

BOOK REVIEW

The brain that changes itself: Stories of personal triumph from the frontiers of brain science

Norman Doidge, 2008
Scribe, Melbourne
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423 pp.

Modern brain imaging techniques now make it possible, in some sense, to “watch” the brain as it learns (Zadina, 2010; Doidge, 2008, p. 199-201). As academic language and learning (ALL) educators often work with students on improving their approaches to learning, the question then arises: can the results of neuroscientific studies of brains as they are learning usefully inform practice in this area? The wealth of titles which can be found by searching online bookstores using the phrase “brain-based learning” suggests that the answer is “yes”, but what is worth reading in this field? The purpose of this review is not to survey the field to answer this question, but to recommend one recent popular science text, *The Brain that Changes Itself*, by Norman Doidge.

The focus of *The Brain that Changes Itself* is the idea of *neuroplasticity*, the finding from recent decades that unlike a machine for which component parts have fixed, unchangeable functions, the human brain is in fact to some extent “plastic”, or in other words “changeable, malleable, modifiable” (p. xv). Thus for example, brain scans have shown that the auditory cortex of people who are totally and constantly blindfolded will within a few days start using parts of the now unused “visual” cortex to process *sound*, thus compensating for the loss of sight (p. 211). Even more amazingly, blind people can learn to “see” to some extent with the aid of electrical signals sent from a camera to the skin or tongue (pp. 11, 19, 25; and also, “Blind soldier”, 2010).

The book’s author, Norman Doidge, is not himself a neuroscientist, but a research psychiatrist at Columbia University. As such, the book does not report on Doidge’s direct research into neuroplasticity, but rather it chronicles his “voyage of discovery” as he consulted the research literature and leading scientists in the field. As a result, the book is written in a very engaging style, using the journalistic devices of extensive case studies and descriptions of scientists to illustrate and personalise the content. Some of the history of the development of the field is also told, and that makes for interesting reading about the social construction of scientific knowledge (for example, for many years it was considered a “heresy” to suggest that the brain was plastic and papers could only get published if they stated their findings without making this claim). Although a journalistic style does make a text more “reader-friendly”, it does raise questions about the credibility and depth of the text. In this case, the extensive endnotes providing links to the original scientific literature gives the reader confidence in the book’s authoritativeness and credibility.

Much of the content of the book, such as the neurological basis for the phenomenon of “phantom limbs” in amputees (chap. 7), tales of recovery from stroke (chap. 1), and ways of reducing the impact of aging on the brain (chap. 10), would only be of personal rather than professional interest to ALL educators, but much of the book does have direct relevance to the *learning* part of ALL practice. While many of the final conclusions about the brain and learning may not be completely new to anyone who’s studied the psychology of learning (e.g. cramming

leads to “easy come, easy go” learning), learning a little about the neurological bases for many facts about learning may lead to a deepening or fine-tuning of understanding which could be valuable for ALL practice.

Perhaps one of the most interesting chapters for ALL educators is chapter 2 which centres on the story of Barbara Arrowsmith Young, a woman who had multiple significant learning disabilities. Arrowsmith Young’s experience was that doing extra drills on what she was trying to learn *didn’t help* because they didn’t address the underlying neural weaknesses causing the learning disabilities.¹ The standard technique of using compensatory approaches (“work arounds”) didn’t help either as she had so many learning disabilities. However, Arrowsmith Young was able to identify where the weaknesses in her brain were and through exhaustive exercising of those areas was able to eventually normalise or even enhance their performance.

There are at least two important lessons to learn from Arrowsmith Young’s experience. First, that significant brain change requires a similar intensity and time of effort to achieve as does physical change in the form of improvements in strength, endurance and flexibility. The second lesson is that the brain exercises seem to need to be *precisely targeted* at strengthening the underlying neural weakness – any old brain exercise does not do² – and the link between the exercise and the subsequent improvement is not always obvious. For example, on pages 37-39 Doidge describes an exercise where children practise tracing complex lines, something which one might think might help with writing skills but not obviously reading and speaking. But speaking, reading and writing all involve the coordination of complex sequences of muscle movements and the theory is that a weakness in the premotor cortex which controls this muscle coordination might explain why some children perform clumsily across all three of these performance areas and hence that exercising the premotor cortex could then lead to improvement in all three areas; which has in fact been found to be the case.

In keeping with the above idea of “exercising” certain areas of the brain so as to increase one’s capacity to perform at a higher level in a wider range of skills, Doidge makes conjectures about the possible general value for brain development of rote memorising speeches and poems etc. (pp. 41,2). As someone steeped in the idea of deep learning and not keen on rote memorisation tasks, these conjectures gave me pause to think about the possible wider developmental value in my children having to learn poems, songs and dance routines for eisteddfods and other public performances.³ It also points to a key challenge in higher education: the development of proficiency requires extensive practice; the question is how to provide students with enough of a reward to keep them interested and paying attention during what might otherwise be a boring training session (pp. 88,9).

Appendix 1, *The Culturally Modified Brain*, is another part of the book ALL educators might find particularly interesting. This chapter is strangely labelled as an appendix as it is better

¹ As examples of what “underlying neural weaknesses” means, there is research which suggests that a contributing factor to some cases of dyslexia is a lack of control over the regulation of small eye movements and in other cases a weakness in the ability to accurately distinguish between similar speech sounds (Fischer, 2010). This suggests that drills aimed at improving gaze control or phonological awareness could lead to subsequent reductions in the number of reading errors made by dyslexics, and this has in fact been found to be the case (Fischer, 2010). Note also that brain scans are now being used to improve the diagnosis of the underlying neurological basis of at least some brain disorders, with one finding being that possibly as many as 50% of children diagnosed as being autistic may in fact be suffering from a type of brain seizure which is treatable with drugs (Shankardass, 2009).

² An important point to be aware of here is that products and programs “based on the latest findings in brain science” are not necessarily “clinically proven” and hence may not lead to general cognitive improvements outside of the type of exercises used in the product or program (Lawton, 2008; Callaway, 2010).

³ Of course, in the performing arts, rote learning a performance is not seen as an end in itself, but as a *means* by which a performer can move from *concentrating-on-what-they-have-to-do-next* to concentrating on the *quality* of their performance.

described as an epilogue or postscript. The key point made in this appendix is that cultural activities shape the brain: brain imaging reveals, for example, that musicians have several areas of the brain that differ significantly from those of non-musicians (p. 288). So, people who are very good at something *do* have brains which are different to the general population, but the conclusion of this book is that most of the differences are a result of extensive practice rather than being innate. The implications of this cultural effect on the brain explored in this chapter include why immigration is so hard on the adult brain and that easterners and westerners do have some measurable differences in perception. Conjectures about the links between too many hours of TV watching and the playing of video games when young and the later development of ADD are also raised.

The book includes many more interesting insights, but I'd like to mention one more before concluding this review, and that is the "paradox of neuroplasticity". Yes, the brain is changeable, but once changes have been made and become "ingrained", such changes gain a "competitive advantage" over other ways of using the brain and this can lead to "rigidity". In addition, as most readers would be well aware, practice leads to increased proficiency which means it is very easy to slip back into bad habits. Doidge states that the breaking of bad habits thus requires the use of "roadblocks" (pp. 210,11), an idea which may be of use to ALL educators who work with students who need to break bad study habits and develop more productive ones.

In conclusion, I believe this book would be a fascinating read for anyone interested in some of the latest finding from brain science. For ALL educators though, the book has added value in providing deeper insights into human learning which may have value in their professional practice. One question I now have though, is how do I convince students that "multitasking" is antithetical to learning and that they would get more out of a lecture if they gave it their full attention rather than splitting their attention between the lecture and glancing at their Facebook page using their wirelessly networked laptop? Or perhaps the question should be, as was the focus of a recent talk by Janet Zadina (2010): how can lecturers give "lectures" which result in optimal student learning?

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