

How neuroscience is being used to spread quackery in business and education ^[1]

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EXCERPTS

During World War II, residents on the islands in the southern Pacific Ocean saw heavy activity by US planes, bringing in goods and supplies for the soldiers. In many cases, this was the islanders' first exposure to 20th century goods and technology.

After the war, when the cargo shipments stopped, some of the islanders built imitation air-strips. These incorporated wooden control towers, bamboo radio antennae, and fire torches instead of landing-lights. They apparently believed that that this would attract more US planes and their precious cargo.

This behaviour, it turns out, is not a singular occurrence. Anthropologists have found examples of similar behaviour at different times in history, albeit in island populations. In a commencement speech at the California Institute of Technology in 1974, the physicist Richard Feynman used the concept to coin the phrase "cargo-cult science".

The cargo cult's air-strips had the appearance of the real thing, but they were not functional. Likewise, Feynman used the term "cargo-cult science" to mean something that has the appearance of science, but is actually missing key elements.

The phrase has since been used to refer to various pseudo-scientific fields such as phrenology, neuro-linguistic programming, and the various kinds of alternative therapies. Practitioners of these disciplines may use scientific terms, and may even perform research, but their thinking and conclusions are nonetheless fundamentally scientifically flawed.

Exploiting the rise of neuroscience

Recent years have seen a huge growth in the public awareness of neuroscience. People have become more interested in new findings about the brain, and also find brain-based explanations quite compelling. This public interest has led enterprising individuals to try to apply neuroscientific ideas to more everyday situations.

This trend first began back in the late 1990s with "neuromarketing". More recent developments involve the use neuroscience in the business world and in education. But, like homeopathy and phrenology many of these applications can be regarded as "cargo-cult neuroscience".

Consider the Neuroleadership Institute. It was founded in 2007 to "encourage, generate and share neuroscience research that transforms how people think, develop and perform". Broadly, it seeks to apply neuroscientific research in management and business. It publishes its own journal, and holds meetings around the world where prominent business people and a few scientists deliver seminars. The cost of registering for this year's two-day summit is US\$3280 for non-members of the institute - that is roughly five times what an equivalent academic conference might charge.

Re-package and re-sell

The Neuroleadership Institute's published work shows why their approach needs more scrutiny. Take the example of the AGES model of learning which was published in the institute's journal. AGES stands for attention, generation, emotions and spacing. The main idea is that effective use of these four domains in training can lead to more effective learning.

For instance, "generation" of associations and deeper, more elaborated processing of material leads to better memory retention. This means that the word "table" will be forgotten easily if it is presented briefly in a long list of other words. However, it will be easily remembered if the subject is asked to imagine an elaborate scene featuring a beautifully decorated table in a restaurant where all the waiters are anthropomorphic ducks. This effect is a well known and robust psychological effect, usually called "levels of processing", first described in 1972.

"Spacing" is the idea that information will be better retained if it is studied for short periods, spaced out over a few days or weeks, rather than intensively studied in a single short-period. The spacing effect was first described by Hermann Ebbinghaus in 1885. Neither of these effects need any reference to neuroscience to make the point.

There are also occasional, mostly nonsensical, references to neurotransmitters such as dopamine and norepinephrine. The neuroscience content seems to be there purely to put a new, modern gloss on some very old ideas from 1970s psychology. This is not to say that it is necessarily bad advice. But these are old ideas, given a slick re-packaging and being sold as brand new.

The Neuroleadership Institute appears to be selling this stuff pretty successfully too. The public seems to be easily impressed with neuroscience right now, and business leaders don't have the scientific background to adequately critique these ideas. Someone who cloaks themselves in the appearance of academic rigour and promises new thinking based on cutting-edge neuroscience must seem pretty attractive.

Another particularly witless example is a recent article from Marketing Week, titled "Neuroscience and marketing: what you need to know". In reality, the article contains discussion of experimental psychology results, with no brain-related content at all. In this case, the term "neuroscience" is simply being used to produce a headline that people will be tempted to click on.

Brain-based learning?

Such marketing tactics are not new, and it is hard to get too morally exercised over a group of business people finding a new way of scamming another group. But consider the growth of businesses that target parents, teachers, and schools, using similar language.

Educational neuroscience is a thriving field of research, and there are many excellent and doubtless well-meaning researchers doing rigorous and valuable work in the area. Unfortunately, there are also businesses that want to exploit teachers' lack of experience and middle-class parental anxieties about school attainment.

Usha Goswami, director of the centre for neuroscience in education at the University of Cambridge, raised this issue in a 2006 review. She noted then that teachers received nearly 70 mail promotions per year trying to sell brain-based learning courses. Many of these, she noted, "contained alarming amounts of misinformation".

Around the same time, science writer Ben Goldacre and others exposed Brain Gym, a brain exercise program widely used in UK schools at the time, as ridiculous nonsense. Education seems to be a fertile area for the development of "neuromyths", and despite this kind of criticism, new variants have flourished in the last few years.

The ideas behind Brain Gym are actually alive and kicking in a company called NeuroNet Learning, which offers an accreditation program for schools in the US. Provided, of course, that they train teachers, implement the system across the whole school, and use the program at least four days a week. Their website is awash with terms such as "motor-perceptual learning" and "research-based learning readiness". They even claim their approach is "backed by hundreds of peer-reviewed articles in the world's top scientific journals", and helpfully provide a list. But the articles they cite turn out to be general papers, only indirectly related to the specific program.

This is a common tactic. Many of these companies have an impressive-looking page of research on their websites. On closer inspection, these turn out to consist of articles only vaguely related to their claims.

Another organisation using these tactics is the Brain Balance Centers. These are a rapidly expanding network of franchise outlets across the US, currently numbering around 70. The interventions are based on an entirely made-up theory of brain dysfunction called Functional Disconnection Syndrome.

Brain Balance claims to effectively treat attention deficit and hyperactivity disorder, autism, and many other developmental issues. Their 12-week starter course of treatment costs more than US\$5,000. As has been pointed out, there is no evidence for "functional disconnection syndrome", and the founders of the organisation are chiropractors not neuroscientists.

UK-based versions of these businesses - for example, Accelerate Learning Centres - tend not to be quite so extravagant in their marketing claims, but their work is still not backed by evidence. Some are even capitalising on the recent trend for "mindfulness" approaches. The Mindfulness in schools project runs regular certification courses for teachers, with the aim of getting their approach into school curriculum. But, sadly, the jury is still out on the effectiveness and benefits of mindfulness in any context, let alone schools.

A way forward

The concern is that schools and parents may be seduced by the marketing, and divert scarce resources in order to implement these programs. This potentially means that other more traditional school programs - music, art or drama - may suffer. Paradoxically, musical training is the one form of "brain-training" where good evidence exists for an enhancement of a variety of functions including verbal intelligence, spatial skills, and mathematical abilities.

As noted by Goswami, there is a gap between neuroscientists, educators and business people, who are fascinated by modern research, and eager to implement brain-based practice into their work. Some scientists have been trying to close that gap, but there is still plenty of room for neuroscience cargo cults to build their wooden control towers.

Scientists are generally a cautious bunch. We are trained to equivocate about our results, stress on caveats, consider alternative explanations and repeat the mantra "more research is needed". Teachers and educators, understandably, don't have time for this academic hand-wringing. They want techniques that will just work. This is the gap that these scientific cargo cults exploit. They promise easy fixes and quick gains, based on "proven" research. Scientists need to be bolder in refuting some of these claims. At the same time, educators and business leaders need to be more critical in approaching them.

There is reason for optimism though. A recent initiative by the Wellcome Trust has funded an Education and Neuroscience project, designed to bring together scientists and educators. A 2011 report by the Royal Society also made recommendations for a "knowledge

exchange network" to bridge the gap. One fantastic project that has recently brought together scientists and school children is Frontiers for Young Minds, a neuroscience journal written by scientists, but edited for kids, by kids.

Initiatives like these are definitely a positive step, and hopefully the space available for the neuroscience cargo cultists to build their control towers will shrink ever further as a result.

Region: International ^[3]

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