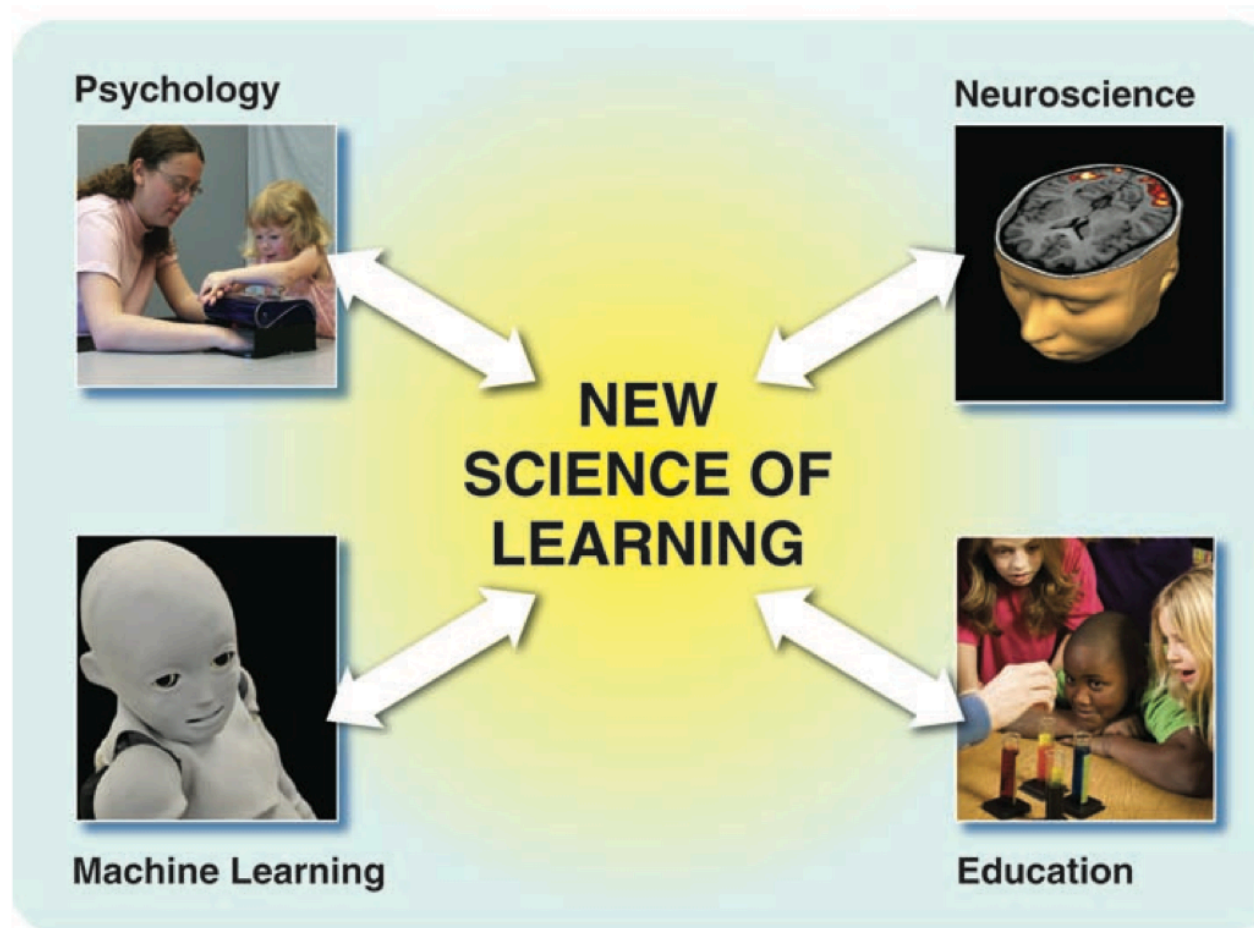


**NATIONAL RESEARCH FOUNDATION**  
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# The Science of Learning

Royal Society  
21 October 2014

# The new field of educational neuroscience



(Meltzoff, Kuhl, Movelland & Sejnowski, 2009)

# London



Neuroscience



Education



Child development

# Cambridge



## Centre for Neuroscience in Education

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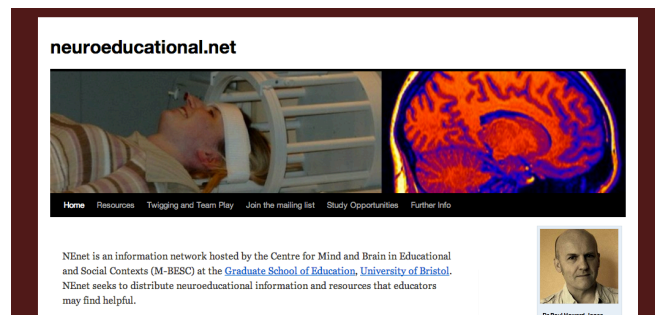
University of Cambridge > Centre for Neuroscience in Education

The Centre was established in 2005, and was the first of its kind in the UK. We are based in the School of Biological Sciences (Department of Psychology) on the Downing Site but we also have strong links with the Faculty of Education. The Centre's aims are to apply the substantial advances in understanding the brain to education.

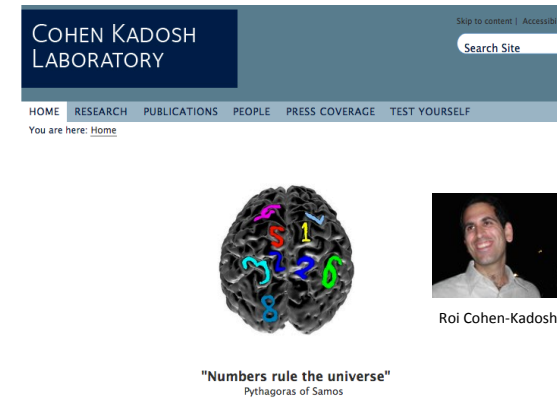
The main research goal of the Centre is to establish the basic parameters of brain development in the cognitive skills critical for education. For example, we aim to understand how the brain functions and changes during the development of reading and maths, exploring the development of related skills such as language, memory, numerosity and attention.



# Bristol



# Oxford





Neuroscience



Education



Child development

# Educational Neuroscience

Edited by

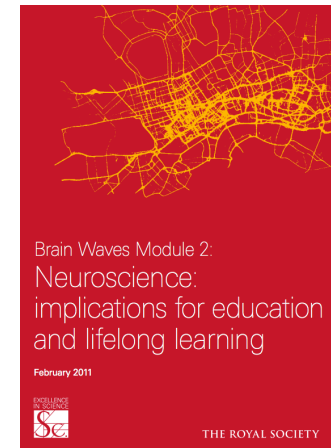
Denis Mareschal, Brian Butterworth,  
Andy Tolmie

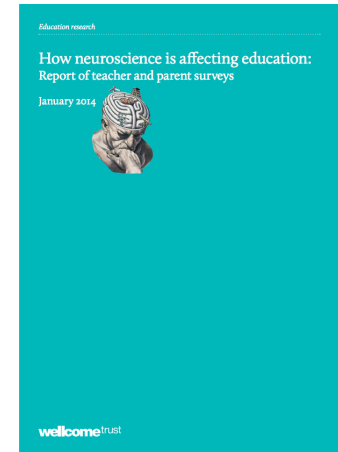


WILEY Blackwell

“There is common ground between neuroscience and education that suggests a future in which educational practice can be transformed by science, just as medical practice was transformed by science about a century ago”

– Royal Society Report ‘Neuroscience: implications for education and lifelong learning’ (2011).



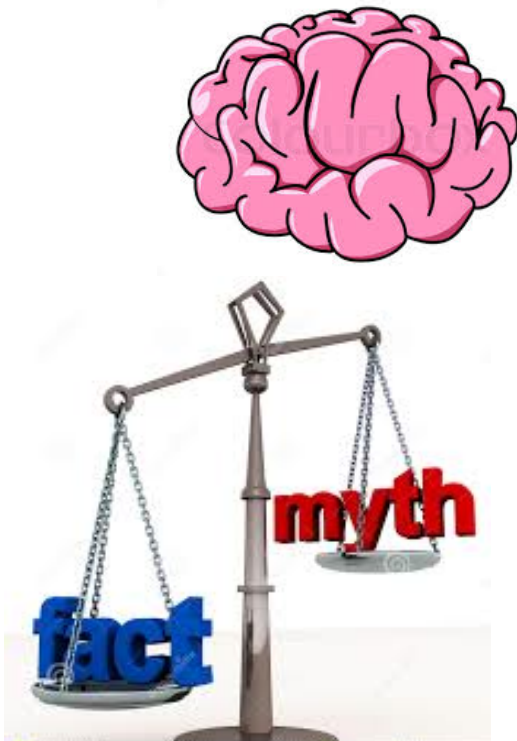


“Teachers’ desire to implement interventions based upon neuroscience is evident, but it is running ahead of the evidence base.”

– Wellcome Trust Report ‘How neuroscience is affecting education: Report of teacher and parent surveys’ (2014)

# Challenges

Neuromyths



Promises that can't  
be delivered (yet)



How to translate neural data into educational implications?



# Neuromyths



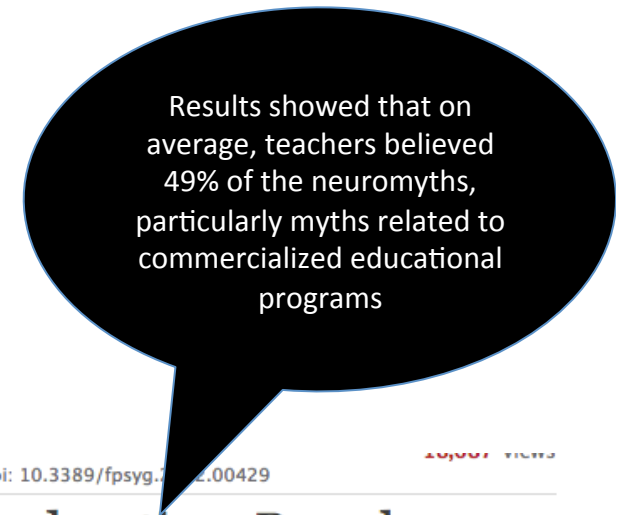
*Nature Reviews Neuroscience* | AOP, published online 12 April 2006; doi:10.1038/nrn1907

## SCIENCE AND SOCIETY

### Neuroscience and education: from research to practice?

*Usha Goswami*

**Abstract** | Cognitive neuroscience is making rapid strides in areas highly relevant to education. However, there is a gulf between current science and direct classroom applications. Most scientists would argue that filling the gulf is premature. Nevertheless, at present, teachers are at the receiving end of numerous 'brain-based learning' packages. Some of these contain alarming amounts of misinformation, yet such packages are being used in many schools. What, if anything, can neuroscientists do to help good neuroscience into education?



Front. Psychol., 18 October 2012 | doi: 10.3389/fpsyg.2012.00429

### Neuromyths in education: Prevalence and predictors of misconceptions among teachers

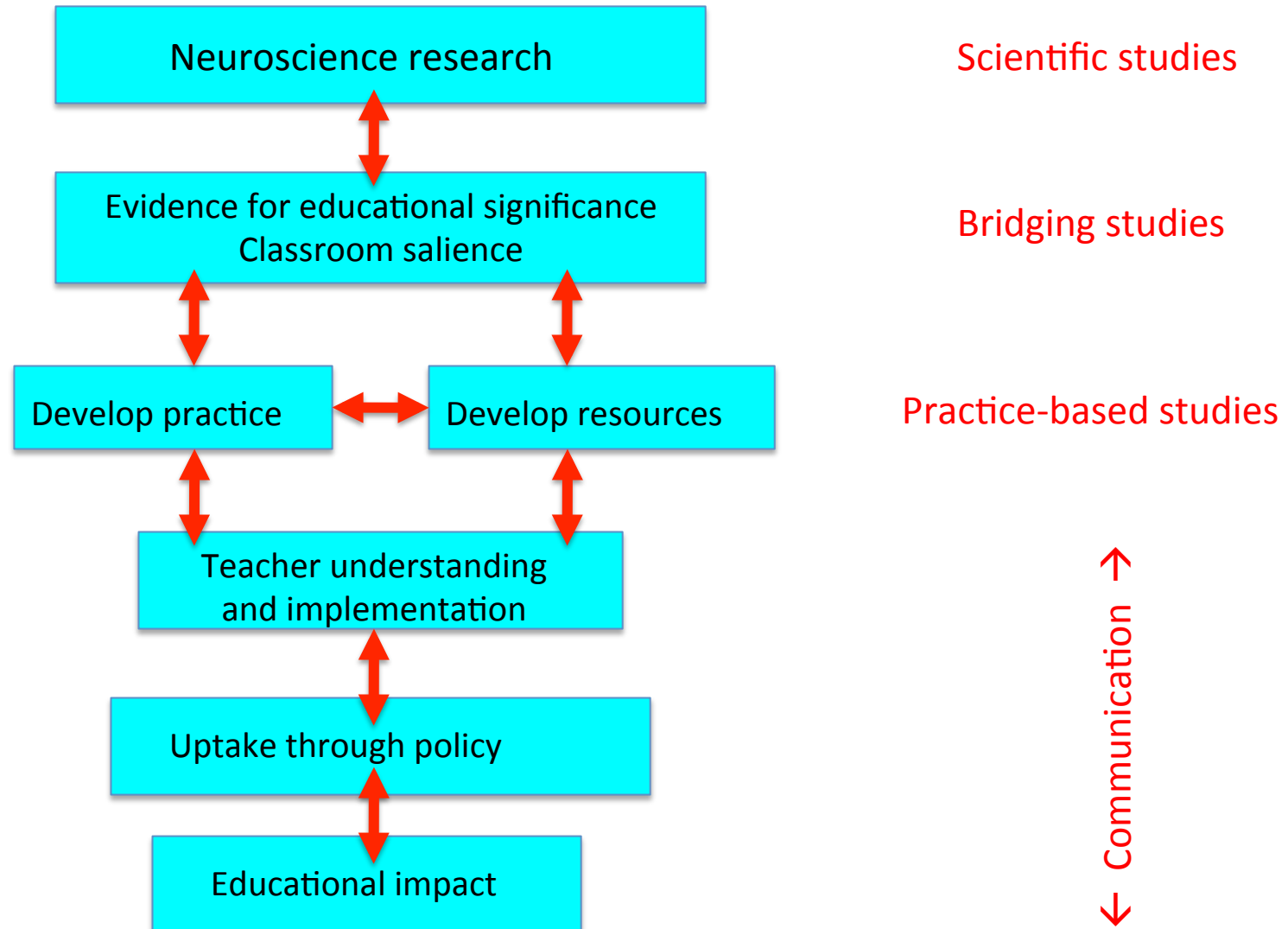
Sanne Dekker<sup>1\*</sup>, Nikki C. Lee<sup>1</sup>, Paul Howard-Jones<sup>2</sup> and Jelle Jolles<sup>1</sup>

<sup>1</sup> Department of Educational Neuroscience, Faculty of Psychology and Education, LEARN! Institute, VU University Amsterdam, Amsterdam, Netherlands

<sup>2</sup> Graduate School of Education, University of Bristol, Bristol, UK

The OECD's Brain and Learning project (2002) emphasized that many misconceptions about the brain exist among professionals in the field of education. Though these so-called "neuromyths" are loosely based on scientific facts, they may have adverse effects on educational practice. The present study investigated the prevalence and predictors of neuromyths among teachers in selected regions in the United Kingdom and the

# How neuroscience and education might interact – Paul Howard-Jones



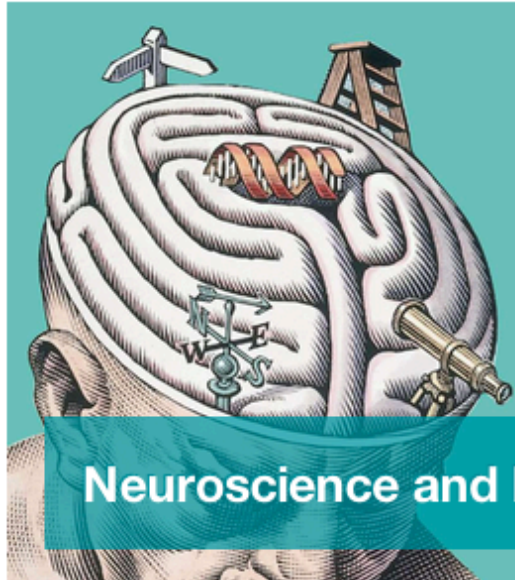
## *Neurocognitive processes and their potential education application (Howard-Jones, 2014)*

Topic	Evidence	Distance to application
Mathematics – non-symbolic and symbolic representation of number	Medium	Moderate
Mathematics – finger gnosis	Medium	Near
Mathematics – mental rotation skills	Low	Distant
Mathematics – maths anxiety	Medium	Near
Reading	Medium	Near
Exercise	Medium	Near
Sleep, nutrition, hydration	Low	Near
Genetics	Medium	Distant
Embodied cognition	Medium	Moderate
“Brain training” of executive function	Medium	Moderate
Spaced learning	High	Near
Interleaving	Medium	Moderate
Testing	High	Moderate
Learning games	Medium	Moderate
Creativity	Low	Moderate
Personalisation	Low	Moderate
Neurofeedback	Medium	Moderate
Transcranial electrical stimulation (TES)	Medium	Distant

**wellcome**trust

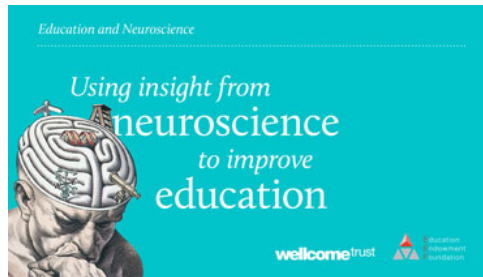


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*Using insight from  
neuroscience  
to improve  
education*

**Neuroscience and Education Round**



Education and Neuroscience

Using insight from  
neuroscience  
to improve  
education

wellcome trust



## Learning Counterintuitive Concepts

A project to develop and test software that improves pupils' ability to "inhibit" irrelevant prior knowledge when learning new concepts.

This project is currently recruiting schools in London, the North West and the Midlands. If you would like to find out more contact [unlocke@psychology.bbk.ac.uk](mailto:unlocke@psychology.bbk.ac.uk) . To see all EEF projects currently recruiting [click here](#).

### The project

When learning new concepts in science and maths, pupils must be able to inhibit prior contradictory knowledge and misconceptions to acquire new knowledge successfully. This skill of "interference control" varies between pupils, with variation evident from an early age. Disadvantaged pupils seem to have weaker control skills than their wealthier peers.

The Centre for Educational Neuroscience, a collaboration between Birkbeck College, Institute of Education and University College London, will develop a computer game to train pupils' ability to control such interferences. Following its development, pupils in up to 100 primary schools will undertake 15 minutes of exercises 3 times a week, at the beginning of maths or science lessons. In the game, a child-friendly character will try to solve problems with help from the player, providing prompts and suggestions. The aim is train the pupil to inhibit their initial response, and instead give a more



**Workshop on the Science of Learning,  
Tuesday 21<sup>st</sup> October**  
Council Room at the Royal Society, 6-9 Carlton House Terrace, London SW1Y 5AG

9:00-9:20	Coffee and registration
9.20-9:40	Current funding developments in the UK, <b>Dr Hilary Leever</b> , Head of Education and Learning at the Wellcome Trust
9:40-9:55	Welcome – <b>Prof. Michael Thomas</b> , Director, London Centre of Educational Neuroscience
9.55-10.00	Welcome - <b>Dr Lim Khian Wee</b> , Executive Director, CREATE, National Research Foundation
10:00-10:30	Singapore's education research priorities: current issues and future possibilities for the application of educational neuroscience - <b>Dr Mariam Aljunied</b> , Principal Specialist, Educational Psychologist, Ministry of Education
10:30-11:00	Reasoning in the brain - <b>Prof. Denis Mareschal</b> , Head of Department, Department of Psychological Sciences, Birkbeck, University of London
11.00-11.30	<i>Break (Tea/Coffee)</i>
11:30-12:00	Principles of learning and the science behind it - <b>Prof Ranga Krishnan</b> , Dean, Duke-NUS Graduate Medical School
12:00-12:30	What works in sciences lessons and why? - <b>Prof. Andrew Tolmie</b> , Professor of Psychology and Human Development, Institute of Education
12:30-13:00	The Science of learning: The field and its work - <b>A/Prof Manu Kapur</b> Head, Learning Sciences Lab, National Institute of Education, Singapore
13:00-14:00	<i>Lunch</i>
14:00-14:30	Sensitive periods in brain development and their relation to education - <b>Prof. Michael Thomas</b> , Director, London Centre of Educational Neuroscience
14.30-15.00	Augmented Learning in Human-Computer Interaction - <b>Prof Ellen Do</b> Co-Director, Keio-NUS CUTE Center Interactive and Digital Media Institute (IDMI), National University of Singapore
15.00-15.30	Brain development in adolescence: Implications for education - <b>Dr. Iroise Dumontheil</b> , Lecturer, Birkbeck, University of London
15.30-16.00	<i>Break (Tea/Coffee)</i>
16:00-16:30	Advancing the field of educational neuroscience - <b>Prof. Derek Bell</b> , Director of Learnus, Professor of Education, College of Teachers UK
16.30 -17.00	Human Cognition Initiative at NTU - <b>Prof Balazs Gulyas</b> Professor of Translational Neuroscience, Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore
17:00-17:30	Discussion (Chaired by <b>Prof. Derek Bell</b> , Director of Learnus, Professor of Education, College of Teachers UK)
18.00	<i>Dinner at Getti – 16-17 Jermyn Street, SW1Y 6LT</i>