JICS Parent Research Night

how brain science helps us understand children's development and learning

Dr. Kaja Jasińska
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Director, Laidlaw Research Centre

Educational Neuroscience

a focus on literacy

Learning about the Brain in the Classroom

Tools for Studying the Learning Mind

JICS Research on Child Development and Learning

outline

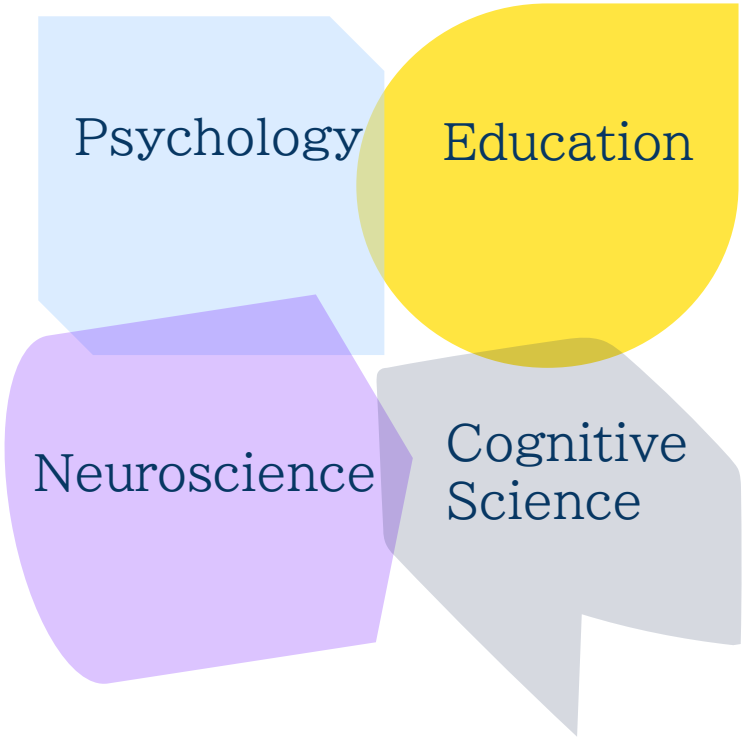
Educational Neuroscience

how children develop and learn

how the brain grows and changes over time

how children's experiences like interacting with others, playing, and problem-solving shape learning

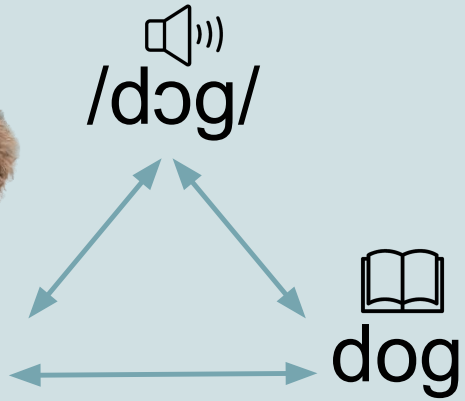
create better learning environments, teaching methods, and supports for children

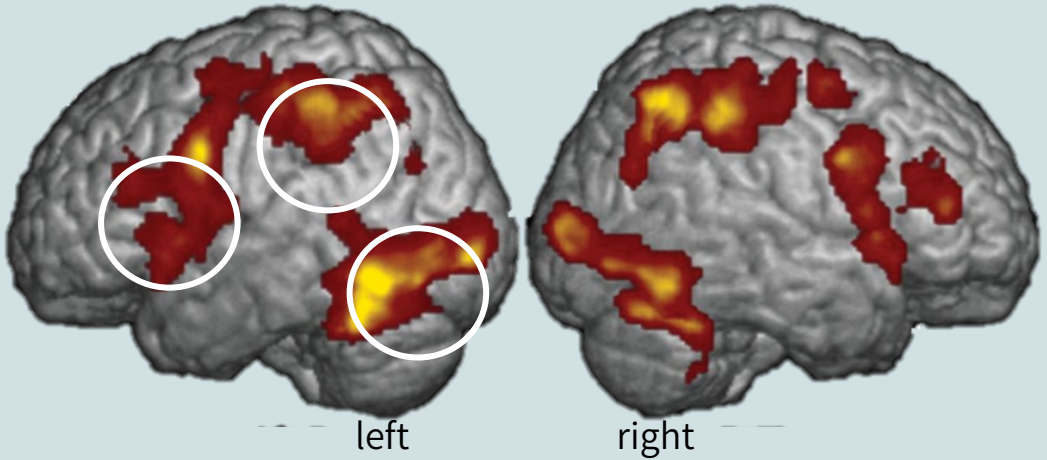


the reading brain

- ↑ left hemisphere
- frontal shift
- speech & print overlap

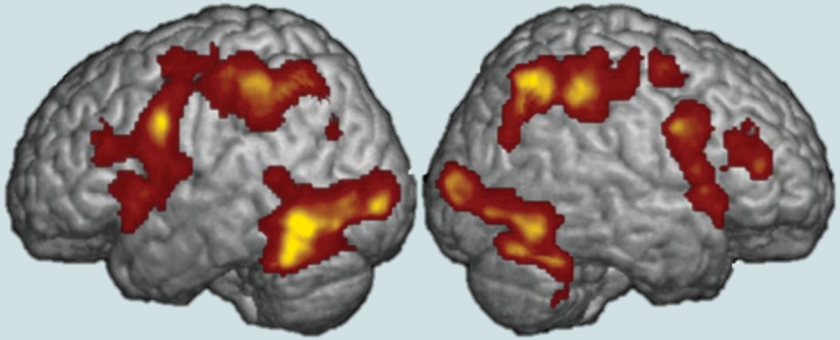
"Otis"



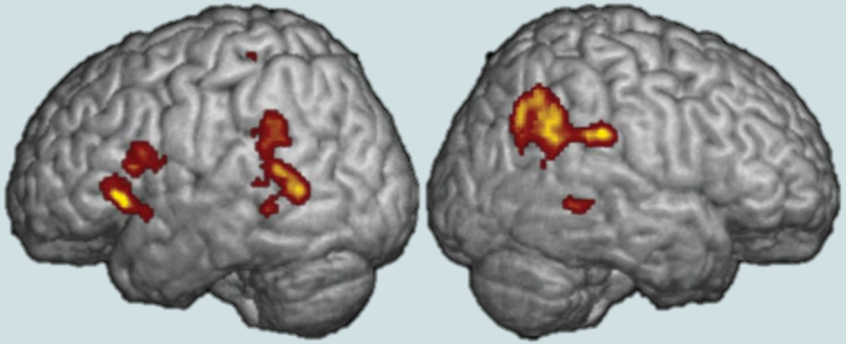


Turkeltaub et al., 2003

brain activity for reading words vs rest



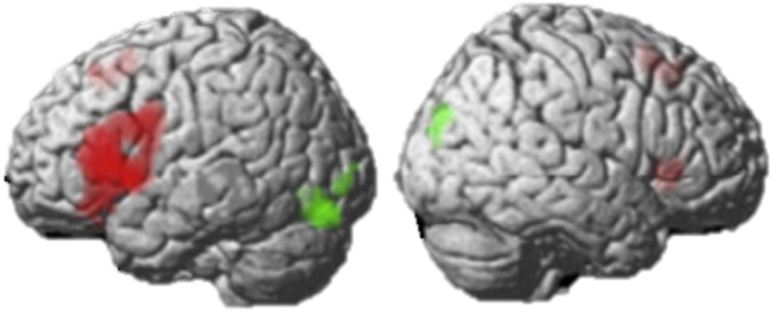
brain activity while reading words vs nonsense print



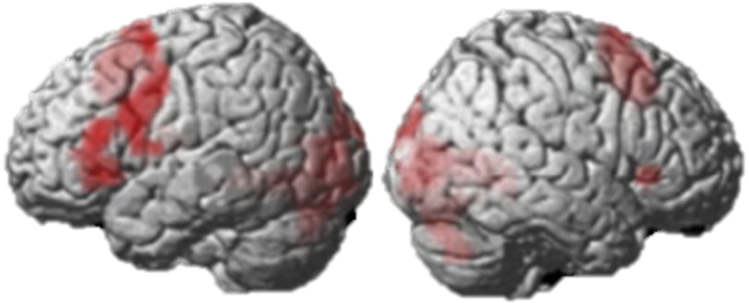
brain activity associated with reading disorders

▲ more left hemisphere

skilled reader



dyslexia



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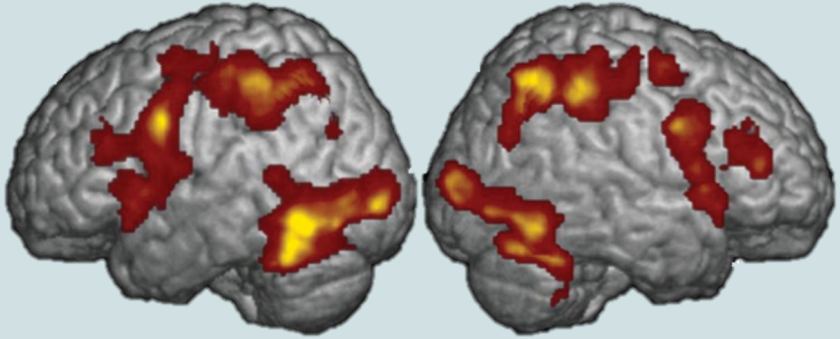
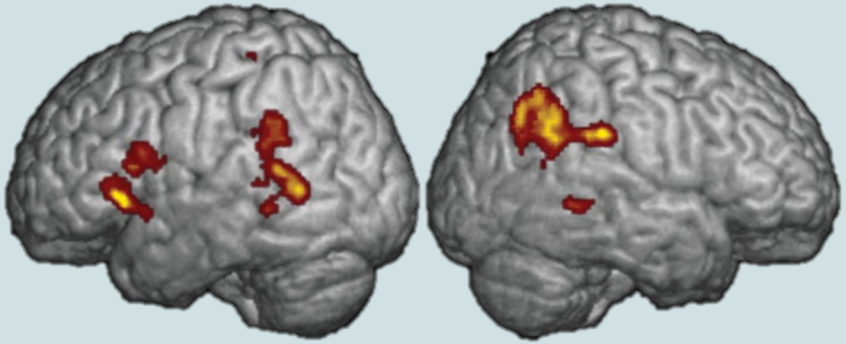
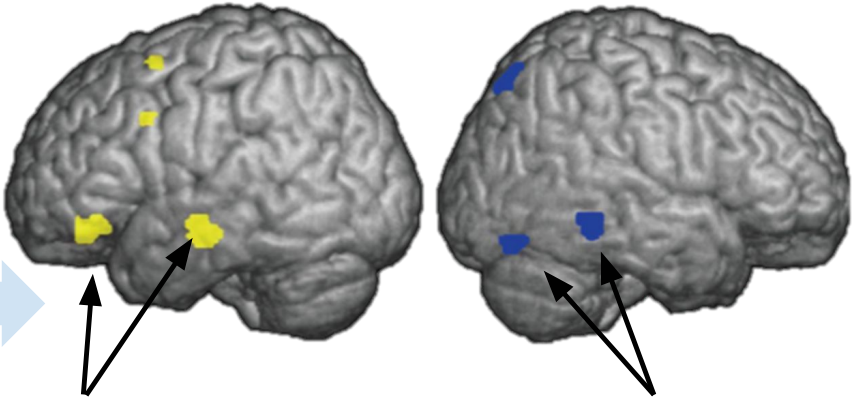


brain activity while reading words vs nonsense print



brain activity associated with reading skill

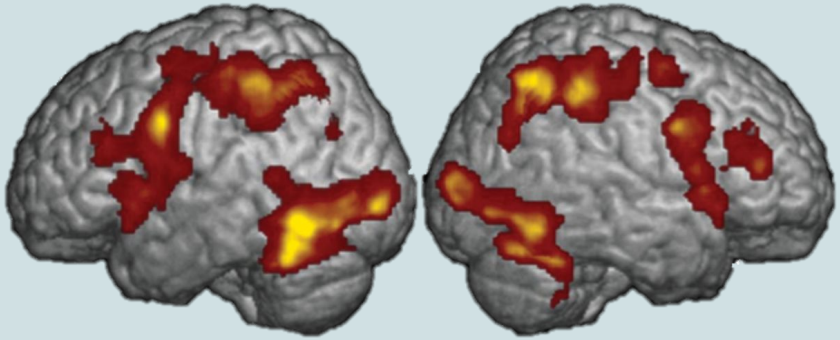


more activity = better reader

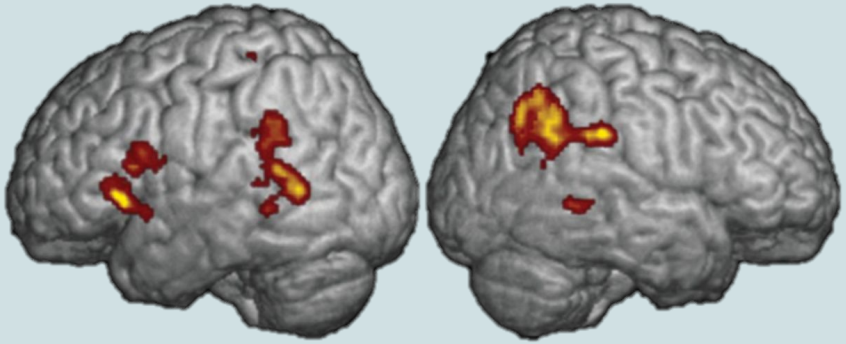
more activity = poorer reader

Turkeltaub et al., 2003

brain activity for reading words vs rest



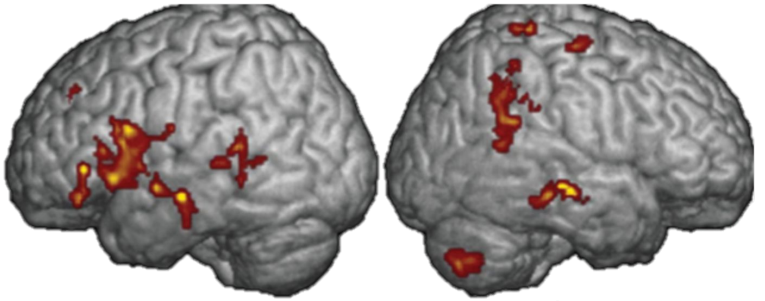
brain activity while reading words vs nonsense print



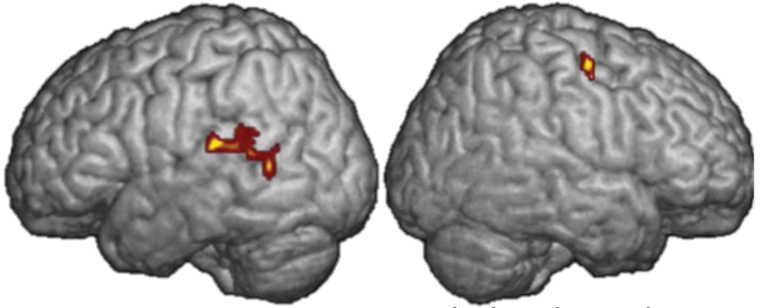
developmental changes in brain circuits for reading

▲ frontal shift

adult



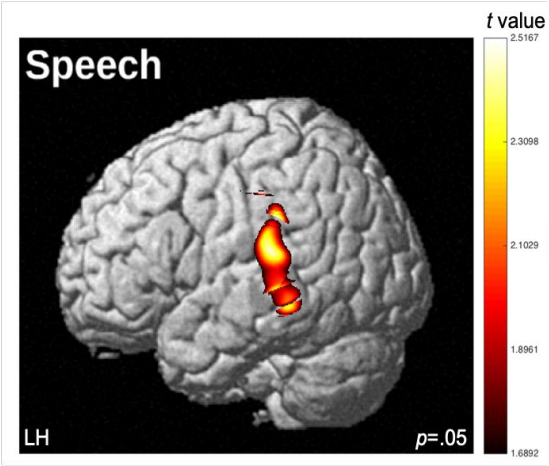
child
emergent reader



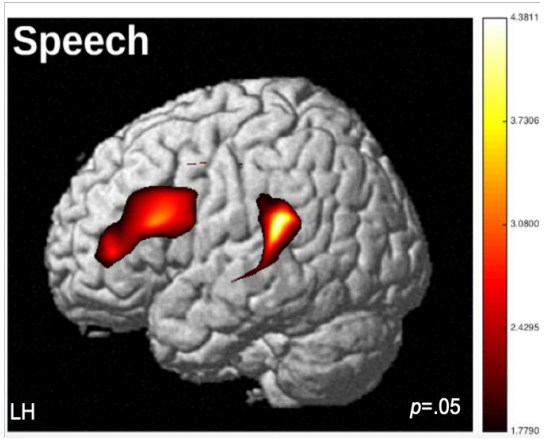
Turkeltaub et al., 2003

learning to read changes the brain

pre-reader



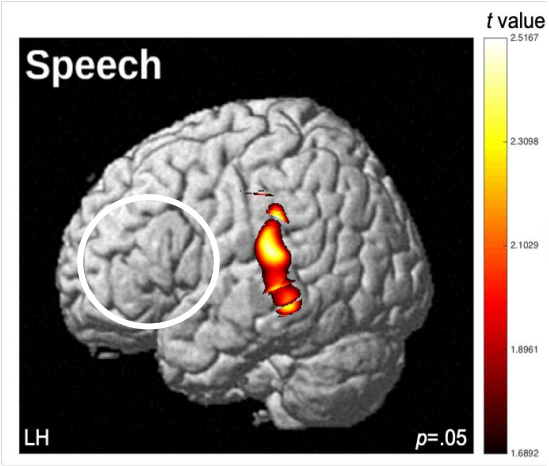
emergent reader



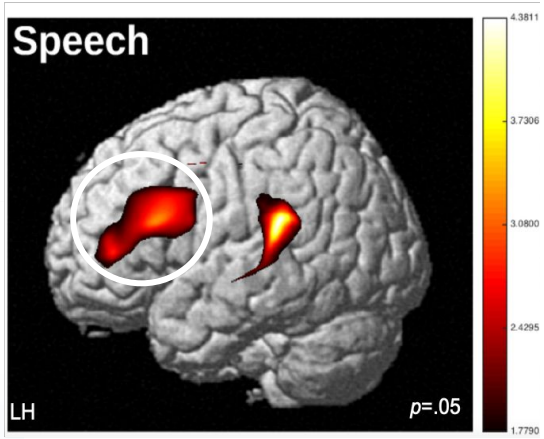
brain activity when listening to speech *before* and *after* learning to read

brain activity and connectivity in pre-literate child predicts future reading skill

pre-reader



emergent reader

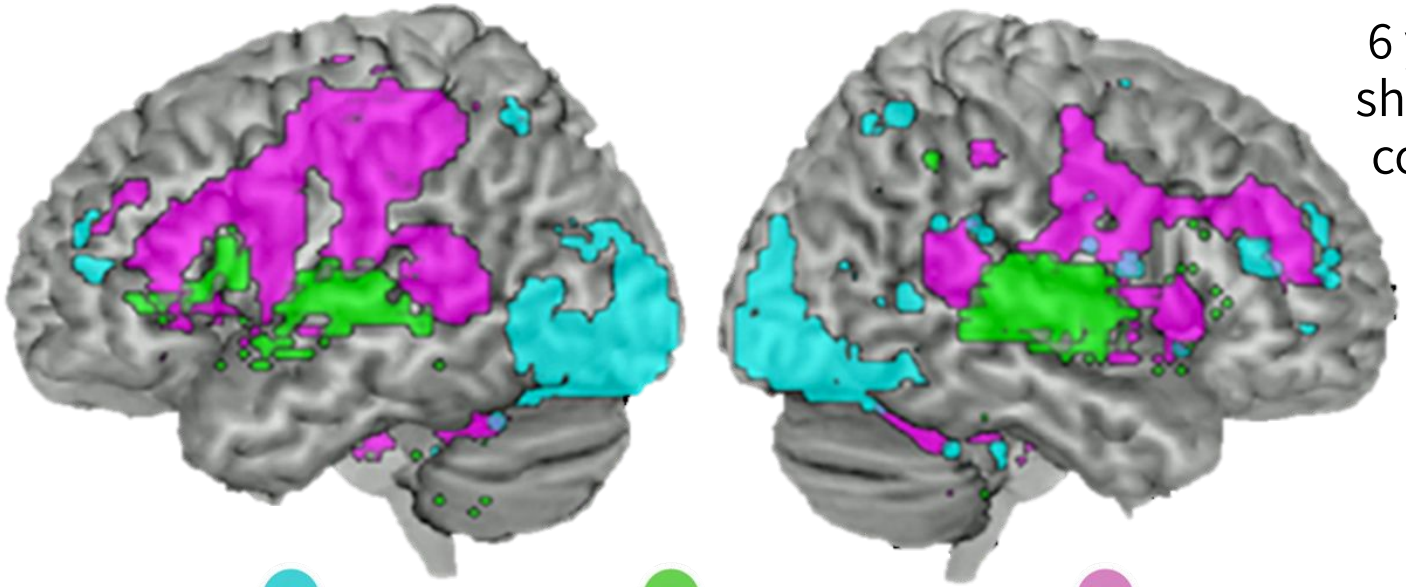


brain activity when listening to speech *before* and *after* learning to read

3-4 year old pre-literate children who show more activation and connectivity in key reading-related language areas are better readers one year later

Jasińska et al., 2020

speech-print convergence: processing spoken and written language overlaps



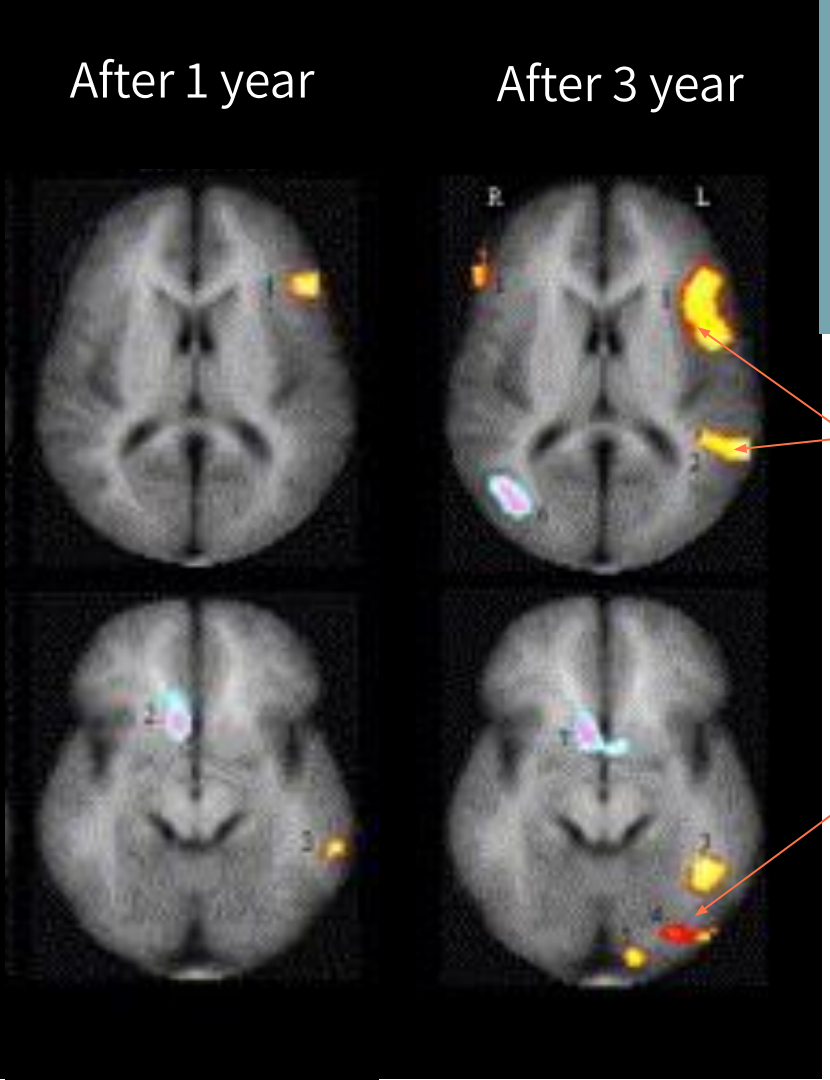
print only

speech only

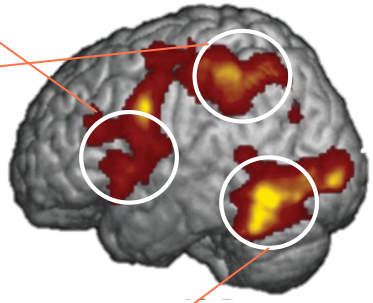
print + speech

6 year old children who show more speech-print convergence are better readers 3 years later

Rueckl et al., 2015

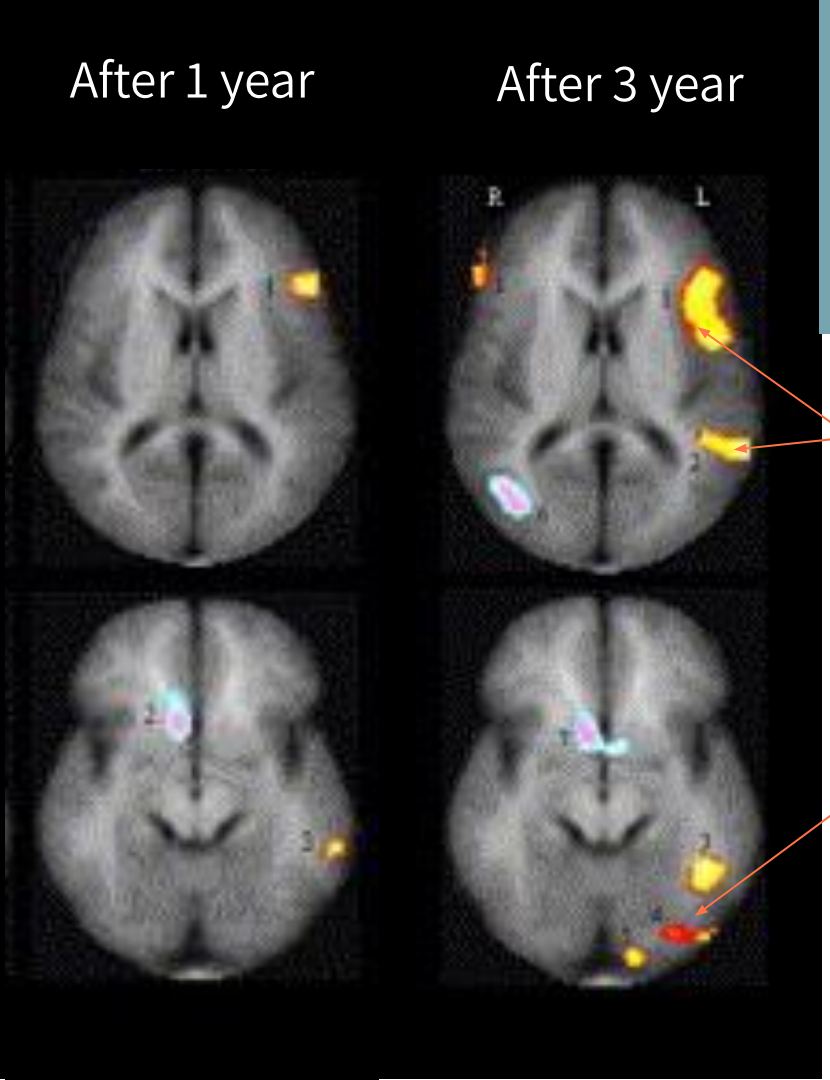


relevance for instruction and intervention

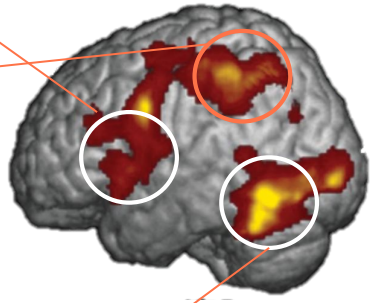


phonics-based reading instruction increases activity in key reading-related brain regions in struggling readers (treatment vs control group)

Odegard et al., 2008; Shaywitz et al., 2004



relevance for instruction and intervention



phonics-based reading instruction increases activity in key reading-related brain regions in struggling readers (treatment vs control group)

different patterns of activation in reading-related brain regions are associated with response to instruction (treatment responders vs non-responders)

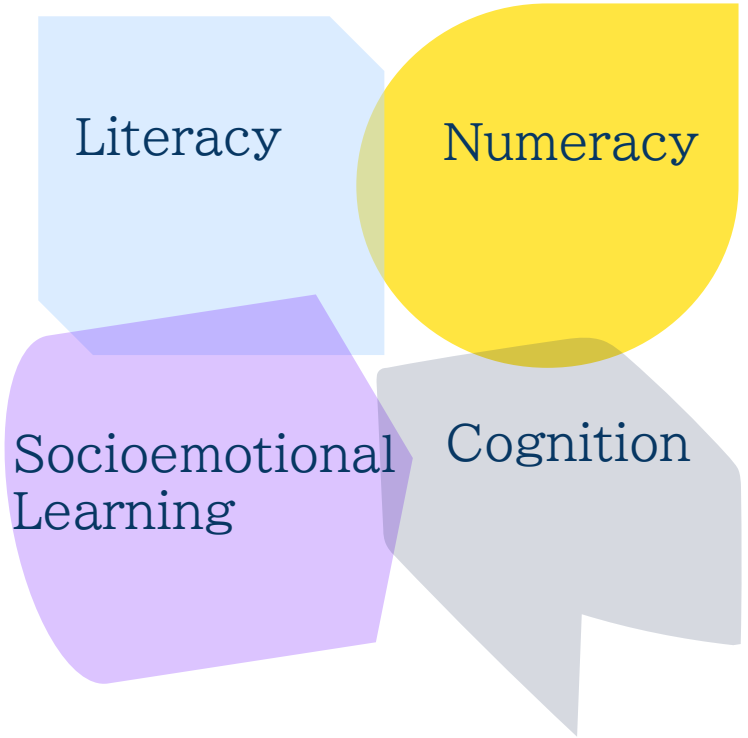
Odegard et al., 2008; Shaywitz et al., 2004

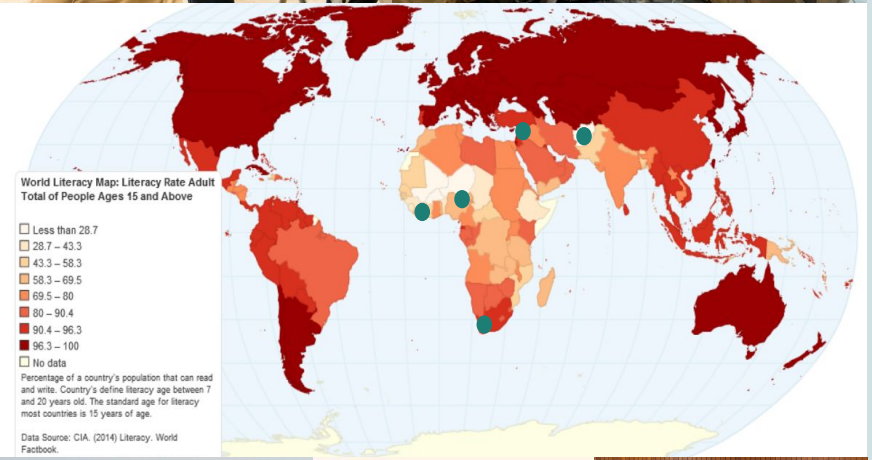
Children’s brains are unique and constantly changing

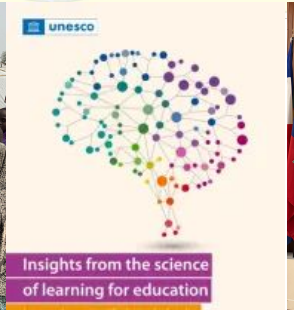
Each time a child practices a skill — such as recognizing letters, learning numbers, or solving problems — connections between neurons and brain regions become stronger

Learning is is supported by cognitive and socioemotional skills

Insights from educational neurosciences help us understand individual learners, what is working well in the classroom, and for whom







relevance for global education

How bilingual children learn to read?

How the neural circuitry for reading develops after educational disruptions associated with refugee displacement and migration?

How children learn to read in environments with high poverty-related risk of illiteracy?

How can we leverage educational neuroscience findings to design, evaluate, and scale education solutions and better inform education policy and practice?

building a bridge from research lab to classroom

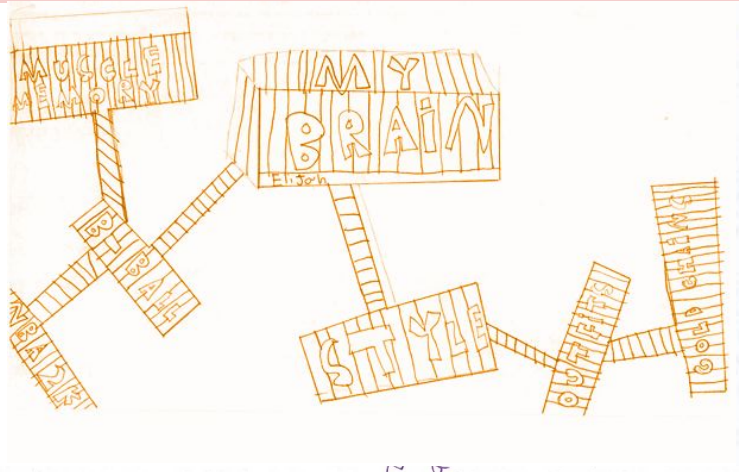
evidence-based education practice and policy

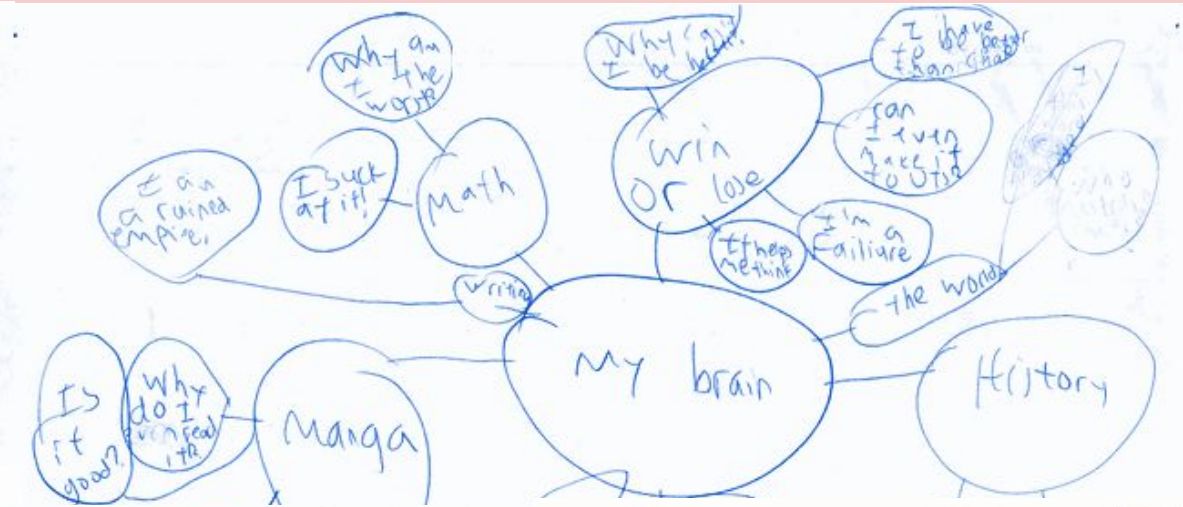
engaging teachers in shaping research agendas

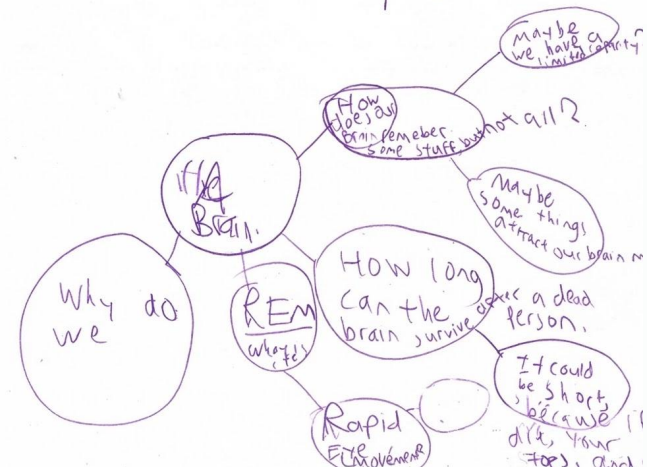
students as researchers who are keenly involved in understanding their learning

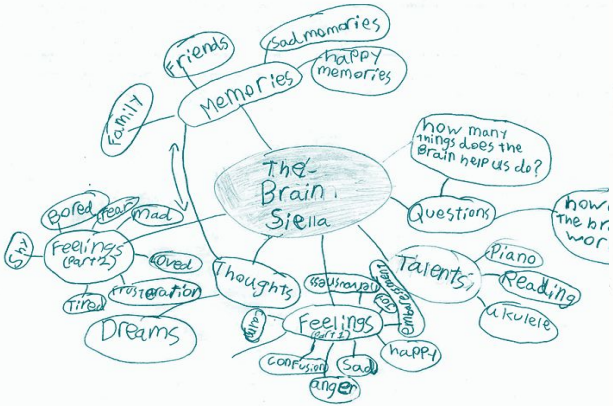
tri-directional exchange

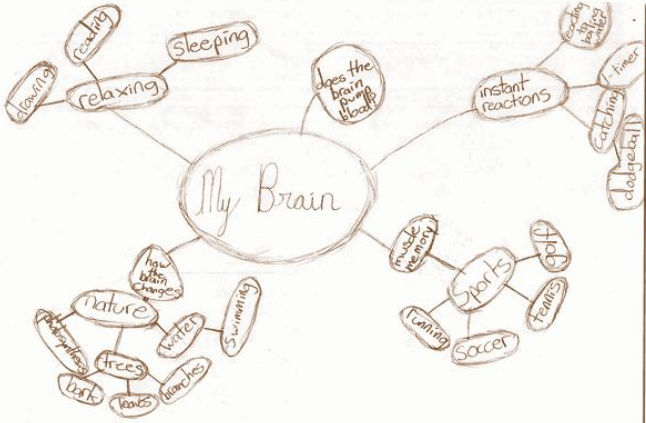
What have kids been curious about in class?







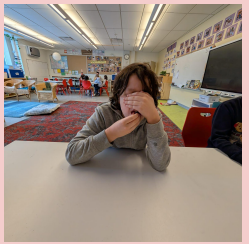




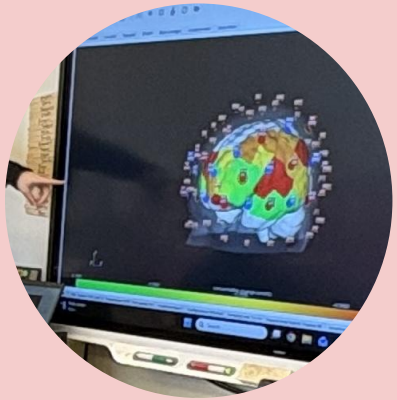
What have kids been exploring in class?

anatomical differences between species

the senses

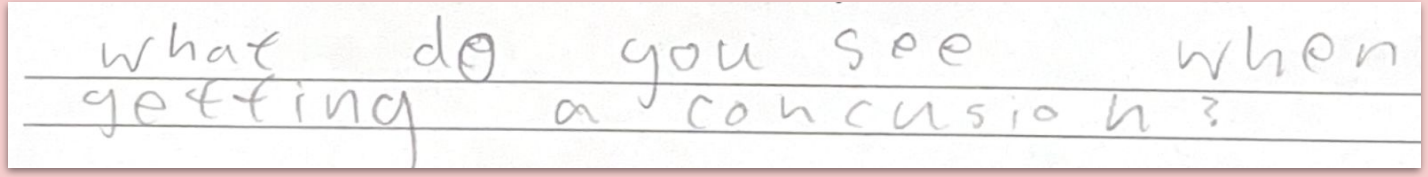


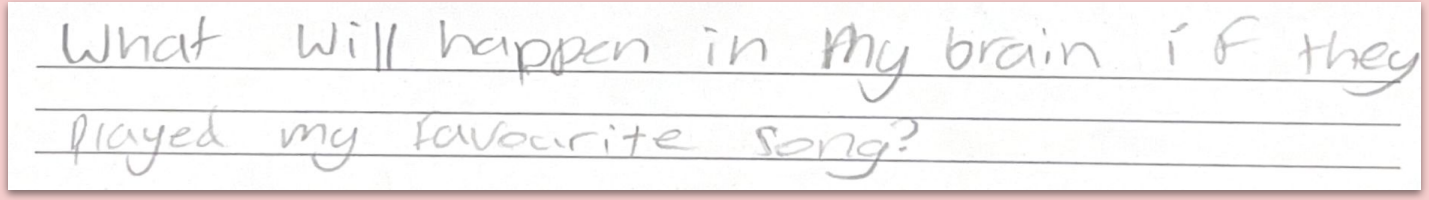
To answer their curiosities...

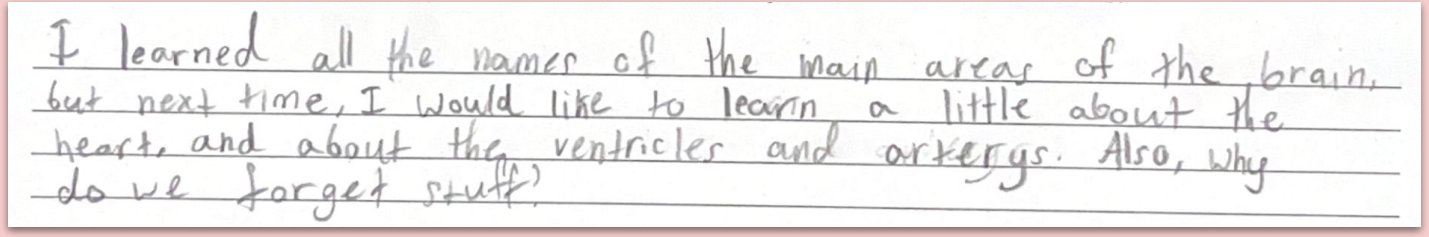


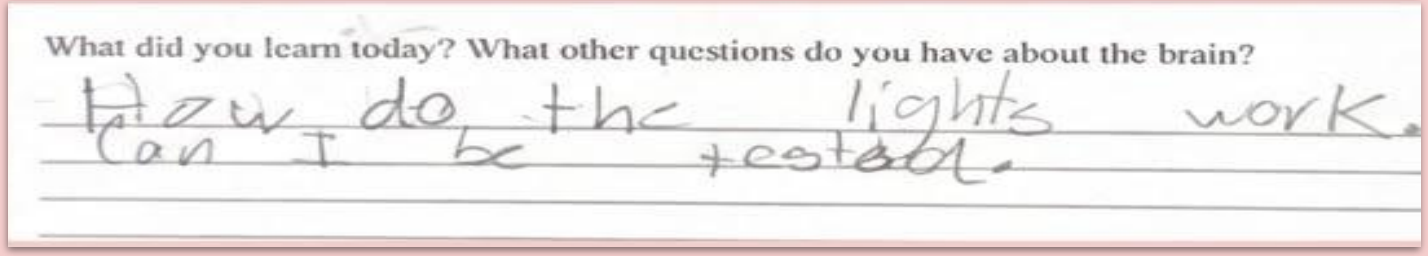

A glimpse into our identities...

Children had more questions after the lesson


what do you see when getting a concussion?


What will happen in my brain if they played my favourite song?


I learned all the names of the main areas of the brain, but next time, I would like to learn a little about the heart, and about the ventricles and arteries. Also, Why do we forget stuff?


What did you learn today? What other questions do you have about the brain?

How do the lights work. Can I be tested.

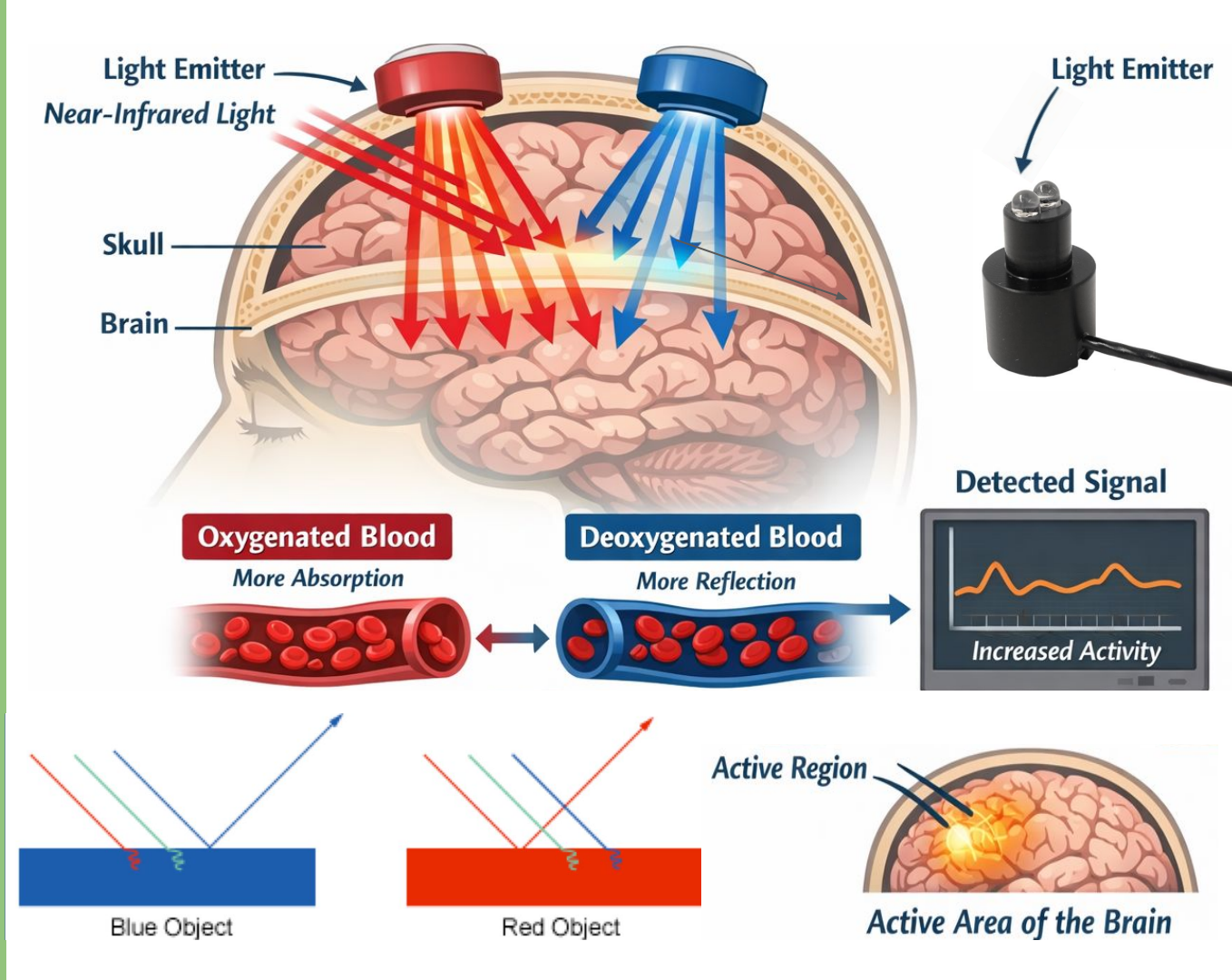
co-constructing lessons with teachers that respond to children's curiosity

Neuroimaging tools for studying the learning mind

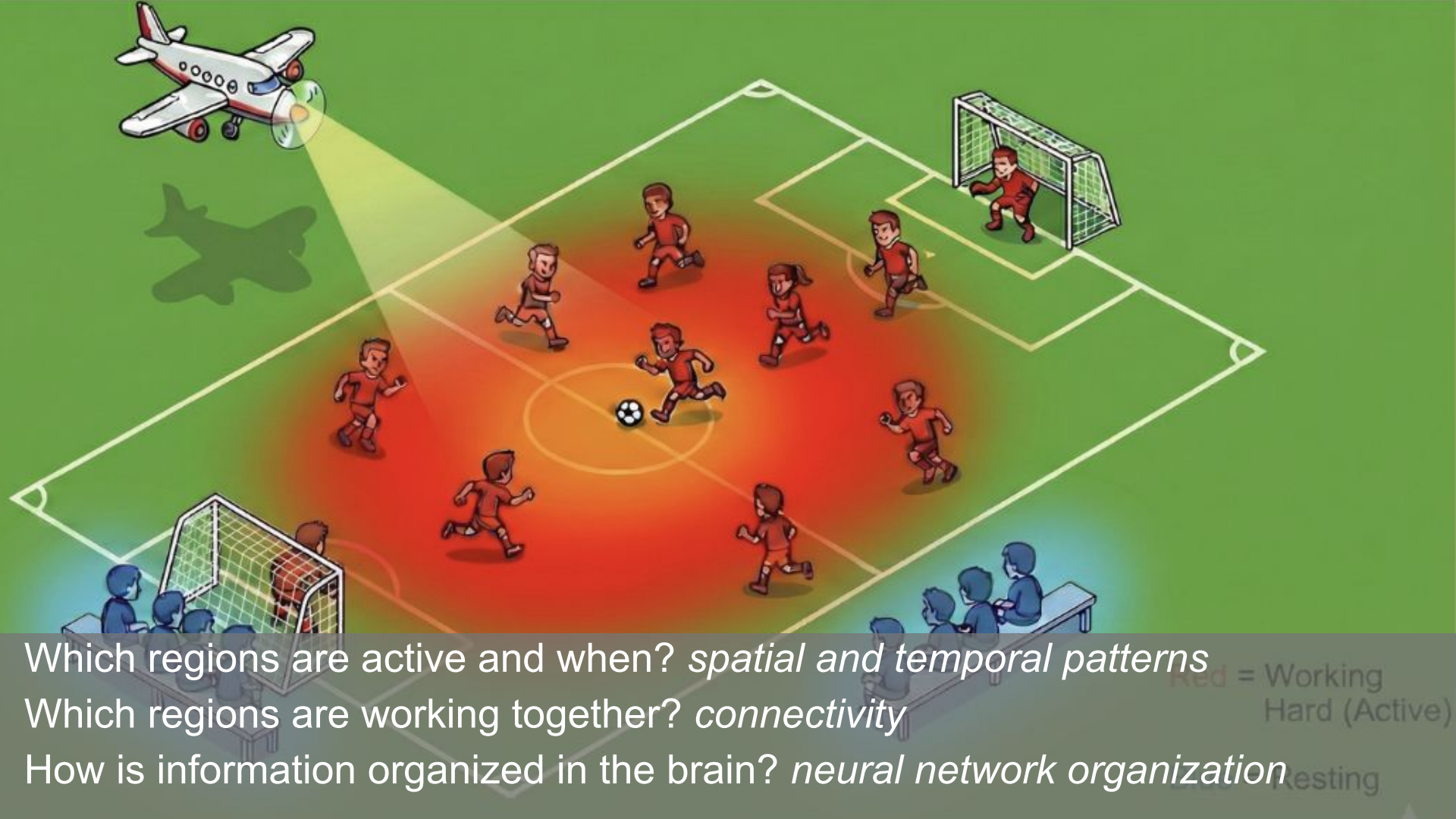
functional Near Infrared Spectroscopy (fNIRS)

science of

fNIRS



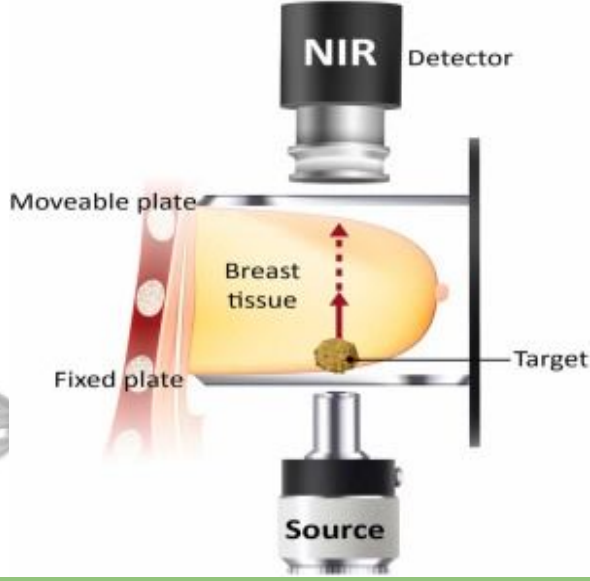

Red = Working Hard (Active)
Blue = Resting



Which regions are active and when? *spatial and temporal patterns*

Which regions are working together? *connectivity*

How is information organized in the brain? *neural network organization*



Real-world applications of NIRS

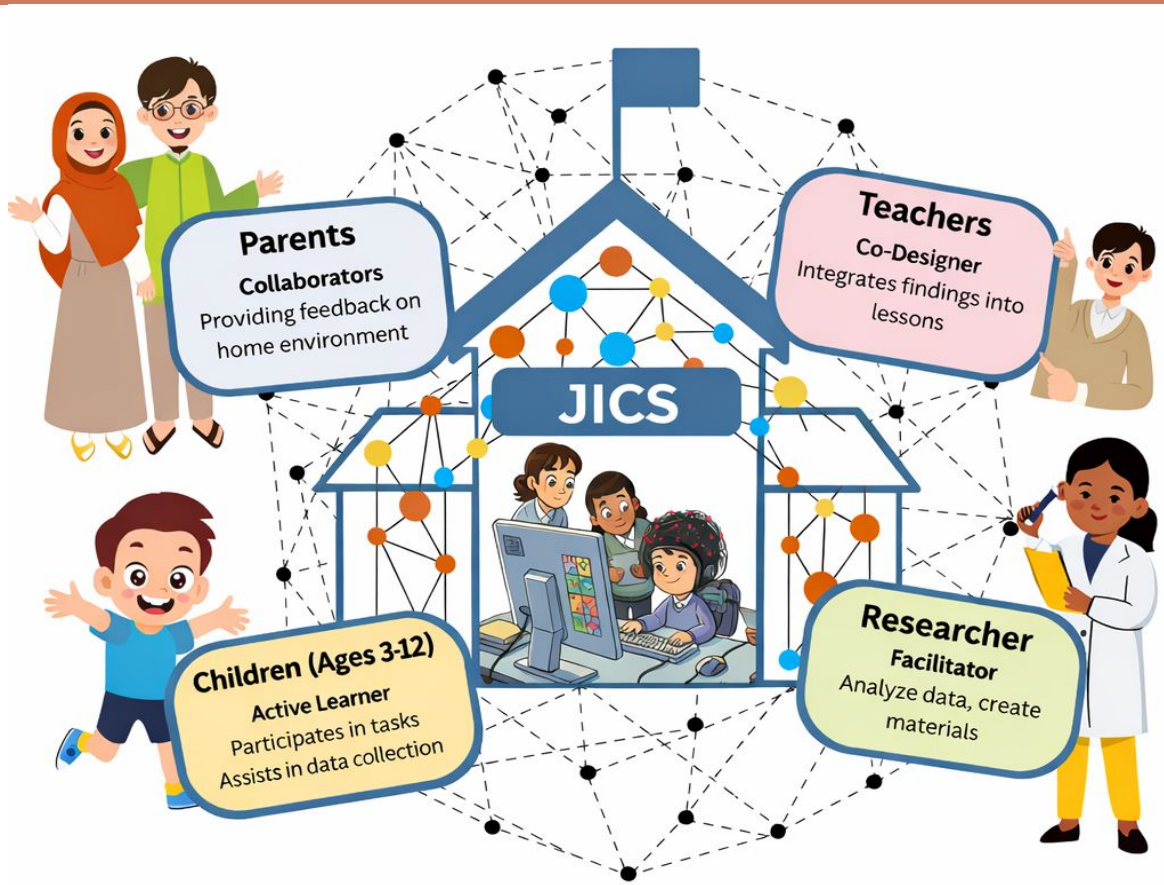
Blood oxygen saturation (pulse plethysmograph)

Neonatal oxygenation

Diagnosis and monitoring of breast cancers

demonstration of fNIRS technology

JICS Research on Child Development and Learning



BRIDGE Study Building Research on Inquiry, Development, and Growth in Education

connect development with learning and teaching

Nursery

Grade 6

understand how children develop and learn

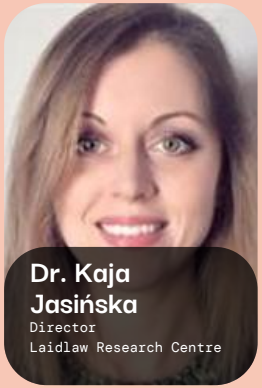
socioemotional & neurocognitive foundations of learning

bridge science of learning with science of teaching

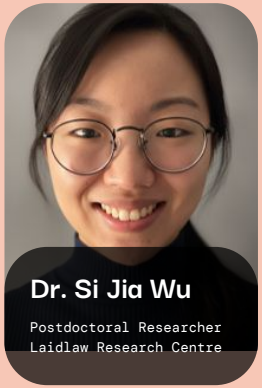
engage children in research

Research Team

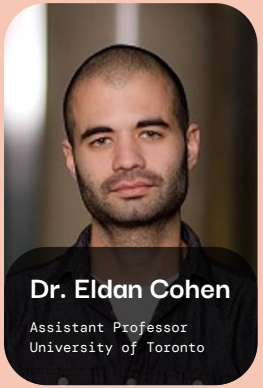
Dr. Jenny Jenkins
Director
Dr. Eric Jackman Institute of Child Study



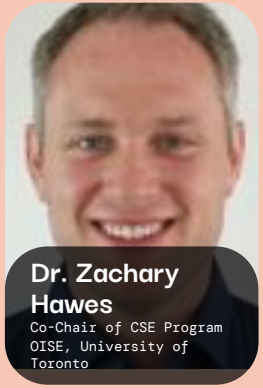
Dr. Kaja Jasińska
Director
Laidlaw Research Centre



Dr. Si Jia Wu
Postdoctoral Researcher
Laidlaw Research Centre

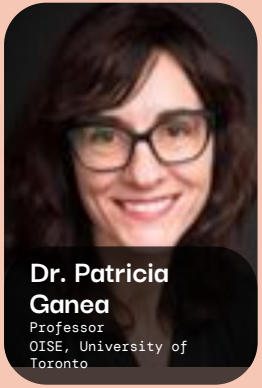


Dr. Eldan Cohen
Assistant Professor
University of Toronto

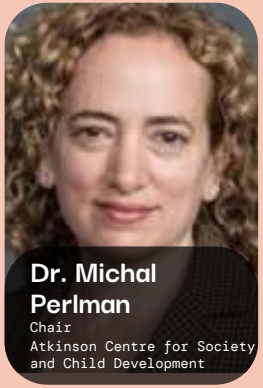


Dr. Zachary Hawes
Co-Chair of CSE Program
OISE, University of Toronto

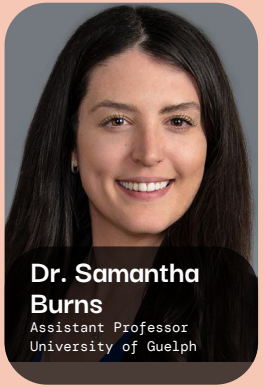
Dr. Julie Comay
Co-Chair of CSE Program
OISE, University of Toronto



Dr. Patricia Ganea
Professor
OISE, University of Toronto

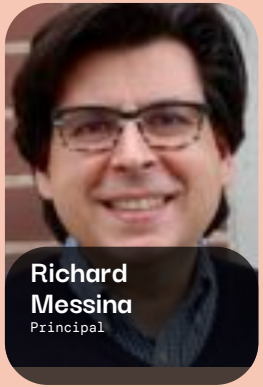


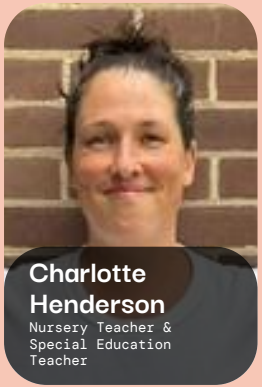
Dr. Michal Perlman
Chair
Atkinson Centre for Society and Child Development

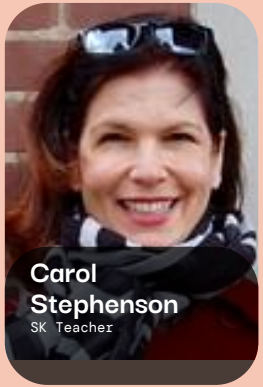


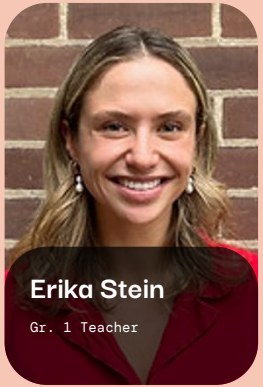
Dr. Samantha Burns
Assistant Professor
University of Guelph

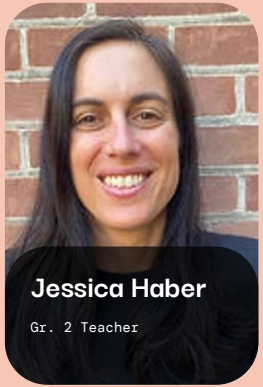
Education Team

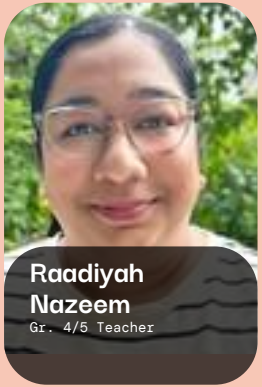


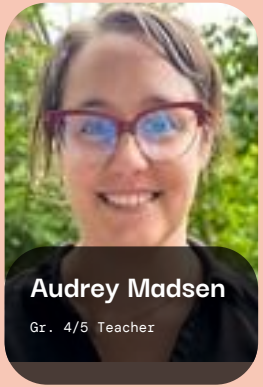












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