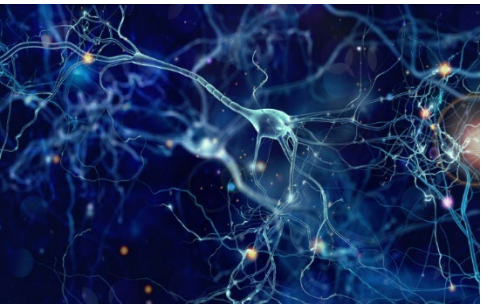
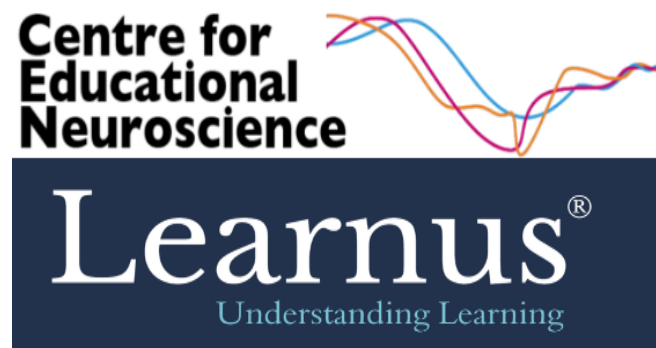
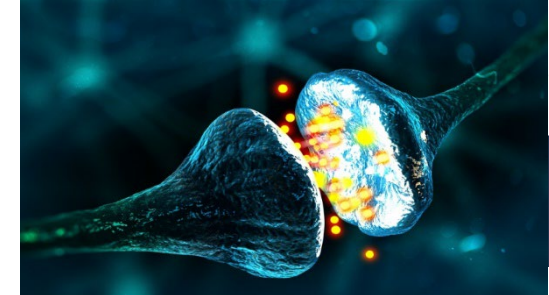
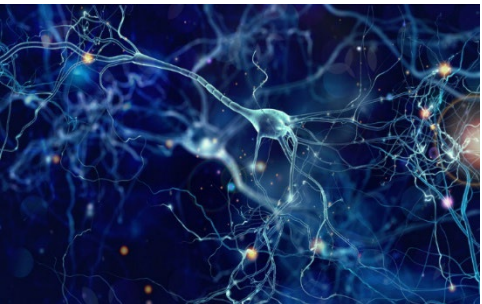


Educational Neuroscience in Practice Insights for Teachers



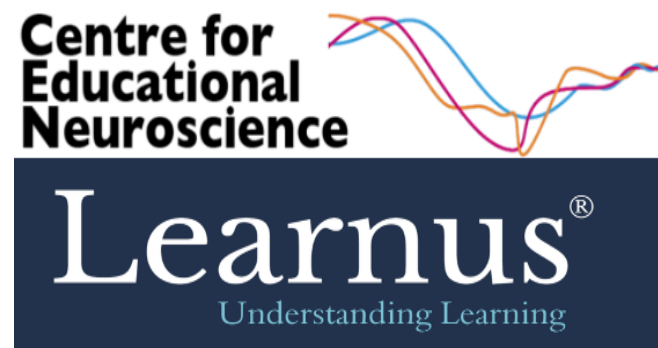
Welcome from Richard Newton-Chance

- Professor Jo Van Herwegen: Current developments in educational neuroscience
- Dr Rebecca Gordon: Informing teaching practice
- Dr Rosanne Esposito: Inclusive practice
- Jeremy Dudman-Jones: The classroom



Current developments in educational neuroscience

Professor Jo Van Herwegen



Current challenges in education

Put in the chat

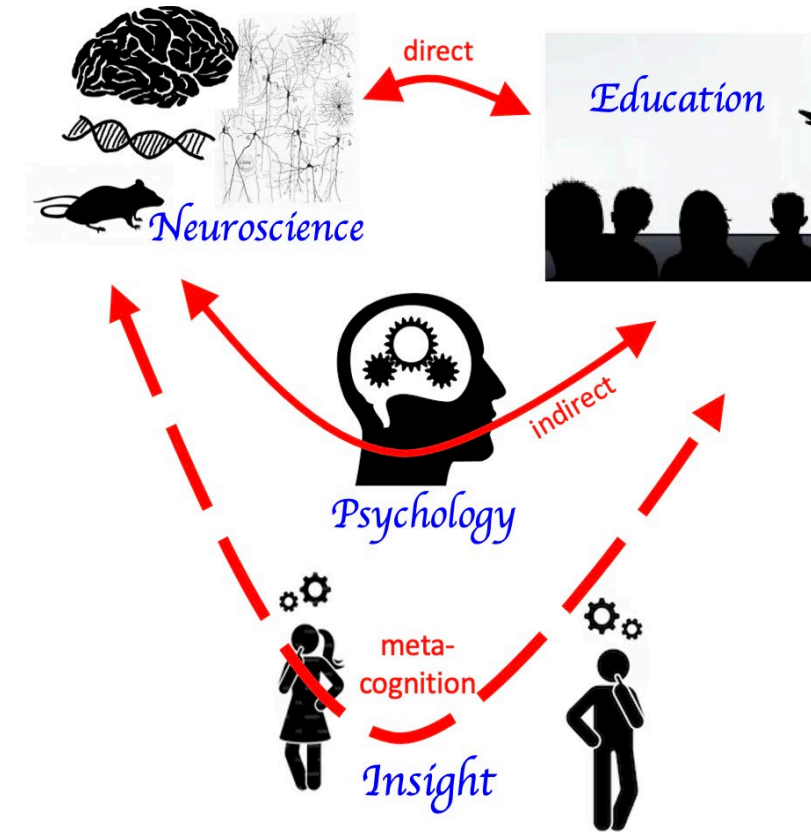
- Growing number of students with Special Educational Need and Disabilities (SEND)
- Large number of 16-24 years olds who are NEET
- Teacher recruitment, retention and career progression (for early years)
- Impact of AI on education
- Persistent absence and disengagement
- Children's mental health and wellbeing

DfE priorities

- SEND reforms
- Early Years: best start in life
- Curriculum review: new vocational pathways
- Recruit more teachers
- Tackle NEET
- Mental health in schools
- AI and education

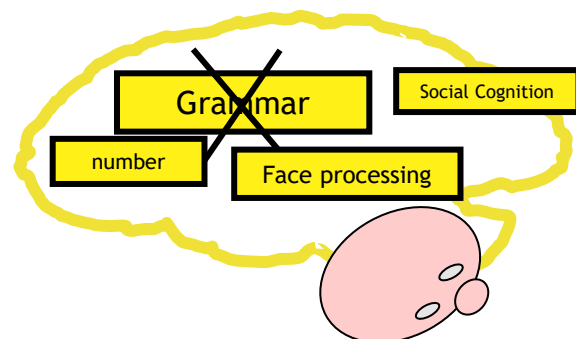
Educational Neuroscience

A transdisciplinary field that brings expertise from education, developmental psychology and cognitive neuroscience to understand better *how* learning occurs in the brain, so we can help in designing better learning environments throughout the lifespan

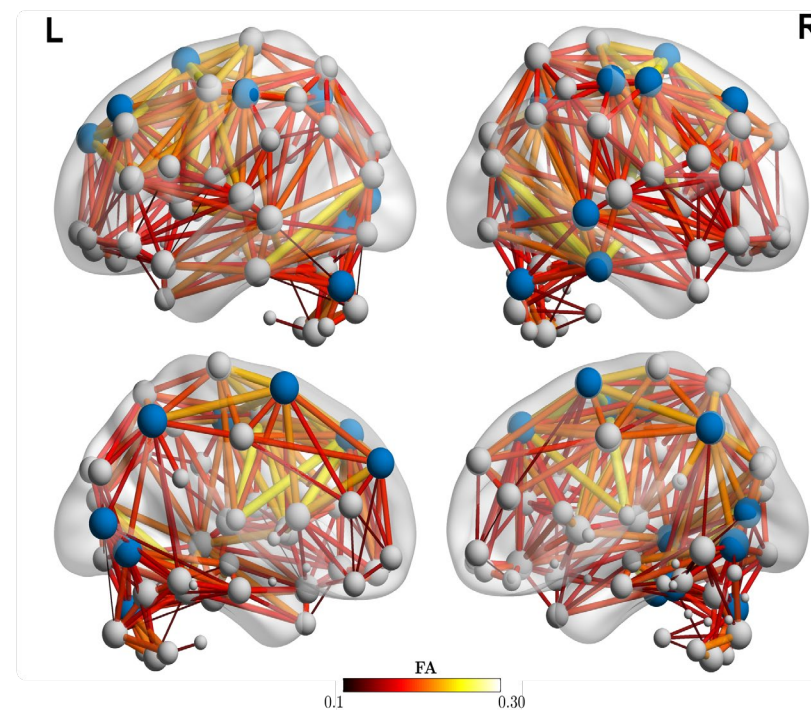
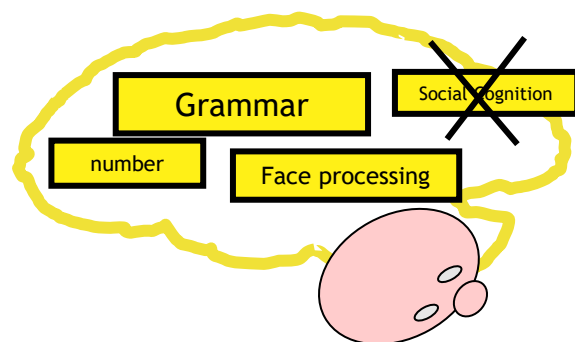


Example: SEND

Developmental Language Disorder



Autism



Siugzdaite and colleagues (2020)

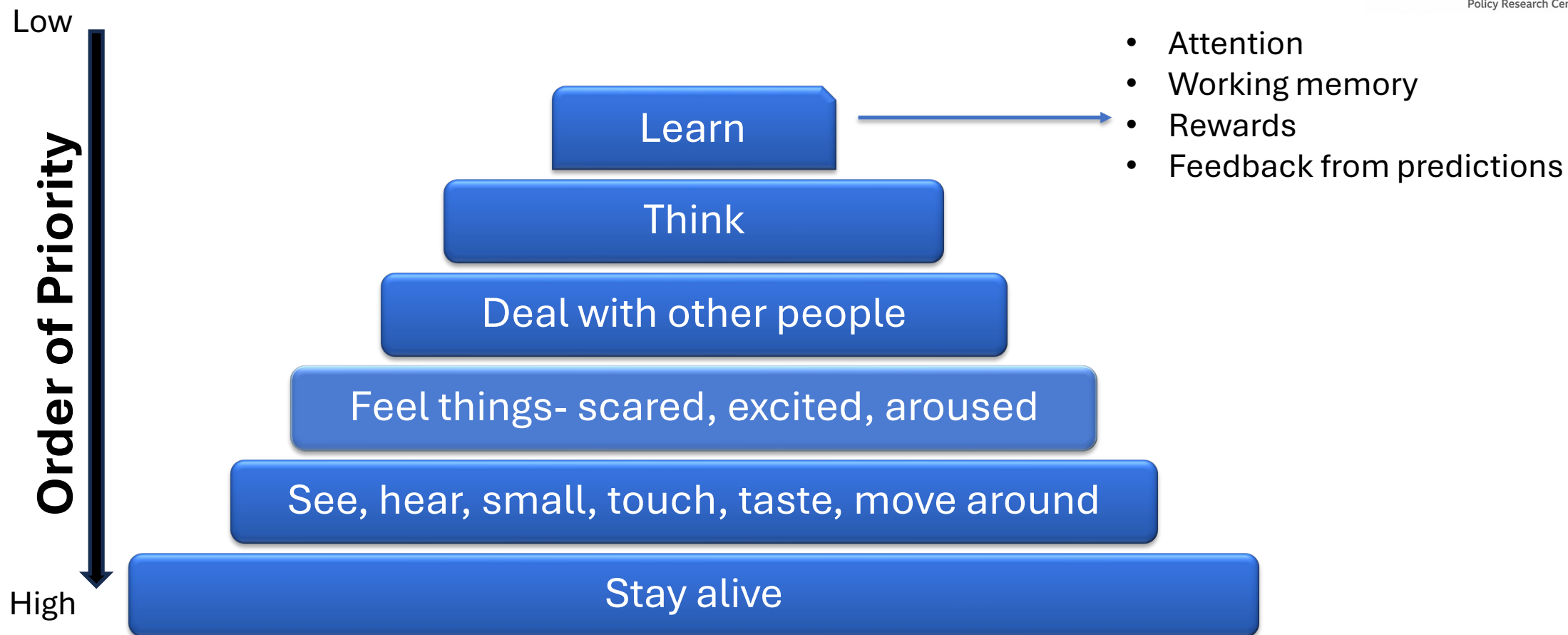
Example: SEND

- MetaSENse
- 467 studies of what works for students with SEND to improve academic outcomes
- 5 months of progress
- Evidence gap
- Explicit teaching
- Feedback
- Not rewards

No specific SEND pedagogy required:
good universal provision with
adaptions and further support

Other barriers to learning in SEND

Priorities for the brain



Other barriers to learning in SEND

- Sensory input: being able to detect, interpret and respond to the environment
- Emotions: calm classrooms
- Social interactions: your peers
- Attention and distraction
- Sleep: consolidation
- Motivation and reward systems



Example: Early Years

Policy

- Best start in life
- 75% children school-ready by 2028, focus on early communication, social skills, healthy development

Educational Neuroscience

- Young brains work differently
- important to construct rich learning environments and social interactions
- Development of behavioural and emotional regulation are supported by adult scaffolding

Example: AI

Policy

- AI identified as a transformative, "defining technology" essential for modernising education, reducing teacher workload, and preparing students for a future workplace shaped by digital advancements
- Push to develop AI tutors that, e.g., may support inclusivity in addressing special needs

Educational Neuroscience

- Generative AI that behaves as an assistant encourages cognitive offloading and undermines learning – need ‘Socratic’ version that scaffolds learning
- Children interact with chatbots as if they are social agents, creating risks around attachment, misplaced trust in content – guidelines for age-appropriate usage

Educational Neuroscience

- **Presentation of information**

- Construction of more complex ideas from simpler ideas, multimodal content, content that has clear sensory properties highlighting salient features, build on prior knowledge, links to existing knowledge, use of analogies, appropriate level of challenge, chunking, use of novelty, content that is relevant and meaningful to students' lives, use of movement, space and manipulatives

- **Regimes of learning**

- Interleaved content, repetition and spaced learning, detailed positive feedback, manipulating and producing learned content (retrieval practice), collaborative learning, sleep

- **Social context**

- Positive, collaborative, sense of belonging, trust in teacher, peer learning (not distraction), minimising social aggression

- **Emotional context**

- Challenge not stress or threat, curiosity not anxiety, personal relevance, balance of intrinsic and extrinsic reward

- **Physical environment**

- To support attention, to support peer learning, to support wellbeing (light, nature), allowing movement

- **Development**

- **Early-years** scaffolding of executive functions, enriching interactions, supporting emotional security and building social relationships; **childhood** building of core skills and knowledge, emotion regulation and social skills; **adolescent** changes in peer influence, motivations, risk taking, enhanced executive skills, vulnerability to mental health conditions; **adulthood** need greater practice for automaticity, strategic use of prior knowledge, busy lives

- **Metacognition**

- Strategies, application of knowledge and skills to new situations, organisation and planning, self-reward and motivation, embracing learning from errors, cognitive control

- **Holistic approach**

- Sufficient sleep, diet to support learning, physical fitness, exercise to support arousal and attention, balanced screen use, non-academic activities (enrichment)

- **Dimensions of variation**

- Dimensions over which cognition varies (SEND conditions), how inclusive environments can support learning, which interventions are effective

Centre for Educational Neuroscience

How learning organises and reorganises the brain, and how this can be translated to the classroom

Since 2008

Centre between UCL and Birkbeck College (and many affiliates): 35 academics and 12 PhD students

What we offer



CEN school network



Seminar series



ENCORE conference
day



Books



**YouTube video
library**



Core Research Programme

Strand1
SEND

Strand 2
Early Years

Strand 3
AI
&
Education

Strand 4
Genetics
&
Education

Strand 5 Workforce Development

Strand 6
Responsive mode research

Capacity building

Co-produced with Department for Education

So why now?

- As policy moves faster and spends more, the risk of it moving on the wrong evidence (or none) rises too, which is exactly the gap Educational Neuroscience—evidence to policy to classroom — is built to close.

ENPRC Research Strands

Six strands translating educational neuroscience into policy across the child's life course

1 SEND

FOCUS Rapid evidence reviews across five developmental areas to identify what SEND interventions work, and why. Using Ed Neuro to fill evidence gaps

RESEARCH QUESTION Which SEND interventions and support work, for whom, and at what ages or educational phases?

2 Early Years

FOCUS How home and early years settings shape brain, cognitive development and wellbeing from infancy to preschool.

RESEARCH QUESTION What modifiable, scalable features of early environments help every child thrive, including those who beat the odds?

3 AI & Education

FOCUS The neural, cognitive and public impact of AI-enhanced technologies on learners.

RESEARCH QUESTION How can AI technologies be used effectively while protecting learners' health and wellbeing?

4 Genetics & Education

FOCUS Using genetic data responsibly to understand and target support for learning and communication needs.

RESEARCH QUESTION Can genetic data help identify needs earlier and more accurately, and how should the ethical risks be navigated?

5 Workforce Development

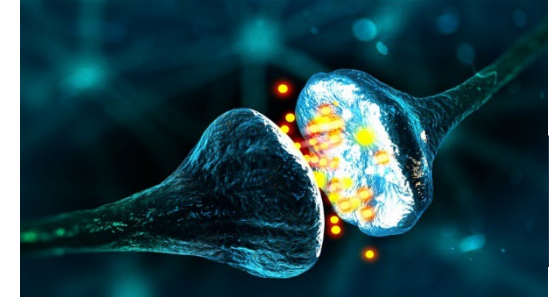
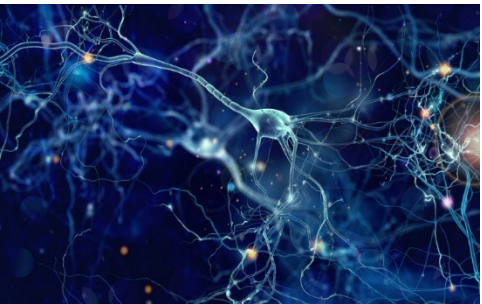
FOCUS Mapping and building the education workforce's knowledge of educational neuroscience.

RESEARCH QUESTION What are the priority evidence needs, and how can they be translated into training and practice?

6 Responsive-Mode Research

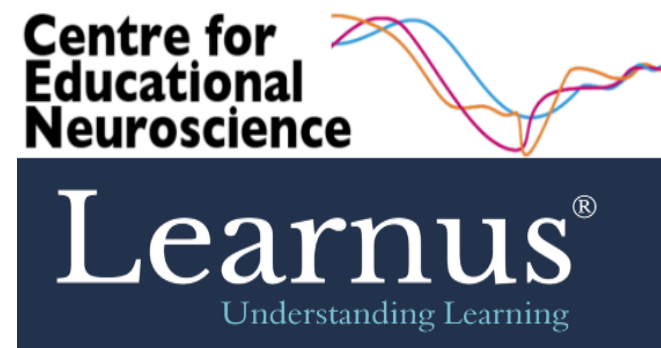
FOCUS Rapid, policy-relevant evidence and briefings responding to emerging DfE priorities.

RESEARCH QUESTION What does the evidence say on emerging policy questions, and what should government do next?

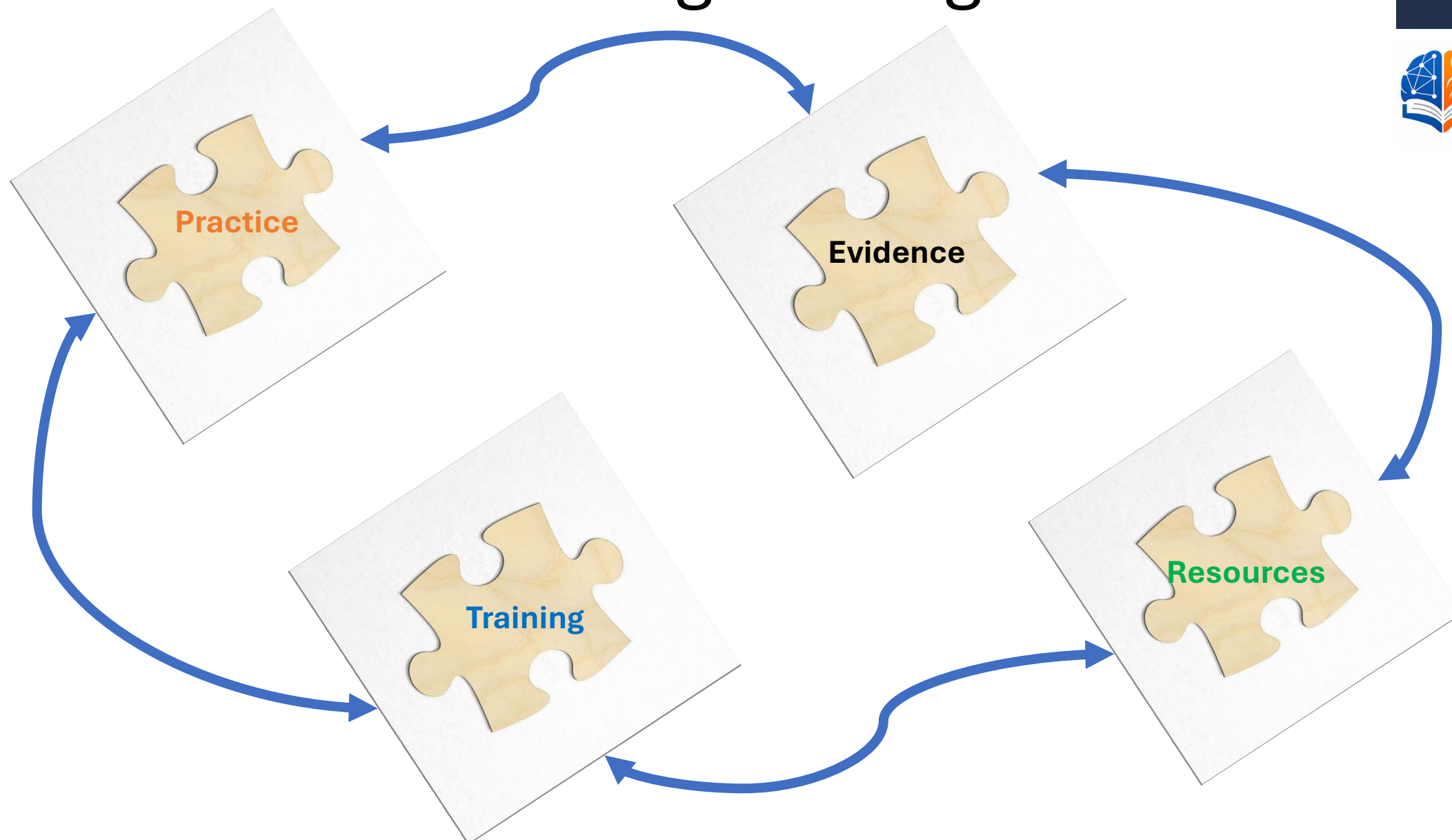


Educational Neuroscience Informing Teaching Practice

Dr Rebecca Gordon



Putting it all together



Evidence to Practice

What are we doing?

- Teacher Perspectives on Educational Neuroscience (TPEN)
- Targeted provision (IMPACT for All)
- Resources for Teaching (EQUIP)
- Workforce Development (ENPRC)

Teacher Perspectives

Teacher Perspectives on Educational Neuroscience (TPEN)

My collaborators



Professor
Chloe Marshall
UCL



Professor Jo
Van Herwegen



Professor Emily
Farran
University of
Surrey



Professor
Michael
Thomas
Birkbeck
University of
London

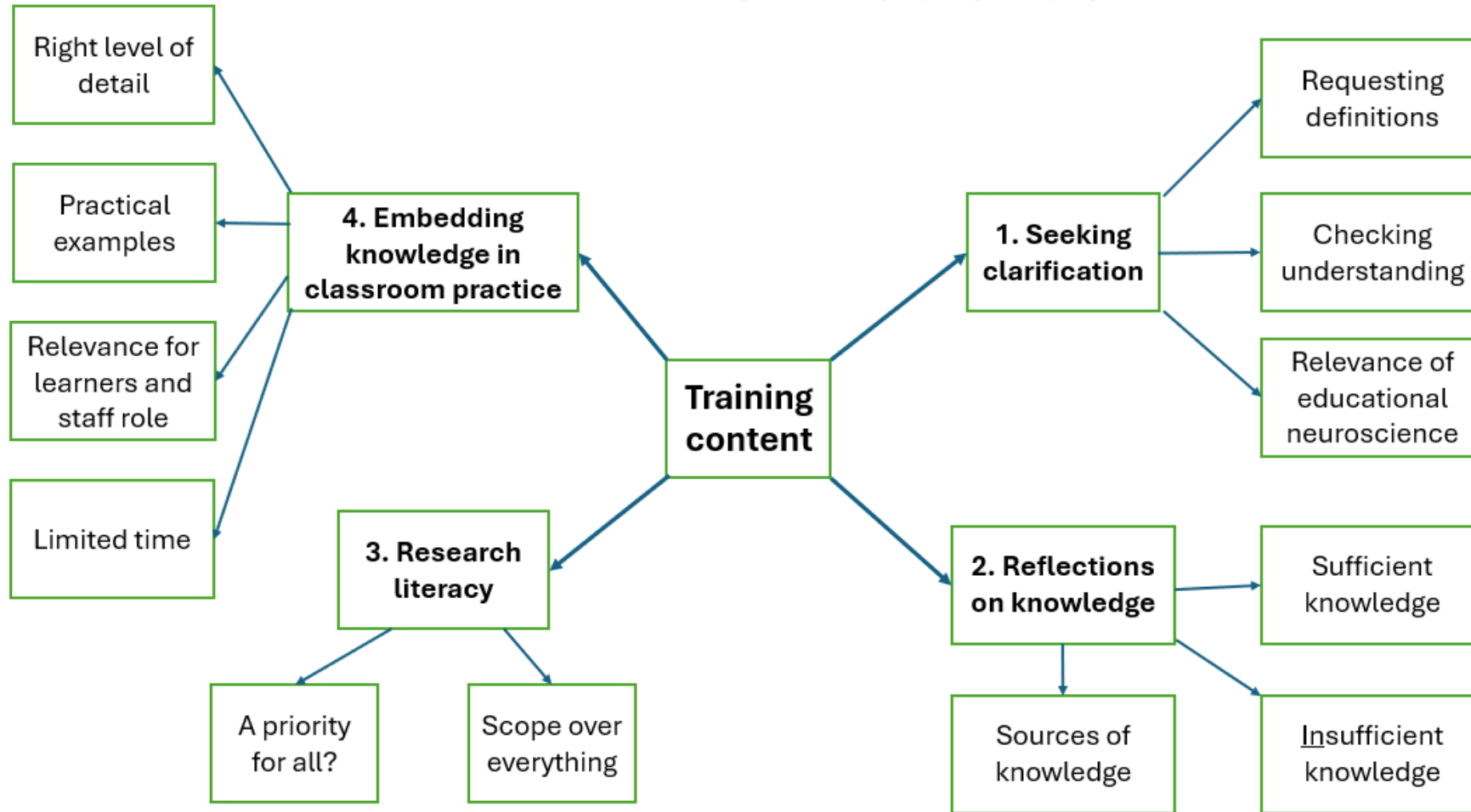


Dr Liory Fern-
Pollak
UCL

Priority Topics

Number of times selected	Topics
3	Critical/sensitive periods, Executive function, Metacognition, Neuroplasticity, Self-regulation
2	Attention, Anxiety, Long-term memory, Neuroanatomy, Neurodivergence, Neurodiversity, Mental health, Working memory, Self-confidence, Special educational needs and disabilities
1	Bullying, Fine motor skills, Gross motor skills, Hydration, Motivation, Multimodal teaching, Nutrition, Peer relationships, Research Literacy, Reward, Sleep, Spatial reasoning, Strategy use
0	Green space, Home learning environment, Literacy learning, Numeracy learning, School attendance, Science concepts, Socio-emotional abilities

Teacher Perspectives on Educational Neuroscience



Teacher Perspectives on Educational Neuroscience

there are some things that maybe we think we know it because we say it or we kind of know it, but actually do we really know it? (motor skills)

Well, we know that. That was kind of part and parcel of our training (literacy and numeracy)

We want to know that it's based on something true, not just fads' (Nutrition)

*Some of the stuff you're reading, it's just either so wrong, so inaccurate, so opinion-based... I sometimes find myself reading thinking, I can't believe you're saying this and you've got 50,000 followers **Research Literacy***

There's no way I've got time to learn all of this stuff, so I've got to prioritise (EN in practice)

Neurodiversity is...those things that are just below it, like Attention, Working Memory. Executive Function... Those are the things that are actually what Neurodiversity is about. Self-regulation as well. Training about those things, I think, leads to an understanding of Neurodiversity.' (Priorities)

Teacher Perspectives on Educational Neuroscience

TPEN Key findings:

- Teachers want to understand how children learn
- View educational neuroscience as relevant to improving teaching
- Priority given to understanding the mechanisms of learning rather than curriculum content
 - For example, executive Function is a prioritised topic
- Understanding these learning processes is important for inclusive practice

In-practice Training

TPEN Key findings:

- Practical, classroom-relevant, collaborative, and interactive CPD
- Support for implementation of this knowledge
- Application of the mechanisms of learning.

*When I come out of training, you just have to have something to take away. So it needs to be relevant to the children you have worked with, you are working with, or you're going to work with, just that. But then practical examples of, so for example, if you were doing some work on Metacognition, "This is how that's going to help in this particular, to help you in this subject" **(Training)***

Targeted Provision

- **I**dentifying
 - **M**eaningful
 - **P**actices for
 - **A**dvancing
 - **C**lassroom
 - **T**eaching
- IMPACT for All

Collaborators



Dr Rosanne Esposito
UCL



Professor Julie
Dockrell
UCL

Targeted Provision

IMPACT for All aims:

Mapping from teaching practice to the evidence

Work with teachers and SENCOs to identify:

- Existing classroom practices perceived as effective for supporting diverse learners
 - Tier 1 (Universal provision)
 - Tier 2 (Targeted provision)
- Constraints that influence implementation
 - (e.g. workload, curriculum, school structures)

Targeted Provision

IMPACT for All aims:

- Identify what is practicable
- Map against the evidence
- Consider the constraints
- Can the active ingredients in Tier 2 provision be feasibly embedded in everyday teaching?

Targeted Provision

IMPACT for All aims:

Work with practitioners to co-design:

- prototype, curriculum-aligned universal resource (e.g. maths or reading)
- clear guidance on implementation and adaptation
- observation and monitoring framework to support SENCOs in QA
- CPD for teachers to implement, monitor, and evaluate
- Ultimate aim: Build capacity!

Resources for Teaching

Every child: Quality Universal and Inclusive Practice (EQUIP)

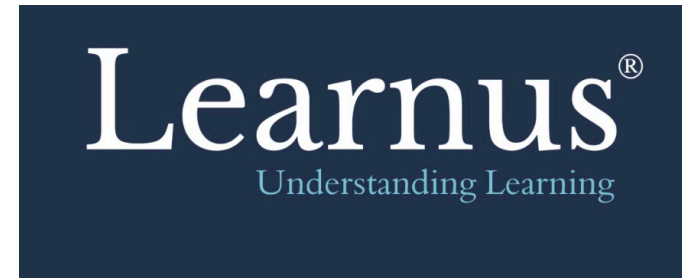
Collaborators



Dr Rosanne Esposito
UCL



Dr Gareth Bates
Anglia Ruskin
University



Caroline Shott
Founder and CEO of
Learning Skills Research
Foundation

Resources for Teaching

EQUIP aims:

Mapping from teaching resources to the evidence

Rapid evidence review of:

- practitioner-facing guidance
- toolkits
- interventions
- professional learning resources relevant to inclusive education

Resources for Teaching

EQUIP aims:

- Audit the evidence base underpinning existing resources
- Assess practicability, accessibility, affordability and implementation readiness
- Work with practitioners and Learnus to co-design an evaluation framework
- Provide to schools to use when selecting inclusive education resources
- Develop and pilot a prototype online resource hub aligned with practitioner needs

Workforce Development

ENPRC: Our mission

- Co-Leads:



Professor Paul Howard-Jones
University of Bristol



Professor Emily Farran
University of Surrey

- To identify workforce priority needs
- and review professional frameworks (e.g. ITTECF, NPQ, SCITT) to...
- ...augment, inform and transforms practitioners' current knowledge and skills

Workforce Development

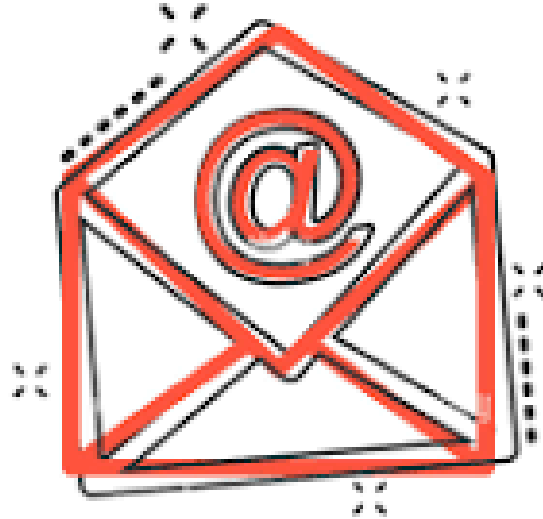
ENPRC: Our mission

- And in doing so, directly address DfE's Areas of Research Interest:
 - “What new or additional knowledge and skills do our workforces need?”
 - “Equipping our workforces to support children with SEND”
 - “Help bridge the research–practice gap, leading to...
 - ...real, sustained improvements in educational practice.”

Putting it all together



Interested in being involved?



Email me: rebecca.gordon@ucl.ac.uk

Policy shift

Policy shift to children's broader development, wellbeing, inclusion, participation and engagement.

Increased importance and relevance of educational neuroscience in understanding how children *learn* and *thrive*.

Areas of development

Shift away from labelling and diagnostic categories to areas of development:

- Executive function
- Motor and physical
- Sensory
- Speech, language and Communication
- Social and emotional

Early identification of need

Move towards focus on areas of development designed to support early identification of need.

Educational neuroscience can provide insights and support for educators into:

- how barriers to learning may present in the classroom
- evidence-based high-quality teaching approaches to inform early intervention to address identified need.

Supporting inclusive practice

DfE workforce development to enhance inclusive practice:

- Investment in training and professional development to increase staff confidence and expertise in meeting diverse learning needs.
- New SEND and inclusion training programmes support teachers and teaching assistants to deliver high-quality inclusive teaching and create supportive learning environments.

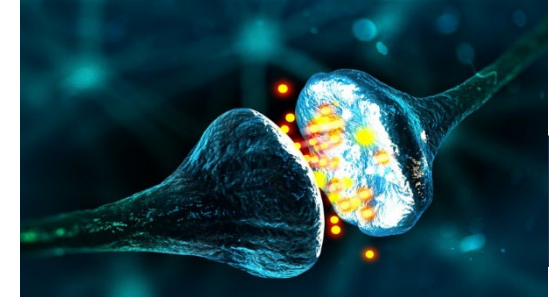
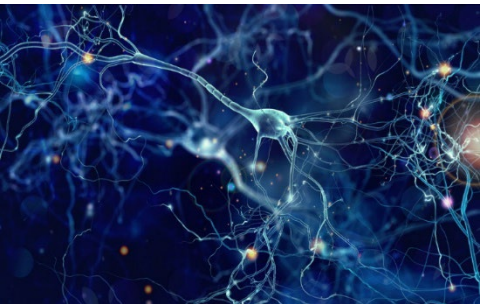
Supporting inclusive practice

The role of the Centre for Educational Neuroscience and Learnus:

- to support teachers by complementing DfE portfolio of professional development programmes
- to support by drawing on findings from MetaSENse, TPEN, EQUIP and Impact for All.

Evidence informed support

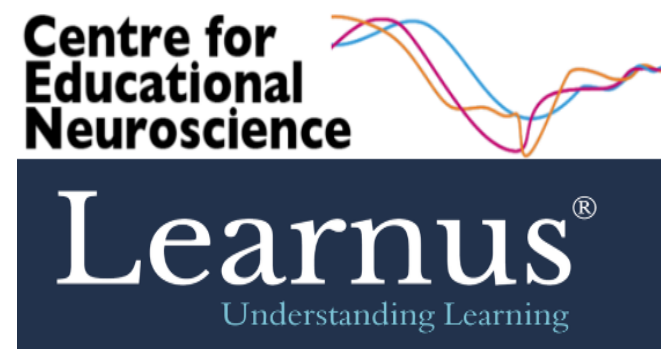
- Research from the Centre for Educational Neuroscience
- Knowledge exchange programmes co-produced with teachers
- In-depth understanding of how children learn, which approaches support children with barriers to learning
- In-depth understanding of what teachers need to embed inclusive practices in the classroom



Educational Neuroscience

The Classroom

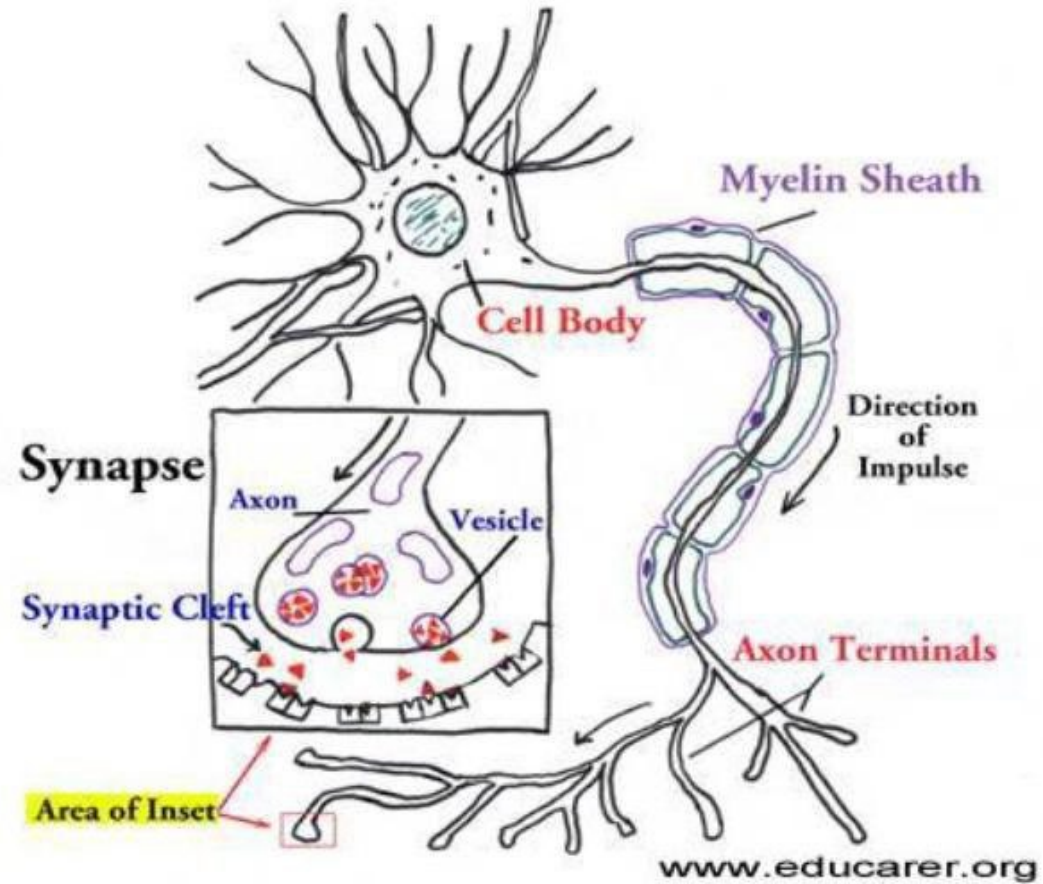
Jeremy Dudman-Jones

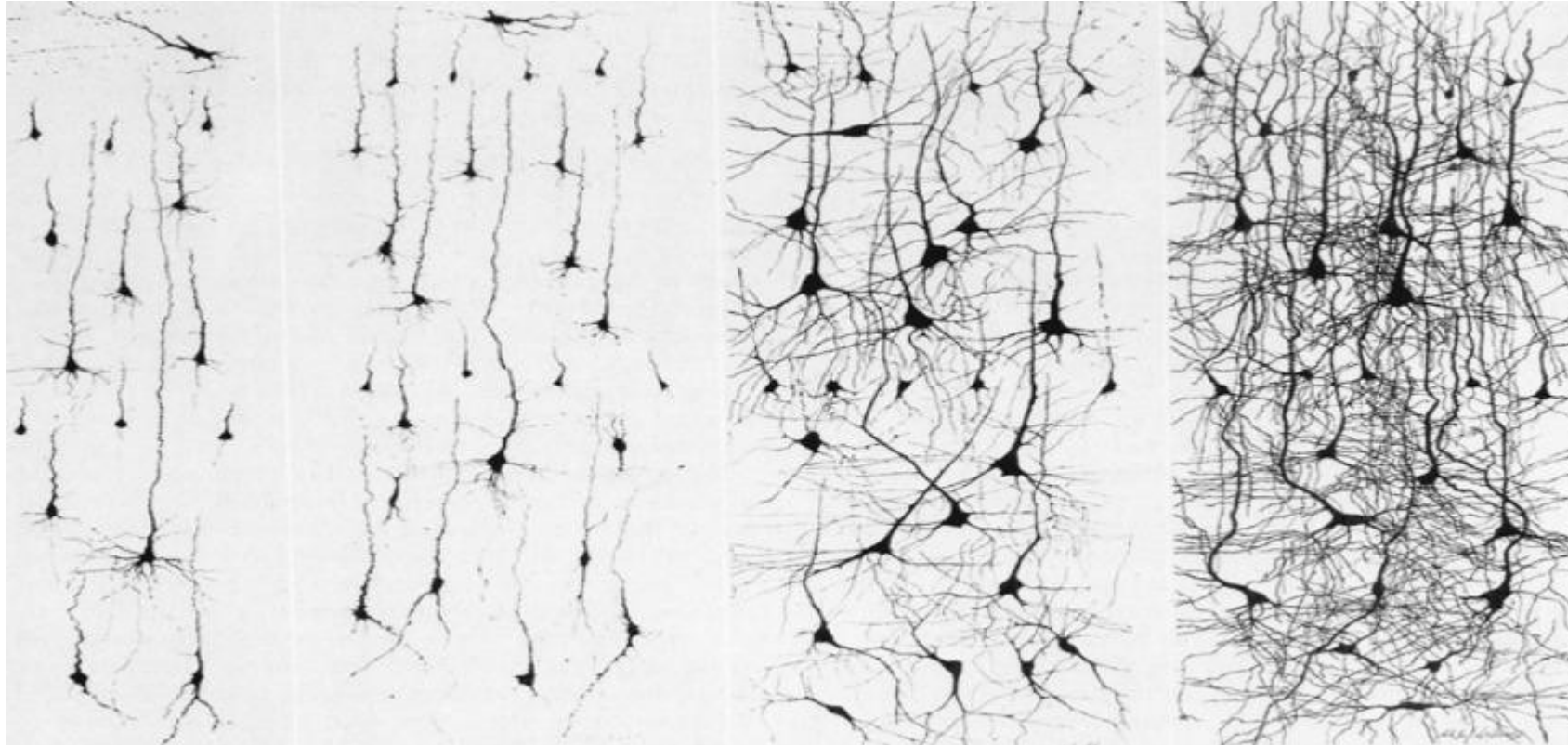


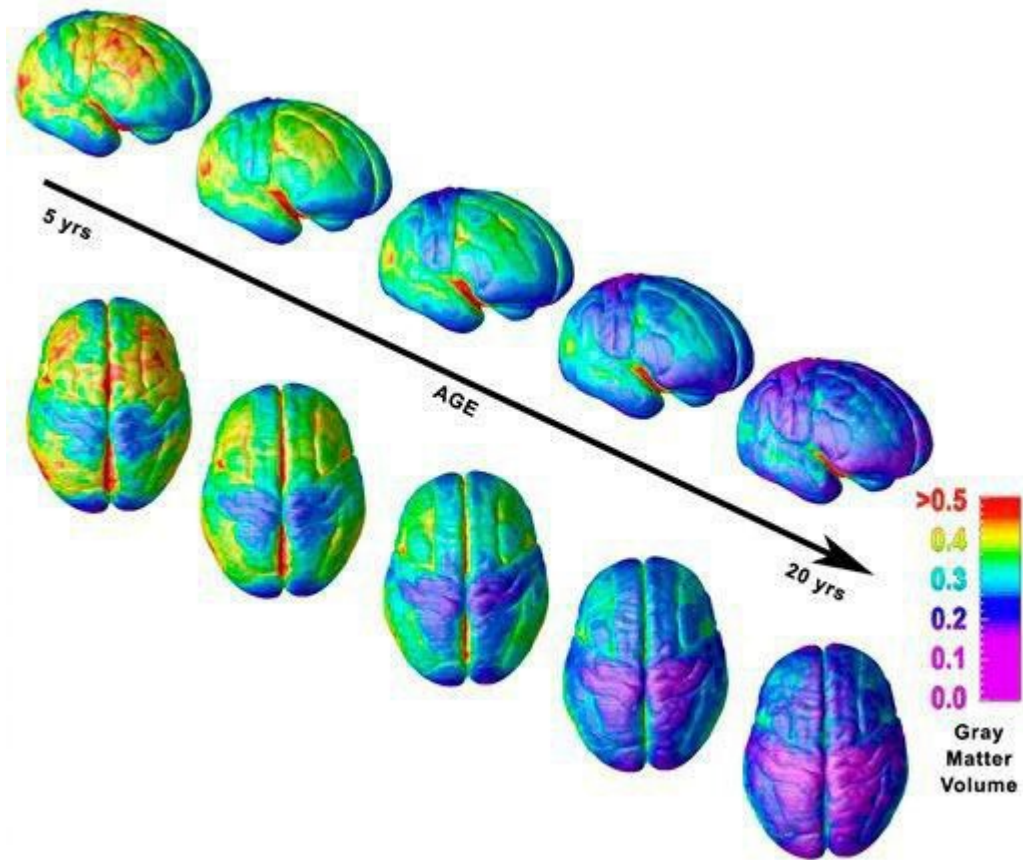
The Basics

- 1. Brain Maturation,
Synaptic pruning and
Plasticity**
- 2. Circadian Rhythms**
- 3. Neurotransmitters
and rewards**

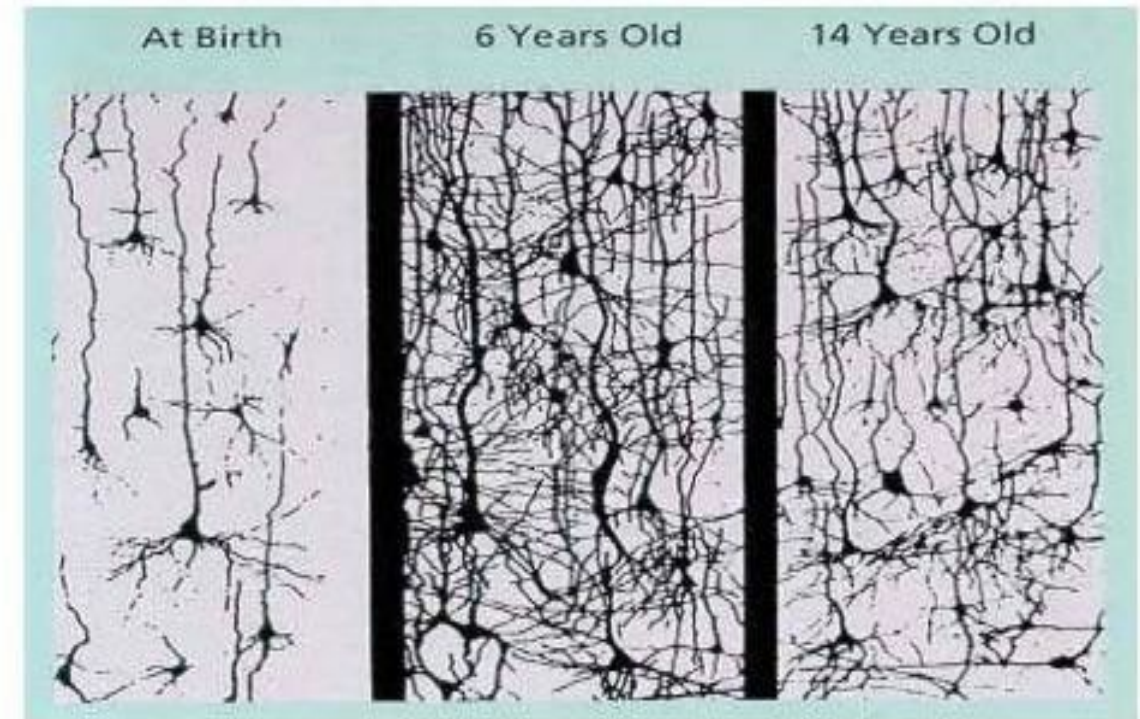
NERVE AXON







Dr. Jay Giedd



Melatonin: a natural hormone related to our daily (circadian) rhythm



Neurotransmitters



- Oxytocin
- Dopamine
- Serotonin

Learning occurs if:

- The brain selects the appropriate sensory information (attention)
- The brain uses the information to produce a prediction (active engagement)
- The brain evaluates the accuracy of the prediction (error feedback)
- The brain incorporates the new information into its acquired knowledge to enable it to improve its next prediction (consolidation)

Thank you for your time and attention
Any questions?