BEING THE BEST LEARNER YOU CAN BE: TRANSLATING RESEARCH INTO EDUCATIONAL PRACTICE

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She has worked in the field of education for most of her adult life and been employed as a teacher at all year levels from preschool to year 12. She has lectured at university as well as TAFE and worked for a number of specialist educational organisations including Autism SA, the Down Syndrome Society and Novita. She was also a Senior Project Officer for the Ministerial Advisory Committee: Students with Disabilities. In 2006, Donna completed the Graduate Certificate in Neuroscience (Learning), a joint venture between the three universities in Adelaide. Since 2009, she has been developing a neuroscience-based program for primary schools entitled Being the Best Learner You Can Be.

ABSTRACT

Being the Best Learner You Can Be is a classroom-based program developed for students from preschool to Year 7. Based on current neuroscience research, this program seeks to improve student learning outcomes by providing students with the underpinning tools that allow them to engage with learning, monitor their own progress and, thus, successfully navigate the school environment. In this sense, it differs from other 'brain-based' educational packages by providing a range of cognitive, emotional and conceptual 'tools for improvement' directly to students thereby placing the onus for 'training their brains' on the students as well as on their teachers. In addition, rather than singling out a unit of study on attention or emotional development, this program synthesises all of the factors that contribute to learning (including attending capacities and emotional development) within the same package.

> *Education is about enhancing learning, and neuroscience is about understanding the mental processes involved in learning. (Frith, 2011, p. v)*

In the last 20 years, neuroscience research (generally defined as the 'study of the brain and nervous system, including molecular neuroscience, cellular neuroscience, cognitive neuroscience, psychophysics, computational modelling and diseases of the nervous system' (MedicineNet, 2013) has enormously expanded our understanding of human brain function and development. We now understand that each person's brain 'wires' or develops in very individual ways based both on unique genetics and also on a vast range of personal experiences (Blakemore & Frith, 2005; Giedd et al., 1999). Foundational brain development takes place during two significant growth periods in the early years and during adolescence. But the learning that takes place in between these two periods is also important, since all brains respond to new learning and experience with structural change to neural networks. This phenomenon

is commonly referred to as 'neuroplasticity' (Shaw & McEachern, 2001) and is validation for a model of learning proposed originally by Donald Hebb more than 50 years ago.

The concept of neuroplasticity is both good news and bad, in that individuals are born with a blueprint for how their brains could and should develop. But they require the necessary inputs to stimulate the brain to develop according to that template. When appropriate input is not provided, an individual's brain will not realise its potential or, worse, a variety of emotional, behavioural, perceptual and learning difficulties may occur.

DEVELOPING A NEW FIELD OF 'NEUROEDUCATION'

Throughout the 2000s, there has been a growing call for an interdisciplinary partnership between neuroscience researchers and classroom educators (Baker, Salinas & Eslinger, 2012; Blakemore & Frith, 2005; Frith, 2011; Geake, 2009; Goswami, 2006; Howard-Jones, 2008a, 2008b, 2009; LIFE Centre, n.d.; Meltzer, 2007; OECD, 2002, 2007; Pickering & Howard-Jones, 2007; Reed & Brescia, 2011). As the initial quote above indicates, the core business of both education and neuroscience is learning. But, while neuroscience is unpacking various aspects of human brain function and learning at a rapid rate, the practical application of this information remains problematic for school-based educators for a number of reasons:

- the overwhelming speed of conceptual change occurring in neuroscience, including the development of new disciplines such as 'affective neuroscience' (Carew & Magsamen, 2010; Frith, 2011; Goswami, 2006; Howard-Jones, 2007)
- the technical nature of reported findings coupled with professional discipline barriers arising from perceptual paradigms and discipline-specific language (jargon) that create a lack of access to useful information for educators (Carew & Magsamen, 2010; Dekker, Lee, Howard-Jones & Jolles, 2012; Frith, 2011; Samuels, 2009)
- the proliferation and confusion caused by neuro-myths based on an over-extrapolation of research findings (Carew & Magsamen, 2010; Dekker et al., 2012; Frith, 2011; Goswami, 2006; Howard-Jones, 2007, 2008c)
- a burgeoning array of commercial 'brain-based education' packages that are often spruiked without enough strong research evidence to underpin them (Dekker et al., 2012; Frith, 2011; Goswami, 2006; Howard-Jones, 2007, 2008c; Samuels, 2009)
- lack of appropriate training for teachers to allow them to cope with the points above (Carew & Magsamen, 2010; Dekker et al., 2012; Frith, 2011; Howard-Jones, 2008b, 2008c, 2009; Samuels, 2009)
- curriculum, attitudinal, financial and time pressures on classroom teachers.

In both the USA and the UK, there are organised groups of neuroscientists seeking to assist educators to access quality research in relation to policy and practice (Baker et al., 2012; Dekker et al., 2012; Frith, 2011; Goswami, 2006; Howard-Jones, 2007, 2008a, 2008b; LIFE Centre, n.d.; OECD, 2002, 2007). In comparison, the Australian dialogue between researchers and educators is in its infancy.

Although neuroscience research is hugely varied and ranges from the study of genetic matter within individual genes right through to more conceptual research involving the study of an 'ethical' brain, there is general consensus about the important key aspects of neuroscience research for educators. Based on the growing understanding of our brain plasticity, key concepts relevant for educators centre around the following:

- general brain development including neural pathways, neural networks, neural systems and the interactions between neural systems

- metacognition, including relationships (both knowledge-based and interpersonal)
- memory systems
- attention systems
- emotional systems
- theories of learning.

There are different motivational aims in how researchers and educators conceptually weave research information with school-based teaching and learning processes.

CONCEPTUALISING NEUROSCIENCE AND EDUCATION

In reviewing the literature this author has concluded that the synthesis of neuroscience research and education can be viewed from the following three foci:

- increased knowledge (for example, scientific information usually absorbed into the science–health curriculum)
- increased educational or therapeutic direction through enhanced diagnostic and supportive capacity for students with additional needs (for example, dyslexia or autism)
- improved practice
    - guidelines for educators in framing and presenting the curriculum
    - a basis for improving individual learning skills across the entire student population.

The literature can be further divided within this third point to include research from the outside – academics in various fields looking to test and apply findings within the education paradigm – and from the inside – educators looking at the growing body of research to discover what may be of practical use in the formation of policy, curriculum and school environments.

THE BEING THE BEST LEARNER YOU CAN BE PROGRAM

The Being the Best Learner You Can Be program falls firmly within the latter category of improved practice taken from an insider perspective (that is, what adds value to and works within a schooling paradigm). Specifically, this program is designed to help students, in the first instance, to build an awareness and understanding of the various executive functions that underpin learning and, in the second instance, to learn to test, practise, review and take responsibility for their personal skills development. The program also aims to improve framing and delivery of curriculum by teachers.

Using a games-based format underpinned by explicit teaching regarding brain development, the program focuses on helping students to improve attention, memory, emotional literacy and higher order thinking skills so that academic and social outcomes are maximised. Aspects of general health such as sleep, diet and exercise are included in the program as these directly contribute to brain function and, therefore, learning. The overriding emphasis of the program is learning focused and defines learning as that which the student does or does not do in response to input. This contrasts with a teaching or curriculum focus, being that which a teacher delivers to a student.

In constructing the program, it was important to determine the most relevant research areas for this purpose. When including concepts and activities in the program, choice was guided by the following two questions:

- has the research been well constructed and verified?
- does this information or approach serve to develop or improve executive function skills and, if so, how?

To define what constitutes well-constructed and verified research, the author has drawn on the approach of the Johns Hopkins University's Center for Research and Reform in Education and the University of York's Institute for Effective Education (see their online resource, Best Evidence Encyclopedia at http://www.bestevidence.org).

The definition of executive function was more problematic. While executive functions are frequently referred to in educational literature (especially in relation to students with disabilities) and widely researched in various disciplines such as neuroscience and psychology, the exact definition of what constitutes 'executive functions' is still unclear. As reported by Zelazo and Müller (2011, p. 574), 'Executive function (EF) is an ill-defined but important construct that refers generally to the psychological processes involved in the conscious control of thought and action'.

Given that the term 'executive function' is used in reference to an array of skills and abilities, it was decided to largely adopt the definition and approach put forward by Peg Dawson (Dawson & Guare, 2004). This decision was made based on both face validity and general transferability into a primary school setting. Hence, the suite of executive functions that form the Be the Best Learner You Can Be program's structural basis are the set of cognitive abilities that control and regulate other abilities and behaviours and that are necessary for goal-directed behaviour. As framed by Dawson, this includes all skills that allow individuals to anticipate outcomes, adapt to changing situations, form concepts and think abstractly. Specifically, the program has targeted and expanded Dawson's set of executive function skills to encompass the following:

- plan (ability to create a road map to reach a goal)
  - organise
  - time manage
- working memory (both verbal and non-verbal)
- metacognition (self-knowledge and higher order thinking)
- response inhibition
  - delay gratification ('with style')
  - stop unsuccessful behaviours
  - manage distractions or interruptions
- self-regulation for affect (ability to manage emotions)
- task initiation
- flexibility (revise, problem solve, error correction)
- goal-directed persistence (adapted from Dawson & Guare, 2004).

Figure 1 Poster created for the Be the Best Learner You Can Be program by the author

In the classroom, emphasis is placed on developing executive function skills through a process of self-discovery (see Figure 1). The suite of games used during lessons has been developed to help students recognise their individual strengths and weaknesses. After each game, students are directed to strategies they can use to make personal improvements.

CONCLUSION

The rapidly developing area of neuroeducation holds much promise for improving both teaching and learning in our schools. In Australia, this is largely uncharted territory. The Be the Best Learner You Can Be program represents one approach for translating research into viable practice.

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