of Reading (SVR; Hoover & Gough, 1990) and the Cognitive Components and Resource Model of Reading (CC-R; Hannon, 2012). The results showed that although both the CC-R and SVR models were suitable for predicting reading comprehension performance, the CC-R model was better at both explaining the data and predicting reading comprehension. Moreover, the results showed that comprehension, a component of the SVR is not a unitary construct. Rather, comprehension draws on two separate cognitive processes, namely (i) text processing and (ii) knowledge access. Finally, a hybrid model composed of both the SVR and CC-R models failed to fit the data better than just the CC-R model. Taken as a whole, the present study provides insight into the nature of reading which should be of interest to both educators and theorists.

PARENT-INFANT INTERACTION DURING SHARED ELECTRONIC BOOK READING

Gabrielle Strouse and **Patricia Ganea,** University of Toronto

This study investigates parents' use of electronic media with infants. Specifically, we ask: 1) Do parents use the same quantity and quality of content-related language when reading electronic books to their infants as when they read traditional books?, 2) Do infants engage more in shared reading with either medium?, 3) Do infants learn new words better from one type of book or the other?, and 4) Do parent or child behaviours mediate learning? Preliminary findings indicate that child engagement with electronic books is high, but parents use fewer content-related scaffolding behaviours. We will also present language data along with information about children's learning of the book's vocabulary. Given the exposure that very young children have to new technology, it is crucial that researchers examine their educational potential. In addition, information about how parents and children use these devices will inform the creation of instructional interventions to enhance their educational value.

REPRESENTATIONS OF FRACTIONS AND DECIMALS AND THEIR DEVELOPMENT

Yungi Wang, Zhejiang University

The present study, using two magnitude comparison tasks and four magnitude estimation tasks, examined the developmental trajectories of fraction and decimal representations and compared students' fraction and decimal knowledge. It yields findings that mental representations of decimals develop earlier and better than those of fractions. These findings shed potential light on the instruction order of fractions and decimals and implicate that decimal knowledge might be used as scaffolds in fraction instruction.

LONGITUDINAL CHANGES IN READING NETWORK RELATED TO AGE AND SKILL

Jessica Wise, Chris McNorgan, and **James R. Booth,** Northwestern University

Previous behavioral and neuroimaging research suggests that orthographic processing becomes more specialized over development. However, it is not known whether improvements in skill are associated with different developmental trajectories in younger as compared to older children. We used a longitudinal study in which we followed 9- and 12-year-old children approximately 2.5 years later. At both Time 1 and Time 2, children were scanned performing a rhyming judgment task to visually presented words that manipulated orthographic overlap. We found that younger children who showed larger behavioral improvement from Time 1 to Time 2 showed larger increases in activation in left fusiform gyrus. However, behavioral improvement was not related to activation changes in older children. We interpret these findings as suggesting that orthographic processing regions become more specialized in the early elementary grades.

TRANSFORMING THE BEAST: AN AUTO-ETHNOGRAPHIC TALE OF THE SHAPE-SHIFTING POWER OF MIND, BRAIN AND EDUCATION

Rene Grimes, Momentous Institute

One objective of the International Mind, Brain and Education Society is to "create and identify useful information, research directions, and promising educational practices" (www.imbes.org). The field of Mind, Brain and Education (MBE) is growing; however to date there are few studies of researched interventions conducted through collaborations between teacher-researchers and scientists in the fields of biology and the developmental and cognitive sciences. In my roles as a graduate student, then graduate, of the University of Texas, Arlington's MBE program and as a teacher-researcher, I weave an auto-ethnographic narrative of my three year journey using the models of MBE to investigate the real world problem of number sense. I present the prologue, characters, and settings as background and then chronicle the weaving of conflicts ("beasts") and solutions (transformed practice). Foreshadowed within this tale is the epilogue: directions for future research with the potential of changing the shape of assessment and instruction.

SATURDAY, NOVEMBER 8, 2014 • 11:30 A.M.-12:30 P.M.

ADOLESCENTS' AGE AND EMOTIONAL HOME LIFE PREDICT THE ACQUISITION OF STRONG AND CULTURE-SPECIFIC PATTERNS OF CORRELATION BETWEEN NEURAL ACTIVITY AND SOCIAL-EMOTIONAL FEELINGS

Mary Helen Immordino-Yang and **Xiao-Fei Yang,** University of Southern California

Adolescents undergo intense maturation, but relatively little is known about how psychosocial and neurobiological factors interact to improve social competence. In particular, complex social emotions like admiration and compassion recruit adolescents' developing abilities to feel emotions based on abstract social-cognitive inferences. Previously we demonstrated that culture influences how activity in the anterior insula, an interoceptive region important for conscious feelings, correlates with young adults' emotion experiences. Here, 22 Latino and 22 East-Asian second generation adolescent Americans aged 14-16 reported their feelings to emotional narratives during neuroimaging and discussed their family relationships in an interview. We found that older adolescents showed more systematic correspondences between AI activity and feelings, and that youths from more loving and socially competent families had acquired more strongly acculturated patterns of correspondence between neural activity and feelings. The results provide a possible biomarker for complex emotional feelings and demonstrate the effects of culture on neurobiological development.

CULTURAL LITERACY, INTELLECTUAL CURIOSITY, ACADEMIC RESILIENCE AND THE ROAD TO "SELF AS SCIENTIST": QUALITATIVE ANALYSES OF LOW-SES ADOLESCENTS' EXPERIENCES IN A NEUROSCIENCE CAMP

Erik Jahner, Victoria Normington Pound, Xiao-Fei Yang, and **Mary Helen Immordino-Yang,** University of Southern California

A three-week summer program engaged an ethnically diverse group of 20 low-SES high-school students in the neurobiological study of social emotion. In addition to conducting neuroscientific experiments, a central purpose was to address habits of mind cultivated by scientists and other successful people, including strategies for discovering and pursuing a life-long passion and for overcoming obstacles. The campers' experiences were documented via private videotaped interviews pre and post camp, and via surveys and written reflections. Qualitative analyses suggest that campers moved toward a definition of "scientist" grounded in abstract qualities of mind, showed evidence of assimilating a scientific identity into their "future self", and learned to value frustrating/difficult activities as "important." The results demonstrate that even a short program can have highly positive effects on social-emotional and identity-related factors known to increase academic persistence. A longitudinal study will examine the endurance of these effects and campers' identity transformations over time.

NEUROANATOMICAL PREDICTORS OF THIRD GRADE MATH COMPETENCE

Gavin R. Price, Eric D. Wilkey, and **Laurie E. Cutting,** Peabody College, Vanderbilt University

This study assesses the relation between gray matter density measured at second grade and third grade math competence in 50 typically developing children. Results showed that math competence correlated positively with gray matter density in the left IPS at second grade, and the same left IPS region as well as the left middle temporal gyrus at third grade while controlling for global brain volume, age, sex, and standard scores on the Peabody Picture Vocabulary Test ($p < .001$ uncorrected, minimum cluster extent 100 voxels). These results suggest an ontogenetically stable role for the IPS region in the acquisition of skills necessary for the development of math competence. The present data provide insights into the neural foundations of math competence over and above those provided by functional activation data and contribute to the ongoing characterization of neurocognitive mechanisms that support the emergence of math skills.

THE UNDERSTANDING OF THE PHYSICS CONCEPT REVEALED BY EVENT-RELATED POTENTIALS

Yanmei Zhu, Southeast University

Event-related potential is used to study the brain responses to the physical motions consistent with or violating the physics concept. Students holding the correct or wrong physics concept

performed an oddball task with a pair of stimuli. For half of the blocks, the motion consistent with the physical law was the oddball stimulus and the motion inconsistent with the physical law was the standard stimulus and vice versa. The students holding the correct concept showed the larger parietal P3 to the incorrect target stimulus. By contrast, the students holding the wrong concept showed the larger parietal P3 to the correct target stimulus. The opposite P3 deviance suggests that individual's concept can affect the representation of the incoming stimulus, and individual develops the strongest mental model when encountering information is consistent with the existing concept. In addition, this opposite P3 deviance might be a helpful ERP indictor of conceptual understanding.

CAN A MUSEUM-UNIVERSITY COLLABORATION BASED ON MIND, BRAIN AND EDUCATION PRINCIPLES INCREASE PUBLIC ENGAGEMENT IN SCIENCE?

Debbie Cockerham, FWMSH RLC; **Rene Grimes,** Momentous Institute; **Marc Schwartz** and **Zhengsi Chang,** The University of Texas at Arlington; **Colleen Blair,** FWMSH; **Lin Lin,** University of North Texas

This study examines the effectiveness of a university-museum partnership designed to support public engagement in science. The Research and Learning Center (RLC) encourages communication between scientists and the public by providing the logistics and museum space for researchers to conduct studies. Museum guests converse with scientists and may participate in active studies. The RLC is guided by MBE principles:

- supporting dialogue and understanding about education and the cognitive sciences;
- providing resources for scientists, educators, and the public; and
- developing new and promising research directions.

An average of 75 researcher-guest interactions (25 participants) were reported during each three-hour research block, and four major benefit themes emerged from post-study response analysis: researcher-public interactions, knowledge gains, resources, and future learning applications. The new research directions generated by university-museum collaborations could help institutions strengthen research opportunities and build effective collaborations as they work towards a new understanding of interactive science education.

BUILDING BLOCKS FOR DEVELOPING SPATIAL SKILLS: EVIDENCE FROM A LARGE REPRESENTATIVE U.S. SAMPLE

Jamie Jirout and **Nora Newcombe,** Temple University

Children's play with spatial toys (e.g., puzzles and blocks) seems to relate to children's spatial development (see review by Verdine, Golinkoff, Hirsh-Pasek, & Newcombe, 2014). However, this conclusion has largely been based on studies using small and homogeneous samples. We report analyses of a large and nationally representative sample in which it is possible to examine correlations between parent-reported spatial play and spatial skill (specifically, scores on WPPSI Block Design), controlling for other abilities, examining divergent validity by analyzing other types of play, and looking at the relation across various sub-groups of children. The data show that the relation between spatial play and block design scores is invariant across SES levels and gender, and seems to mediate SES differences. Males outperform females, and have higher frequency of spatial play. These findings provide strong support for advocating for family and preschool activities and interventions to develop children's spatial thinking.

DOES THE CONGRUENCY BETWEEN DISCRETE AND CONTINUOUS PROPERTIES OF NON-SYMBOLIC NUMBER INFLUENCE CHILDREN'S FORMATIONS OF SYMBOLIC REPRESENTATIONS?

Rebecca Merkley, Joanna Bishop, and **Gaia Scerif,** University of Oxford

A prevalent hypothesis is that children's acquisition of numerical symbols is supported by core innate systems of numerical quantification, including the approximate number system (ANS). There is increasing evidence that the ANS is influenced by continuous properties of number and not just discrete numerosity but the influence of continuous quantity on the development of numerical cognition is not well understood. It has been proposed that young children rely more on continuous quantity when making judgments on non-symbolic arrays and come to use discrete number more with experience and education. We investigated the influence of the congruency between discrete and continuous properties of number on children's formation of symbolic representations using an artificial learning paradigm. Children were trained to associate abstract symbols with numerical magnitude and congruency of non-symbolic arrays manipulated between participants. The strength of learned representations was then tested with a symbolic magnitude comparison task.

RATIO COMPARISON IN 2ND-GRADE CHILDREN

David M. Gomez and **Pablo Dartnell,** University of Chile

Mastering rational numbers is a difficult challenge for children. Many of them learned rationals starting by fractions via the parts-of-a-whole schema. Such pathway is known to lead to biased reasoning by many children, in which the natural numbers composing fractions interfere with correct fractional reasoning (Natural Number Bias, NNB). We explored an alternative way of introducing young children to rational numbers by means of ratios of numerosities, focusing particularly on the emergence of NNBs in this new context. Forty 2nd-grade children learned to use fraction-like symbols for ratios, through five brief audiovisual recordings. Data from a subsequent 12-item test of ratio comparison showed significant learning at the group level and revealed important differences between groups of children: whereas some of them grasped successfully the required notions for comparing ratios, others answered only based on the NNB. We discuss possible implications for the teaching and learning of rational numbers at school.

NUMBER SENSE USING NATIVE NUMBERS IPAD APP PILOT STUDY

Cynthia Trask, The University of Texas at Arlington

Current research indicates a well-developed knowledge of number sense is paramount to a child's understanding mathematical concepts. In a 2013 pilot study, first graders, in Arlington, Texas, were observed using Native Numbers, an iPad app designed to measure a child's understanding of number sense. Findings from this study suggest the app's function as a screener allows educators at the campus level to assess and provide immediate feedback, ensuring students receive conceptually appropriate reteach lessons. At the district level, utilization of data in Professional Learning Communities (PLC's) encourages dynamic, open-ended collaboration between teachers and administration. Further research focusing on the use of credibly proven brain-based technology will allow teachers maximum teaching opportunities, assuring school districts will deliver the necessary tools for students to learn at optimal levels.

AFTERSCHOOL AND "NON-COGNITIVE" SKILLS

Hilary K. Swank, Plymouth State University

Although heavy emphasis remains on achievement and standardized testing in schools, awareness of the value of "non-cognitive" skills is growing. If these skills are indeed essential for success in the 21st century, we must find ways to foster them in children. Afterschool may be better positioned than school to work on these skills because it is more flexible in terms of scheduling, activities, and staffing. Because it also often serves those students with the highest need, afterschool could be especially valuable in supporting positive development of vital skills often underdeveloped in at-risk children. This research examines the relationship of afterschool participation to a variety of non-academic student outcomes related to grit, self-efficacy, and mindset. The data include demographic information, academic achievement records, and data collected as part of mandatory reporting for afterschool. Results point to significant associations between regular afterschool attendance and students' self-reports of self-confidence, motivation, and other related characteristics.

STUDENTS' PERCEPTIONS OF THE ROLE OF THE BRAIN IN LEARNING: IMPLICATIONS FOR EMBEDDING NEUROSCIENCE INTO THE CURRICULUM AND FOR DESIGNING CLASSROOM ENVIRONMENTS THAT FACILITATE CONSTRUCTIVE INTERNAL REFLECTION

Laura Jane Linck, Rosarian Academy

Explicitly teaching students about neuroplasticity has a transformative impact in the classroom. The force behind this cycle is students' belief that they can get smarter through study and practice, which enhances their commitment to persist in the hard work that learning requires. Knowledge of neuroplasticity also provides students with purpose, goals and the confidence required to practice transitioning into constructive internal reflection. Classroom environments and experiences designed with opportunities for appropriate lapses in outwardly directed attention, and high-quality introspective states support students' knowledge consolidation meaning making, future planning and transfer of learning into new contexts. These findings suggest that if we want to nurture meaning making, future planning, self-regulation, and creative problem solving then we need to set up conditions in the classroom that facilitate constructive internal reflection and advocate for educational practices that incorporate neuroscience into the curriculum and promote effective balance between external attention and internal reflection.

THE EFFECTS OF MUSIC ON THE BRAIN: FROM BEETHOVEN TO EMINEM

Robin Wilkins, Donald A. Hodges, Paul J. Laurienti, and **Jonathan H. Burdette,** Wake Forest University Medical Center

Within the brain, music affects an intricate set of complex neural processing systems. Music has been shown to affects systems and structural components associated with sensory processing, as well as emotional and functional elements implicated in memory, cognition and mood fluctuation. Network science, based on graph theory, provides a method for studying the brain as a complex system. Because of the vast complexity of music processing within the brain, it is an ideal candidate for network science. Using network science methods and entire songs, we were able to study music as people actually experience it. We investigated whether music preference influences brain connectivity. Our results show that when people listen to music their functional networks are similar as long as they like the music—not whether the music is classical or country with lyrics or not. In other words, people's preference for the music—not the type, determines their functional brain network.

BRIEF MINDFULNESS INTERVENTION IMPROVES EMOTION, CREATIVITY AND WORKING MEMORY

Yi-Yuan Tang and **Rongxiang Tang,** Texas Tech University

One form of mindfulness meditation, the integrative body-mind training (IBMT) has been shown to improve attention, emotion, and reduce stress through enhancing self-control network in the brain. In this paper we examine whether short-term IBMT can improve performance related to creativity and working memory and determine the role that mood may play in such improvement. Forty undergraduates were randomly assigned to short-term IBMT group or a relaxation training (RT) control group. Mood, creativity and working memory performance were assessed by the Positive and Negative Affect Schedule, Torrance Tests of Creative Thinking questionnaire and N-back working memory measure respectively. Our results indicated that few hours of IBMT improved creativity and working memory performance, and yielded better emotional regulation than RT. In addition, further analysis indicated that both positive and negative affect may influence creativity and working memory in IBMT group through enhanced self-control network in the brain.

THE IMPACT OF PLAYWRITING FRAMED BY COGNITIVE NEUROSCIENCE ON THE NARRATIVE WRITING SKILLS OF CHRONICALLY ILL STUDENTS

Rebekah Carlile and **Marc Schwartz,** The University of Texas at Arlington

Framed by models from cognitive neuroscience, this pilot study examines the influence of a group playwriting intervention, on the narrative language skills of chronically-ill students. A growing body of research suggests that the educational needs of chronically-ill children are not well-served, and that new programs for delivery are needed (Jackson, 2013; Thies, 1999; Irwin & Elam, 2011); Shiu, 2001). In collaboration with Cook Children's Hospital in Fort Worth, Texas, a small group of chronically ill children aged 9 to 12 years, who come to the hospital for outpatient treatments, will participate in the intervention. This playwriting intervention combines narrative language and writing to offer the chronically ill student a skill set that has potential for broad academic impact. Insight into the potential of a program such as this may warrant its more rigorous research in light of the tremendous need of this population of students.

INDIVIDUAL DIFFERENCES IN COGNITIVE STRATEGY SELECTION DURING MENTAL ROTATION: ROLE OF EARLY SPATIAL EXPERIENCE

Alina Nazareth, Marcela Ramos, Anaelle S. Labi, Wellington J. Humes III, and **Shannon M. Pruden,** Florida International University

In the present study, we hypothesize that individual differences observed in mental rotation performance due to early spatial experience, specifically "male" sex-typed spatial activities can be explained in part by differential cognitive strategy selection. Participants were presented with stimuli based on the Shepard and Metzler (1971) mental rotation task and their eye movement was recorded using a Tobii X60 eye tracker. Preliminary analysis revealed that mental rotation performance differed significantly by cognitive strategy selection, $F(1,62) = 7.938$, $p = .006$. Further analysis will examine the mediating role of strategy in the relation between early spatial experience and mental rotation performance. If early "male" sex-typed spatial experience is associated with an optimum cognitive strategy, encouraging female youth to engage in these activities may be one effective way of reducing the sex difference in spatial ability, a skill linked to Science, Technology, Engineering and Mathematics (STEM) success (Wai, Lubinski & Benbow, 2009).

POSTER PRESENTATIONS

STUDENT PERCEPTIONS OF TEACHERS' MINDSET BELIEFS: RELATIONS TO STUDENT AND TEACHER BELIEFS

Anne Gutshall, College of Charleston

Research suggests teachers and students hold beliefs about the stability/malleability of ability. Belief that ability is largely stable and unchangeable is commonly referred to as a "fixed mindset"; whereas, believing that ability is malleable and can be influenced by experience, effort and persistence is known as a "growth mindset". Growth mindset beliefs are consistent with neuroscience understandings regarding the plasticity and experience dependence of the human brain and have consistently shown to have a positive impact on student learning and motivation. However, little is known about the nature of the relationship between student beliefs and teacher beliefs in classroom settings. The current research explores the nature of student mindset beliefs (n=359), students' perception of teacher mindset beliefs (n=359) and teacher mindset beliefs (n-=7) in two southeastern schools. Implications for educators are discussed.

MIND MAPS AND SIX THINKING HATS TECHNIQUES AS A STRATEGY FOR THE CREATIVITY DEVELOPMENT AT TECHNICAL EDUCATION

Cleiton Ferreira and **Ferananda Carvalho,** Universidade Federal Do Rio Grande

Professional education should promote the transition between school and the working world, empowering youth and adults with specific knowledge and skills like creativity. It is essential to encourage and empower these people for the demands of the labor market of the twenty-first century. In this scene, the neuroscience comes and provides a dialog that allows the establishment of new ways to develop the capacity of the learner's thinking. Grounded in articulation between neuroscience and education, this work brings the tools of mind maps and six thinking hats as possible collaborators in the classroom for the enhancement of creative behavior. From a practical experience with students of a technical high school applying these techniques in managing information and developing skills of potentiating creativity, this research establishes the benefits of these learning tools and brings subsidies for supporting effective strategies to assist teachers in their educational activities.

SYMBOLIC NUMERICAL MAGNITUDE PROCESSING ACCOUNTS FOR UNIQUE VARIANCE IN MATHEMATICS ACHIEVEMENT IN GRADE 2 AND GRADE 5

Tracy Solomon, Jenny Lam, Min-Na Hockenberry, and **Rosemary Tannock,** Hospital for Sick Children

Nosworthy and colleagues developed a 2-minute paper and pencil test of symbolic and non-symbolic number processing and found that, while both were correlated with arithmetic achievement, only symbolic processing explained unique variance in arithmetic achievement, in grades 1 to 3 (Nosworthy et al., 2013). The present study sought to replicate the results for grade 2, and to extend this work to grade 5, with more extensive measures of math achievement. The main finding was that performance on the symbolic task, but not on the non-symbolic task, accounted for unique variance in all five measures of math achievement. The results thus replicate previous findings for grade 2 and contribute to evidence that symbolic magnitude processing predicts math achievement in grade 5. As such, they suggest that this easy to administer, affordable test may help to identify students at risk for difficulty in math as late as the end of elementary school.

DEVELOPMENT OF A COGNITIVE CLASSROOM OBSERVATION TOOL

Elida Laski, Anna Ermakova, and **Melissa Paz,** Boston College

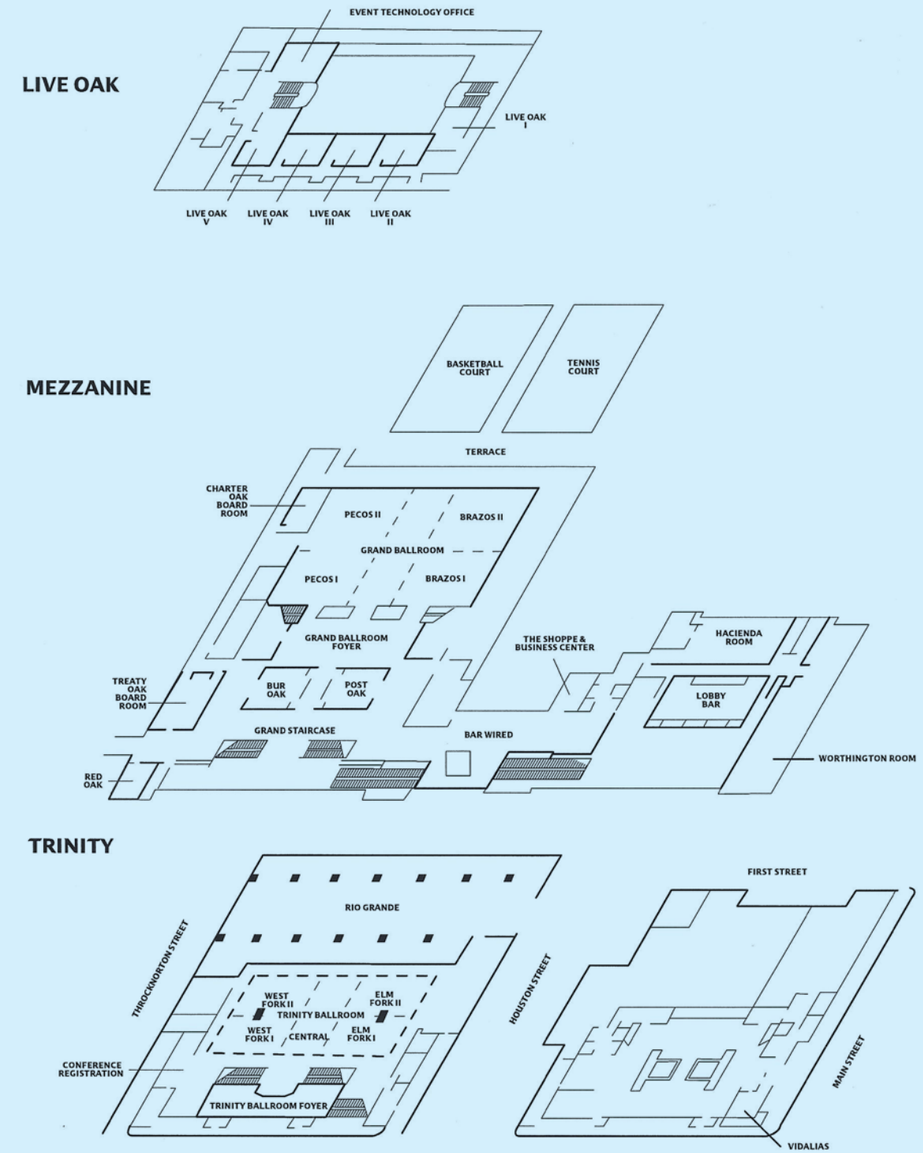
The extent to which learning principles from cognitive science have been integrated into teaching practice is unknown. Further, there is little empirical evidence that principles which have emerged from laboratory research are efficacious in classroom contexts. We report initial efforts to develop a classroom observation instrument—The Cognitive Principles of Learning (CPOL)—that could be used in empirical investigations of these issues. The eight learning principles included in the instrument and the operational definitions in the rating categories for each will be described in order to gain input from researchers in the cognitive field. Initial findings indicate that the instrument has moderate reliability (76% inter-rater agreement) and captures variability in teaching practices, particularly on the extent to which they incorporate multiple representations and signaling.

DEMONSTRATION AND DISCOVERY

Audrey Kittredge, David Klahr, and **Anna Fisher,** Carnegie Mellon University

Although exploration-based activities are common in early childhood classrooms, there is little research to guide teachers on the optimal mix of open-ended v highly directive instruction. Moreover, the existing literature is inconclusive as to whether demonstration suppresses or enhances young children's exploration and discovery. In two experiments, we ask 4-7 year-old children to find toy animals in a miniature forest with many possible hiding places. When an experimenter demonstrates how to find an animal, children seem to discover fewer undemonstrated animals, compared to children who are only told the goal of the game. This suppressive effect of demonstration emerges when the experimenter's language is neutral ("look...see?") or explicitly pedagogical ("here's how you can find animals"). When the demonstration is followed by a hint to consider other search strategies, children's discovery is no longer suppressed. These results highlight the importance of subtle differences in pedagogy for guiding children's independent exploration.

MAP



SPONSORED BY:

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SUPPORTED BY:

NATIONAL SCIENCE FOUNDATION UNDER GRANT #DRL-1434973