

EdTech to Enhance Early Language & Reading Acquisition, and Reading Comprehension: Cross-Language and Global Perspectives

DATES 8-9 December 2017

LOCATION Agora, Auditorio 3 and Lea Pulkkinen Hall (4th floor), University of Jyväskylä, Jyväskylä, Finland

ORGANIZERS Fumiko Hoeft, Heikki Lyytinen, Kenneth Pugh, Ovid Tzeng

PURPOSE A meeting of experts from multiple disciplines (including cognitive science, neuroscience, education, computer science, policy, and education technology [EdTech]) to make progress on developing evidence-based technology-aided tools to support at-risk children **across languages and cultures** at three critical stages: 1] preschool oral language/vocabulary and numeracy; 2] reading acquisition; and 3] reading comprehension support (with consideration of links to STEM). Additional focus on opportunities and challenges in and around adult literacy and second language literacy will also be considered.

KEY WORDS reading comprehension, STEM, EdTech, digital environment, gamification, learning, teaching, personalized learning profile, individuals, collaborative learning, learning support, dynamic assessment, implicit and explicit learning/teaching, closed-loop and feedback, cognitive skills, motivation (self-efficacy), learning disability, cross-cultural, cross-language

SCHEDULE

DAY 1. 08.12.2017 Friday

Auditorio 3, Agora

CHAired BY PROFESSOR ULLA RICHARDSON

10:15 **Welcome, Rector Keijo Hämäläinen (University of Jyväskylä)**

10:25 **Introduction to the meeting and opening discussion (Lyytinen - Finland, Tzeng -Taiwan & Pugh – US)**

10:45 **Early language and reading acquisition: An update on GraphoLearn from Finland (Lyytinen, University of Jyväskylä, Finland)**

Heikki Lyytinen, Professor at the University of Jyväskylä, UNESCO Chair on Inclusive Literacy Learning for All, Professor of Developmental Neuropsychology, PI of the Jyväskylä Longitudinal Study of Dyslexia since 1993, co-leader of Centers of Excellence on “Human Development and Its Risk Factors” and “Learning and Motivation”, both nominated and funded by the Academy of Finland during 1997-2011, leader of EU-COST A8 action “Learning Disorders as a Barrier to Human Development” 1994-1998, member of the Academy of Sciences and Letters of Finland. He has served in numerous positions, such as the Vice President of the University of Jyväskylä, and Chair of Boards of the Niilo Mäki Foundation and the Agora Center for human technology research, and advisory board member of the International Dyslexia Association. He has published more than 300 articles in scientific journals and books. His areas of recent research include dyslexia and reading acquisition, as well as digital learning environments for children at risk of reading difficulties or dyslexia.

11:05 **DysGeBra – Brain and gene -related findings from children with dyslexia (Anni Nora, Aalto University, Finland)**

11:20 **When the Earth is Not Flat in Literacy Acquisition: Linguistic Problems, Socio-Cultural Obstacles, and Potential Solutions (Presenters: Ovid J. L. Tzeng, Jun Ren Lee, Co-authors: Daisy L. Hung, Nissen Kuo, Rose R.-W. Lee, Taiwan)**

Professor Ovid J. L. Tzeng is the chancellor of University System of Taiwan and academician of Academia Sinica. He was the Minister of Education, the Minister Without Portfolio, and the Minister of Council for Cultural Affairs. He is an outstanding researcher in Cognitive Neuroscience and Neurolinguistics and an experienced leader in academic institutions. He serves as a member of the Board of Directors of Haskins Laboratories in the U.S. and an advisory board member of the ARC Centre of Excellence in Cognition and its Disorders in Australia. He has also been elected to be the academician of The World Academy of Sciences (TWAS) since 2010 and active member of The European Academy of Sciences and Arts since 2017. He has been the Chancellor of University System of Taiwan for several years, which was created by him and established to oversee and integrate the research and teaching developments of Taiwan’s four top research universities, namely, Central-, Chiao-Tung-, Tsing Hua- and Yang Ming University. Prior to the Chancellorship, he was the Vice President of Academia Sinica in Taiwan, in charge of International Scholarly Exchange Program as well the developments of Taiwan’s International Graduate Program (TIGP). He not only created the TIGP, but also made sure that the program should serve students from developing countries. He has long been concerned with the devastating consequences of unequal opportunities for access reading education among societies. He is currently an Executive member of the Committee on Human Rights of the NAS, NAE, and NAM, as well as a member of the UNESCO’s Inclusive Literacy Learning for All Project.

Professor Daisy L. Hung is a Chair Professor of the Institute of Cognitive Neuroscience of National Central University and Taipei Medical University in Taiwan. In addition to research and teaching, Professor Hung has translated over 50 books about biotechnology and psychology in order to popularize scientific knowledge. Believing in reading is the core of education that forms the foundation of a country; she visited about 1000 primary and secondary schools all around Taiwan and delivered speeches on reading promoting for more than two decades. Numerous prizes and awards honored her, including the Outstanding Chinese Leadership Award of the Lifetime Achievement by the Global Views Monthly (2011), and Special Contribution Award by Teco Technology Foundation (2005) for her dedication on reading promotion in rural area in Taiwan. Professor Hung’s translation works were awarded the Golden Bookmark Prize for Pop Science Books of 2010 by Wu Ta-You Foundation and awarded the 10 Best Books in the translation category by China Times Book Review bulletin in 2000 and 1998 respectively.

Dr. Jun Ren Lee is an associate professor at National Taiwan Normal University and is visiting CRADLE (the Center for Research on Atypical Development and Learning), Georgia State University, U.S. He took a temporary leave from NTNU in 2013-2015 to serve as the director of Testing and Evaluation Center, National Academy of Educational Research, Taiwan. In that period, he was in charge of national educational progress assessment, the national assessments of remediation program, and the certification of teacher qualification exam in Taiwan. He also serves as the member in the committee of identification of learning disability in Taipei area.

Dr. Nissen Kuo is a cognitive neuroscientist expert in speech and language processing and an associate professor at Institute of Neuroscience of National Yang Ming University in Taiwan. His current research interests include cognitive neuroscience of Chinese language processing and reading, cognitive neuroscience of decision, emotion, and action control, and neuroimaging methods and design. In addition to utilizing non-invasive neuroimaging methods, such as fMRI, MEG, and EEG in his studies, he currently conducts auditory and speech-related studies using intracranial recordings in presurgical patients. This approach significantly strengthens the capability to see how our brain works.

Dr. Rose R.-W. Lee is an assistant programmer at MEG Lab in Academia Sinica and an associate investigator of ARC Centre of Excellence in Cognition and its Disorders, Macquarie University, Australia. She received her Ph. D. from Graduate Institute of Information and Computer Education of National Taiwan Normal University in Taiwan. Her research interest is how to leverage technology to enhance learning across life span. She has coordinated projects of Taiwan Cognitive Neuroscience Labs for a decade, and recently initiated Taipei Society for International Research and Promotion on Brain and Learning.

11:40

GraphoGame Company – How business supports sustainability in literacy (Pertti Jalasvirta, CEO of Grapho Group Oy, Finland & Jesper Ryyänen, Director of Partnerships of Grapho Group Oy)

Pertti Jalasvirta has thirty years of professional experience in government affairs, administrative management and military medicine and is now leading the commercial implementation of GraphoGame globally. With Pertti's connections and know-how of government procurement processes around the world, GraphoGame is well equipped to become a spearhead Finnish education export for the benefit of children around the world.

With a background in emerging markets, venture capital and ecommerce, Jesper Ryyänen is heading GraphoGame's business development efforts and researcher relations. Jesper was closely involved with the negotiations for commercialising GraphoGame during 2017 and is now dedicated to building long-term commercial viability for evidence-based education gaming.

Discussion

12:15-14.00 **Lunch Break and networking**

KEYNOTES:

[Lea Pulkkinen's Hall \(4th floor\), Agora](#)

14:00 (20 min) **PISA Finland – highlights (Tommi Kärkkäinen, University of Jyväskylä, Finland)**

Tommi Kärkkäinen has completed his PhD from the University of Jyväskylä in 1995 and worked as a full professor in the Faculty of Information Technology since 2002. He has been and is serving in many positions of administration and responsibility at the faculty and the university level. His main research fields include computational sciences and computing education research. He has published

over 170 research papers on various topics, led dozens of R&D projects, and supervised 25 PhD theses in Mathematical Information Technology and Information systems.

14:30 (20 min) Math and other Stem R&D for children In Finland (Harri Ketamo, Headai, Finland)

Harri Ketamo, Ph.D., an entrepreneur with more than 15 years' experience as a researcher of learning sciences, data mining and artificial intelligence. Currently he is founder & chairman of Headai, a company developing natural language based cognitive artificial intelligence, and advisor for Education (higher education) and BrainQuake (serious games). Ketamo has published 90 international peer-reviewed research articles and had more than 200 presentations in international forums. He has developed educational products and platforms (games, adaptive learning, learning analytics, artificial intelligence) that are used in more than 100 countries all over the world. Previously he has been e.g. Academy of Finland -granted post-doc researcher, founder & CEO of gameMiner Ltd (gameAI & data mining) and SkillPixels Ltd (serious games). Ketamo was awarded the Eisenhower Fellowship in 2017.

15:00 (30 min) Reading Comprehension In EdTech: An update from ETS, US (John Sabatini, ETS, US)

John Sabatini is a Principal Research Scientist in the Center for Global Assessment at Educational Testing Service. His research interests include reading literacy development, disabilities, assessment, cognitive psychology, and educational technology, with a primary focus on adults and adolescents. He has been the principal investigator of an Institute of Education Sciences (IES) funded grant to develop pre-K -12 comprehension assessments as part of the Reading for Understanding initiative and an IES grant to adapt those assessments for use in adult education programs, as well as co-PI on a project that uses automated item generation technology so that instructors can build language activities from their own content texts for their English language learners. He is co-author and designer of the PIAAC reading components measures, and serves on the PIAAC and PISA expert literacy groups. He is lead editor of two volumes on innovations in reading comprehension assessment and has served as co-editor for three special journal issues on adult literacy (Scientific Study of Reading, 2002; Journal of Learning Disabilities, 2010; and Journal of Research Effectiveness and Evaluation, 2011).

15:30 Coffee / Tea Break, open discussions

DEMONSTRATIONS: EDTECH SUPPORTING CHILDREN'S LITERACY, NUMERACY, AND STEM LEARNING

16:00 (1 hour)

- 1) **Evidence-based math learning – Headai (Harri Ketamo, Headai, Finland)**
- 2) **Science Entertainment: "Finland tackles misinformation about Vaccines with Games (Olli Rundgren, Psyon, Finland)**

Olli Rundgren is the co-founder and CEO of Psyon Games, a company producing science entertainment games. Olli has years of experience as a high stakes poker professional and he studied science; chemistry, physics, cell- and molecular biology, physiology and pedagogy at the University of Jyväskylä. He loves philosophy and psychology, but his expertise is also in the game theories, strategic business planning and creative thinking. His vision is to integrate science, games and deep level of understanding and be creating a new era of entertainment. His passion for creation, innovation and science lead him to start a Psyon Games, a company built around creating philanthropic value and big positive impact. <http://psyongames.com/>

3) **ViLLE – Electronic Learning Path for Studying Math, Programming and Finnish (Erkki Kaila, University of Turku, Finland)**

Erkki Kaila is going to finish his PhD about utilizing educational technology in programming education in January 2018. He has 10 years of experience in researching educational technology, learning analytics and programming learning and teaching. Kaila is one of the original creators of ViLLE – a collaborative learning platform utilized by more than 100 000 users in Finland and other countries. Kaila has more than 50 international peer-reviewed research articles.

4) **My Science Tutor and MindStars Books: Spoken dialogs with K-5 students for science and reading comprehension (Ron Cole, Boulder Learning, US)**

Dr. Ron Cole is President and Principal Scientist in *Boulder Learning*. He has an extensive career in spoken language research and has been e.g., Professor in Department of Computer Science & Education at Oregon Graduate Institute as well as in Center for Spoken Language Research at University of Colorado Boulder. For the past twenty years, Dr. Cole has been working with colleagues in fields of deaf education, reading, science education, math education and speech-language pathologies to learn about and develop intelligent tutoring and therapy programs to help people learn. This research has been funded by approximately \$30 million in grants from the National Science Foundation, Institute for Education Sciences (Department of Education), and National Institutes of Health. The research has led to a new generation of intelligent tutoring, assessment and speech and language therapy programs (for individuals with aphasia and Parkinson disease). Research resulting from the grants has led to over 200 peer-review publications. In all projects conducted thus far, the resulting intelligent tutoring and therapy systems have produced outcomes in summative evaluations and clinical trials, comparable to human tutors or clinicians. Since founding Boulder Learning with Wayne Ward, Dr. Cole has focused on developing intelligent tutoring systems to help children become more excited about science, math and reading. His hope is that the research and systems we develop will enable every student to achieve their potential by learning with their own empathic and effective virtual teacher.

17:00

Networking and possibility to discuss the presented technological solutions in detail

Poster demos on Finnish projects associated with the themes of meeting

18:00

Keynote: Learner Positioning Systems: Navigating learner variability to make learning personal for all (Vic Vuchic, Digital Promise Global, US)

Vic Vuchic is the Chief Innovation Officer at Digital Promise Global and Executive Director of the Learner Positioning Systems initiative. Vic is a seasoned thought leader in education technology and philanthropy. He is an expert in learning science, innovation, and scaling what works and has launched game-changing initiatives that have increased access to education and improved learning for tens of millions of learners in the Americas, Europe, Asia and Africa. Prior to Digital Promise Global, Vic consulted with a number of foundations and organizations on education technology, innovation and philanthropy. Prior to consulting, Vic developed strategies and managed over \$100 million in technology-focused grants at the Hewlett Foundation to launch and grow the Open Educational Resources (OER) movement and create and advance the Deeper Learning strategy. Vic completed a master's degree in education and technology at Stanford University and a bachelor's degree in systems engineering at the University of Pennsylvania. Vic also received a scholarship and attended Berklee College of Music for a year. Previous experience includes working at startups in Silicon Valley for eight years with expertise in human-centric system design and innovation methodologies

DAY 2. 09.12.2017 Saturday

Lea Pulkkinen's Hall (4th floor), Agora

PERSPECTIVES ON RELEVANT RESEARCH (20 min each presentation)

09:30 **Genetics, neuroscience and education: Implications for global literacy & EdTech (Elena Grigorenko, Yale, US, Russia)**

Dr. Elena L. Grigorenko received her Ph.D. in general psychology from Moscow State University, Russia and her Ph.D. in developmental psychology and genetics from Yale University, USA. Currently, Dr. Grigorenko is affiliated with five universities: Baylor College of Medicine, University of Houston and Yale University in the USA, and Moscow State University for Psychology and Education and St. Petersburg State University in Russia. Dr. Grigorenko has published more than 500 peer-reviewed articles, book chapters, and books. She has received multiple professional awards for her work and received funding for her research from numerous federal and private sponsoring organizations in the USA and Russia and other countries. Dr. Grigorenko has worked with children and their families in the USA as well as in Africa (Kenya, Tanzania and Zanzibar, Ghana, the Gambia, and Zambia), India, Saudi Arabia, and Russia.

09:50 **Brain-based online learning & remediation: implications for EdTech (Ken Pugh, Haskins & Yale & Fumiko Hoeft, UCSF, US)**

Kenneth Pugh, Yale, associate professor of Linguistics and Diagnostic Radiology, President and Director of Research at Haskins Laboratories. He also directs the Yale Reading Center. His awarded research focuses on identifying differences between typically developing readers and those with disability; publishing brain-based models of reading development; and demonstrating the 'normalization' of the brain's reading network in response to interventions.

Fumiko Hoeft MD PhD is Professor of Child & Adolescent Psychiatry and Weill Institute for Neurosciences and directs the UCSF Hoeft Developmental Cognitive Neuroscience Laboratory (brainLENS.org), UC Office of the President's Multicampus Precision Learning Center (PrecL.org). Other academic positions include: Deputy Director of UCSF Dyslexia Center (dyslexia.ucsf.edu), and Senior Scientist and Advisor of Strategic Planning at Haskins Labs. Hoeft trained and held positions at Keio, Harvard, Caltech and Stanford. Her theoretical interests are in the neurobiological mechanisms underlying individual differences in brain maturational processes, acquisition of skills such as literacy and how they interact. Her team also specializes in R&D of cognitive science-based tools that can be deployed in educational practice to maximize personalized learning.

10:10 **Brain research on learning in Jyväskylä (Jarmo Hämäläinen & Tiina Parviainen, University of Jyväskylä, Finland)**

Jarmo Hämäläinen is currently a University Researcher at the Department of Psychology, University of Jyväskylä, Finland. He has been conducting research on dyslexia, auditory and speech perception with particular focus on brain research (EEG and MEG). He has been involved in the Jyväskylä Longitudinal Study of Dyslexia from 2002 and examined the processing of amplitude envelopes in dyslexia at the Centre for Neuroscience in Education, University of Cambridge, UK, and auditory processing in infants at the Center for Molecular and Behavioral Neuroscience, Rutgers University, NJ, USA. Current projects involve quantifying changes in brain activity during training and examining interactions between speech perception and production.

Tiina Parviainen is university researcher and the director of the Centre for Interdisciplinary Brain Research in University of Jyväskylä, Finland. During her PhD in Aalto University and postdoctoral studies in Oxford University, she used magnetoencephalography (MEG) to study the brain basis of language processing both in adults and children, as well as the general indicators of brain development. In Jyväskylä she has extended her research focus also on the effects of physical activity

and body awareness on brain structure and function in different age groups. As the head of CIBR, she has been strongly involved in building 'educational neuroscience' and 'brain development across life span' as the Academy of Finland funded strategic profiling areas of the University. Besides research projects on brain development, she directs also an EU-funded project that aims to bring brain research results more approachable to public and private sector.

10:30 **Open discussion, refreshments**

11:45 **EdTech and reading fluency: Lessons from Dutch (Ludo Verhoeven, the Netherlands) –remotely via Skype**

Ludo Verhoeven is Professor in Communication, Language and Literacy at the Behaviour Science Institute at Radboud University Nijmegen and at the General Faculty of the University of Curaçao. The focus of his research is on language, literacy and science learning in typically and atypically developing children in culturally and linguistic diverse environments. He completed an MA Psychology and an MA Special Education at Radboud University and received his PhD (honours degree) at the University of Tilburg. He published over 350 empirical papers in peer-reviewed scientific journals and (co)supervised 76 PhD students. Currently, he is involved in international research programs on (i) learning problems, (ii) bilingual development and (iii) special education. He is upcoming president of the international *Scientific Society for the Study of Reading* and chair of the national research program on *Children's Science Learning (Curious Minds)* and of the NIHC research program *The Learning Child*. His scientific work aims at societal relevance with a focus on the development of technological learning environments.

12:10 **Cognitive neuroscience meets policymaking: a report on a study of youths exposed to violence and disengagement of attention-related networks and theory of mind processing in the brain-fMRI and hormonal investigation of the effects of victimization on education (Augusto Buchweitz, Pontifical Catholic University of Rio Grande do Sul, Brazil)**

Augusto Buchweitz, Ph.D., Associate Professor at the School of Humanities, Pontifical Catholic University of Rio Grande do Sul; Researcher and Coordinator of International Affairs of the Brain Institute of Rio Grande do Sul; Senior Affiliated Researcher, Haskins Laboratories, Yale. Dr. Buchweitz's research focuses on the brain bases of learning to read and reading disabilities and, more recently, on the effects of violence on education. In partnership with the Interamerican Development Bank, he coordinates an investigation that combines brain, behavioral, hormonal and epigenetic measures to investigate how violence affects brain function and learning. Dr. Buchweitz is the scientist responsible for the Brazilian Portuguese version of GraphoLearn, currently in its final stages of development.

12:30 **Discussion**

12:45-14:00 **Lunch**

EDTECH IN SPECIAL POPULATIONS

14:00 **EdTech for non-traditional learners: Challenges (and opportunities) for adult literacy learners and language minority populations (Mark Seidenberg, University of Wisconsin-Madison, USA)**

Mark S. Seidenberg is Vilas Research Professor in the department of psychology at the University of Wisconsin-Madison (USA). His reading research addresses the nature of skilled reading, how children learn to read, developmental reading impairments, and the brain bases of reading, using the tools of modern cognitive neuroscience: behavioral experiments, computational models, and neuroimaging. His current research focuses on how differences in language experience, particularly the use of a

non-mainstream dialect, contribute to achievement gaps in reading. He also studies the statistical structure of language and its role in determining the character of linguistic information (e.g., morphology), in language acquisition and processing, and in age-related changes in language learning abilities. Seidenberg is author of *Language at the Speed of Sight: How We Read, Why So Many Can't, and What Can Be Done About It* (Basic Books, 2017). The book provides an overview of advances in reading science and examines the disconnection between this research and educational practice, its impact on literacy, and how it might be overcome

14:20

Shaping EdTech to the needs of students with learning differences (Benjamin Powers, US)

Dr Benjamin Powers (DBA), is Head of Southport School, co-director of the Academic Center for Excellence in the Dyslexia Foundation, and research affiliate at Grenoble Ecole de Management. A passionate advocate in the LD/ADHD community, Benjamin Powers has worked with students with dyslexia, language-based learning disabilities, and ADHD since 2000, with a particular interest in the intersections of research, practice, and advocacy. His doctoral research was influenced by understanding the literature on the social-emotional aspects of self-esteem for LD/ADHD students and focused on the relationship between the self-efficacy perceptions of students with dyslexia and their entrepreneurial intentions. Benjamin is also a life-long traveler who has lived in Kiev, Moscow, Paris, Helsinki, and various places in the US. Outside of his work, he serves on various boards and speaks on topics related to dyslexia and ADHD, leadership, and entrepreneurship.

14:40

EdTech for early education / remediation through global partnerships (Robin Morris, US) via Skype

Discussion

15:00- 15:30

Tea/Coffee break