

TEACHING PSEUDOSCIENCE SUBVERTS THE PUBLIC GOOD

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For better or worse, we live in a world that is increasingly technologically sophisticated, especially so in Western countries. The technologies that are arguably slowly taking over our world, Google search algorithms, for example, are not broadly understood by the average citizen. At the same time, widespread communications technology has also made individuals far more aware of relative social and economic inequities. The political and ethical questions facing humanity become more complex as our interconnectedness grows. Consequently, the teaching of morals, ethics and arguably science are perhaps more important now than they have ever been.

Throughout this letter we take the position that a belief in pseudoscientific claims that are strongly discredited is a bad thing for individuals, and the wider public good. While a precise definition of pseudoscience is not possible (see Pigliucci & Boudry 2013 for numerous concerns and a discussion of the “Demarcation Problem”), broadly we assume it to include homeopathy, astrology, crystal healing and faith healing, among many others, which have no significant statistical support from studies. We do not want to devolve into an argument over whether “poor science” exists, it clearly does, and much harm has been brought on people in the name of science, but equally well there are significant examples of theories of remarkably excellent predictive power and countless lives science has saved. It is also worth noting that in an era of increasing pressure on scientists to provide results with commercial viability the requirement of reproducibility is being failed by much medical research, although suggestions for improvements have been published (Ioannidis et al 2014).

But regardless of issues facing mainstream science, many pseudoscientific ideas actively seek promotion as well through the use of unproven arguments (“the power of crystals simply isn’t understood”), with perhaps a secondary effect of encouraging individuals to perceive the world as an apparently simple place. A cadre of individuals promoting ideas through social media, particularly with well-known influencers, for example, anti-vaccination advocate Jenny McCarthy, also leads to rapid dissemination of misinformation. Indeed studies of pseudoscience and science communication emphasize the power of framing (e.g. Nisbet & Mooney 2007) to help spread ideas.

Some have argued for increased science teaching as a mechanism for addressing these challenges (Sagan 1996). However, research (e.g. Johnson & Pigliucci 2004) strongly suggests the mere teaching of science facts has little impact on the abilities of individuals to discern science from pseudoscience. Indeed in some countries, notably France, a positive correlation between belief in the paranormal and educational attainment has been reported (Broch 2000).

It appears, and there are some significant studies that support this perspective, and that two major factors may contribute to the rise of pseudoscience, both falling under the theories of Etienne Wenger and his concepts of ‘Communities of Practice’ (Wenger 1998, Wenger, MacDermott & Snyder 2002). The communities of practice (CoP) concept states that once a practice or method or way of doing things is established, it forms a self-preserving role in society through those practices, and moves from establishers to those not yet indoctrinated. It ripples through society

and fills a void which makes it difficult for other practices to establish themselves. In the case of the sciences vs pseudosciences, CoP states that both elementary teaching and the media can play a dominant role in determining how the public comes to choose and support one over the other. From this context, it is worth noting that in almost all teaching jurisdictions of North America, teachers, from primary through to grade seven, are non-specialists when it comes to teaching the sciences and mathematics, and according to Ingersoll (1999) are under-qualified to provide grounding in scientific method. In Nova Scotia (Dept Ed 2016) an elementary school teacher is only required to have one post-secondary credit in the sciences and one in mathematics to qualify to teach math and science at an elementary school level, and remedial courses in mathematics and sciences are accepted.

The second issue in the sciences vs pseudosciences, is that of the traditional media. Studies have shown that once out of the formal education stream the main educational driver in the sciences are mainstream media, particularly television. Miller et al (2006) tells us that 80% of all adult education in the US comes from nightly television newscasts. What further exacerbates this dire situation is that with recent changes in the traditional media, along with media consolidation and cutbacks, fewer and fewer journalists who provide content for the nightly newscasts have any post-secondary science backgrounds at all (Zurawski 2010a, 2010b, 2012).

An argument can be made that perhaps what is missing from science curricula is the teaching of critical assessment and a better understanding of process. Broch (2000) reports success in terms of the ability to differentiate between science and pseudoscience by actively developing courses that do this. Both of the authors of this article have attempted to take this idea out of the classroom and into mass communications. By presenting science as a discovery process, not a collection of facts, and giving people the frameworks to better understand how science works, we can potentially greatly improve public understanding of science. Of course, determining how effect such efforts are requires a proper study.

Integrating these concerns leads us both to be deeply skeptical of the value of using Academic Freedom as a means to justify the teaching of pseudoscience. While we cannot speak to how an academic might put together a course on anti-vaccination, for example, a number of consistent themes behind that movement include (1) that vaccinations cause autism (2) vaccines contain unsafe toxins (3) natural immunity is somehow better than vaccine acquired immunity (4) vaccination isn't required because diseases are so rare today. Each of these concerns, and, for that matter, a number of others, have been shown in published literature to have essentially no merit. This is not of course to say that vaccinations cannot have side effects, they of course do, but the overall public health benefit of mass vaccination versus side-effect risk is not seriously debated by the medical profession.

Consider the following scenario: Under the guise of academic freedom a course is taught with an emotionally appealing but ultimately false criticism of vaccination. Picked up by popular media and a tide of growing support, the arguments presented cause thousands of people to choose to remove their children from vaccination. Child mortality for the disease rises.

As much as this sounds like an implausible nightmare, arguably Jenny McCarthy's promotion of anti-vaccination arguments has led to this scenario being realized across North America.

Following child inoculation rates for the influenza virus falling from 52% to in the 2011-12 season to 40% in the 2012-2013 season, the US Centers for Disease Control and Prevention was sufficiently concerned to report in a “news flash” that 90% of all pediatric influenza deaths that year were in children who had not been vaccinated. Accurately predicted vaccination campaigns reduce the probability of catching influenza by between 50 and 60%, and tend to reduce the seriousness in cases where the disease is still caught. While admittedly anecdotal, social media and news reports highlight that many parents of children that might have been saved by vaccination are now taking stands against the anti-vaccination movement.

Thus our biggest concern about using academic freedom to teach any particular branch of discredited pseudoscience is laid out: the damage it can do in a public context. Many other concepts, especially conspiracy theories, root themselves in argument frameworks that often cannot be disproven, indeed the most popular ones are actually reinforced when criticized. Members of the public who subscribe to these ideas have varied reasons for doing so. From anti-establishment viewpoints, through to simple confirmation bias, there is no single dominant thought framework that leads people to believe ideas shown to be false.

Within this construct lies an equally important concern. One of the single most disturbing elements in modern culture is the rise of argument without evidence, or at the very least, the conflation of facts with opinion. Rhetorical techniques such as the “Strawman argument”, “pious fraud”, or “cherry picking” are so common that incoming students use them as a natural form of argument. Could such approaches be intimately tied with propaganda and the rise of “fake news”? Anyone with a significant social media presence who supports the scientific method may well have been faced with dogmatism such as: “You can’t believe anything from the BBC, they supported the child abuser Jimmy Saville.” Such techniques draw on numerous logical fallacies but nonetheless, to those without skeptical viewpoints, they can have elements of persuasion.

So if, as academics, we choose to teach things that we know are either almost certain to be false, or at the very least do not present these ideas in a way that is reflective of honest and broad assessment, we contribute to an undermining of the public good. The biggest irony for one of us, speaking as a physicist, is that the individuals most guilty of this over the past few decades are in fact physicists by training (Oreskes & Conway 2010). Although perhaps, given that the attacks were aimed precisely at science, it shouldn’t be entirely a surprise that the best people to do that would be scientists.

Academic freedom is a significant privilege that takes considerable achievement to earn. There is no doubt it has to be vigorously protected especially when it comes to criticism of institutions. But equally well, we fail to see how using it to justify the teaching of debunked pseudoscience is in anyone’s benefit.

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