The Science of Learning

Royal Society
21 October 2014
The new field of educational neuroscience

(Meltzoff, Kuhl, Movelland & Sejnowski, 2009)
“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”

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

Challenges

Neuromyths

Promises that can’t be delivered (yet)

If you promise the moon, be able to deliver it.
Byrd Baggett

How to translate neural data into educational implications?
Neuromyths

Results showed that on average, teachers believed 49% of the neuromyths, particularly myths related to commercialized educational programs.

Neuromyths in education: Prevalence and predictors of misconceptions among teachers

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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

Scientific studies
Bridging studies
Practice-based studies
Communication

Neuroscience research
Evidence for educational significance
Classroom salience
Develop practice
Develop resources
Teacher understanding and implementation
Uptake through policy
Educational impact
<table>
<thead>
<tr>
<th>Topic</th>
<th>Evidence</th>
<th>Distance to application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics – non-symbolic and symbolic representation of number</td>
<td>Medium</td>
<td>Moderate</td>
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<tr>
<td>Mathematics – finger gnosis</td>
<td>Medium</td>
<td>Near</td>
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<tr>
<td>Mathematics – mental rotation skills</td>
<td>Low</td>
<td>Distant</td>
</tr>
<tr>
<td>Mathematics – maths anxiety</td>
<td>Medium</td>
<td>Near</td>
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<tr>
<td>Reading</td>
<td>Medium</td>
<td>Near</td>
</tr>
<tr>
<td>Exercise</td>
<td>Medium</td>
<td>Near</td>
</tr>
<tr>
<td>Sleep, nutrition, hydration</td>
<td>Low</td>
<td>Near</td>
</tr>
<tr>
<td>Genetics</td>
<td>Medium</td>
<td>Distant</td>
</tr>
<tr>
<td>Embodied cognition</td>
<td>Medium</td>
<td>Moderate</td>
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<tr>
<td>“Brain training” of executive function</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
<tr>
<td>Spaced learning</td>
<td>High</td>
<td>Near</td>
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<tr>
<td>Interleaving</td>
<td>Medium</td>
<td>Moderate</td>
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<tr>
<td>Testing</td>
<td>High</td>
<td>Moderate</td>
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<tr>
<td>Learning games</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
<tr>
<td>Creativity</td>
<td>Low</td>
<td>Moderate</td>
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<tr>
<td>Personalisation</td>
<td>Low</td>
<td>Moderate</td>
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<tr>
<td>Neurofeedback</td>
<td>Medium</td>
<td>Moderate</td>
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<tr>
<td>Transcranial electrical stimulation (TES)</td>
<td>Medium</td>
<td>Distant</td>
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</table>
Using insight from neuroscience to improve education

Neuroscience and Education Round
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. 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 21st 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 - Dr Hilary Levers, Head of Education and Learning at the Wellcome Trust

9:40-9:55 Welcome - Prof. Michael Thomas, Director, London Centre of Educational Neuroscience

9:55-10:00 Welcome - Dr Lim Khiang Wee, 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 - Dr Mariam Aljunied, Principal Specialist, Educational Psychologist, Ministry of Education

10:30-11:00 Reasoning in the brain - Prof. Denis Mareschal, Head of Department, Department of Psychological Sciences, Birkbeck, University of London

11:00-11:30 Break (Tea/Coffee)

11:30-12:00 Principles of Learning and the science behind it - Prof Ranga Krishnan, Dean, Duke-NUS Graduate Medical School

12:00-12:30 What works in science lessons and why? - Prof. Andrew Tolmie, Professor of Psychology and Human Development, Institute of Education

12:30-13:00 The Science of learning: The field and its work - A/Prof Manu Kapur, Head, Learning Sciences Lab, National Institute of Education, Singapore

13:00-14:00 Lunch

14:00-14:30 Sensitive periods in brain development and their relation to education - Prof. Michael Thomas, Director, London Centre of Educational Neuroscience

14:30-15:00 Augmented Learning in Human-Computer Interaction - Prof Ellen De Co-Director, Keio-NUS CUTE Center Interactive and Digital Media Institute (IDMi), National University of Singapore

15:00-15:20 Brain development in adolescence: Implications for education - Dr. Iroise Dumontheil, Lecturer, Birkbeck, University of London

15:30-16:00 Break (Tea/Coffee)

16:00-16:30 Advancing the field of educational neuroscience - Prof. Derek Bell, Director of Learnus, Professor of Education, College of Teachers UK

16:30 - 17:00 Human Cognition Initiative at NTU - Prof Balazs Gulyas, Professor of Translational Neuroscience, Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore

17:00-17:30 Discussion (Chair by Prof. Derek Bell, Director of Learnus, Professor of Education, College of Teachers UK)

18:00 Dinner at Getti – 16-17 Jermy Street, SW1Y 6LT
