

Keynote Presentation

A Job Half Done: Reinterpreting Educational, Scientific and Technological Success for a Covid and Post-Covid World

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ABSTRACT Wherever we have looked during the last two years we have been able to witness failure. There have been failures of policy, as governments have acted too slowly and done too little to stop the spread of the pandemic. There have been moral failures, as the wealthiest countries have snapped up the vaccine available, and left the poorer countries to fend for themselves. And there have been simple failures of common sense, as ridiculous rumours and ‘fake news’ have spread on social media. Those have been terrible failures, and I will not try to persuade you otherwise. We have done too little, and we have done the wrong things. But what I will try to persuade you is that it is extraordinary that we could do anything at all. For centuries, until very recently, plagues and pandemics have, from time to time, swept across the earth, killing large proportions of the population, and nobody could do anything about it. Drought and famine have similarly been the scourge of humankind. Today we can do something to reduce the impact of these disasters. We should look for educational, scientific and technological success in the measures we can now take to mitigate disasters. And we should look for future success in learning how to use the fruits of education, science and technology better, and in particular seeing that those fruits are distributed more fairly.

Keywords: Reinterpreting Educational, Scientific and Technological Success, Covid and Post-Covid World

Introduction

The theme of this year’s conference is “Reinterpreting Educational, Scientific and Technological Success for a Covid and Post-Covid World”. So I want to talk about reinterpreting success. I do not mean to make a glib play on words, or talk about failure being a way of ‘succeeding differently’. I do not even want to join Thomas Edison and say that failing a thousand times should be seen as successfully finding one thousand things that did not work. All of these observations are true, and I would not wish to contradict anybody who talks in that way about reinterpreting failure. In fact, what I want to talk about is seeing failure as a job half done. Perhaps that is not very different from Edison saying that his thousand attempts were not failures but steps on the way to success.

In setting the context for this conference, the conference organisers said, “Generally, people associate educational, scientific and technological success with the attainment of qualifications, certification and professional jobs”. But as teachers, and perhaps more widely, we generally do not see the pursuit of a certificate for itself as a success. After all, it is not the certificate on the wall of the doctor or engi-

neer that helps us; it is the ability of the person to apply their knowledge appropriately. And that requires judgement, and the use of professional standards. So we are inclined to see the pursuit of paper qualifications for their own sake as a failure.

What I am hoping to do, as a teacher, is present my students with knowledge, certainly, but also with standards of what counts as good academic conduct. And one of the ways in which I make my standards of academic conduct public, and available to my students, is through tests, examinations and formal assessments. In this way students become aware of what I value, and hopefully, through me, what society values.

My understanding of the teaching process is that, following Vygotsky, teaching has two phases; a public or interpersonal phase, and a private or intrapersonal phase (inside the head of the student). Teaching and examinations are ways of making standards public, in the interpersonal phase. But what happens next, in the head of the student, when they decide to value what they have learned, and decide to internalise the standards that have been demonstrated, is not in the hands of the teacher. Only the student can manage that process of internalising knowledge and making it available to themselves, or on the other hand, rejecting that knowledge and discarding it. So, if I am disappointed if a student seems to be pursuing a paper qualification without valuing the process of learning, I may be disappointed. But at least that student is fully engaged in the public phase of learning. It is a job half done.

Conversely, Carol Dweck argues that if a student does not pass that public phase successfully, we should not regard it as a failure, as an indication that the student has failed. She argues that we should say the student cannot perform the task – “not yet”, or “nyet”. Again, there is a sense that failure is on the path to success, and it can be if we choose to see it that way.

Self-Assessing for Success or Failure

Before I go on, I want to make a slight diversion to talk about self-assessment. This is obviously a crucial part of the educational process that I have been talking about. I used to have a colleague who described our educational situation in this way:

“As teachers, we decide what knowledge a person needs to be a good doctor, or lawyer or engineer. Then we give them that knowledge, and set an exam. And the exam may cover about half of the syllabus. And the students will pass if they get, say, 50 per cent on the exam. That is to say they pass if they know half of the half of what they needed to know. That is 25 per cent of what we thought they needed to know. Six months later, they will remember about a fifth of what they knew when they were sitting in the examination room. So when we meet them when they are in practice, they may only know about 5 per cent of the knowledge that we thought was essential for them to do the job.

“So, now, when you meet a professional, whether it is a doctor or an airline pilot, would you rather they knew 5 per cent of the essential knowledge for their job, as in the traditional system, or would you rather they had an accurate self-evaluation, so they knew when they had to brush up on their knowledge?”

Well, put that way, I suspect we would all prefer the professional who has an accurate view of their own capabilities, and who exercises their skill well within the

limits they understand, and who knows when to seek help when the task falls outside those limits. A job partially done is fine, so long as nobody thinks that it is completely done, and is then let down when the results do not live up to expectations.

But self-assessment, self-evaluation, is notoriously difficult to achieve accurately. And you may think that is because people will have a general tendency to believe that they are better at things than they actually are, or to exaggerate how good they are. But that is by no means always the case. Notwithstanding the Kruger Dunning effect, that people who have a little competence tend to overestimate their abilities, people who are truly skilful tend to show the opposite effect.

There are two parts to this story. On the one hand, as people develop higher levels of skill, they also develop the metacognitive ability to recognise their own level of skill more accurately. In that sense, lack of skill is more or less bound to go hand in hand with an inability to assess accurately that lack of skill. But the second part of the story is that we are likely to undervalue skills that we possess, and overvalue skills that we do not. This is not a question of not being able to evaluate our own level of skill objectively, and has more to do with thinking that skills we have are relatively easily acquired, while skills that we do not have are more obscure, more esoteric.

For example, I tend to think that fiddling around with mechanical gadgets and making them work is a relatively unimportant skill (although I observe that it seems to be in popular demand when somebody I know has a washing machine that does not work, or their car will not start). But because I can do it, it seems rather commonplace to me. On the other hand, speaking five or six languages seems to me to be a skill that is entirely beyond my comprehension, and I admire people with such skill. This is rather like Dr Watson, who is completely mystified by Sherlock Holmes' ability to deduce much from little indications, but who afterwards is always disappointed by the mundane nature of the deductions that he could not understand before. What had seemed so difficult turns out, always, to be 'elementary'.

And from being elementary, skills that we have, and the means by which we acquired them, soon disappear completely. I am fascinated by the fact that the word for school in Welsh (*ysgol*) is the same as the word for ladder. It is as though, once one had ascended the path to learning, one pulls up the ladder, and the route of the climb disappears altogether. It is one of the reasons that teaching is difficult, because the expert in any field of activity is likely to be able to understand the difficulties that the novice faces only by exerting a great effort of imagination.

So I bring these various thoughts about reinterpreting success for the post-Covid world, in the summary that we are very likely to see large obstacles ahead of us, while the magnitude of our achievements to date appear insignificant. We are likely to overestimate the size of the molehill that confronts us, and underestimate the scale of the mountain that we have already climbed. And so I want to take a few moments to review our present situation, and celebrate what we have achieved in the last two years.

What We Can Do, Not What We Cannot Do

This time last year, I was suggesting in a different context, that it might be time to try to put the Covid-19 pandemic into some sort of perspective. We might, for example, wonder why Covid-19 was attracting so much attention, when, in the long run malaria kills more people. Well, in case you missed it, it was announced in April this year that an effective vaccine against malaria had been produced using the same technology as the Covid-19 vaccines. At the end of a difficult two years, we deserve some good news.

And no doubt we will have a lot more bad news over the next few years; reviews and inquiries into what was done well, what was done badly and what could have been done better to limit the harm done by the pandemic. But I do not want to focus on that. I want to focus on the fact that we could do anything at all, and the role of education in providing us with the tools to address disease.

For many years philosophers and educational theorists have been telling us that knowledge is power, and that with great power comes great responsibility. And now we have the chance to see those principles in action. Over centuries, over millennia, the human population has been ravaged by waves of disease. And we are pretty much the first generation that has been able to respond, and to do something to mitigate the misery, rather than just watch and mourn. The first vaccine, for smallpox, was introduced 220 years ago, but smallpox was not eradicated until the 1970s. And although we have seen precedents in this century in the cases of SARS, MERS and Ebola, there really has been nothing quite like the response to Covid-19 in terms of the speed of developing a vaccine and the global scope of the response.

That is to say, in previous pandemics, from the bubonic plague to the influenza pandemic of 1919, people were helpless in the face of the diseases that threatened them. They did not understand the causes of disease, and they did not have any tools with which to fight against them. We may feel frustrated by the rate at which vaccines are being rolled out across the globe, angry about the inequity of distribution, or fearful about the fake news that has spread with the vaccines, but that anger and frustration comes from knowing what we could have done, from knowing that we had some means in our hands but we deployed them less effectively than we should. It is not the resignation that comes from complete impotence.

So, where do science and education come into it? Well, there is the education of all those doctors and medical researchers, of course. Science has advanced and is advancing all the time. The very first vaccines were really the product of chance. Jenner reputedly discovered the first vaccine against smallpox on the basis of the widely held belief that dairymaids were immune to smallpox. The fact is that there is a disease, cowpox, which is much less severe and dangerous than smallpox, and which exposure to confers protection against smallpox.

This is a fortunate accident of nature, that there are two diseases that are sufficiently similar so that exposure to one stimulates immunity to the other, while one is relatively safe and the other extremely dangerous. Jenner was able to use this fact to produce a vaccine based on cowpox that would protect against smallpox.

However, diseases do not normally come in such convenient pairs, and subsequent vaccines typically depend on taking the virus of a disease, and either killing it or weakening it in some way, so that it cannot produce the full-blown disease, while it is capable of stimulating an immune response in the patient. Some of the current vaccines against Covid-19 work on this basis. But the majority that are being used around the world depend on gene-sequencing, and being able to produce a tailor-made vaccine that matches the structure of the virus itself. It is these advances that have made it possible to shorten the time it takes to create a vaccine, and that hold out the hope that as the virus mutates, it will be possible to adapt the vaccines to reduce the likelihood that the vaccine will turn into something yet more menacing.

So, we have the ability to respond to a pandemic outbreak, largely thanks to the advances in science that have been made in the last 200 years.

But just having the ability to designing a vaccine is not, as we have seen, enough. We also need to be able to manufacture it in quantity, and for that we depend on the technicians, engineers, bio-engineers and production engineers who can run the facilities that can turn out billions of doses of vaccine. And that knowledge,

skill and ability is not confined to a few specialists in research laboratories. Production facilities around the world, depending on the skill of a whole range of scientists, have been dragooned into operation to mitigate the effect of the pandemic.

And at the same time, scientists who take the longer view are busy trying to untangle the history of the pandemic, what it is that we have done to bring this upon ourselves, by living such overcrowded and interconnected lives, by increasing our contact with wild animals, and so on, that have increased the likelihood of developing such pandemics. And by untangling the history of this pandemic, they hope to be able to advise on the prevention of future pandemics, or at least it that is not possible, to be able to anticipate them more effectively.

In all these ways we can see that professional scientists have worked hard, and are working hard, not only to keep the impact of the current pandemic to the least it can be, but are also working to develop scientific approaches that can serve us in the future.

However, while I have every respect for the scientists who put their skills at knowledge at the service of humankind, I do not wish to stop there. There are other ways in which science is helping us in the difficulties that we confront. Perhaps even more important than the legions of professional scientists, large proportions of populations around the world understand the principles of the spread of disease, and the role of microscopic bacteria and viruses, and the need for social distancing and personal hygiene in limiting contagion. We may owe the discoveries to the likes of Louis Pasteur, but the knowledge has to be widely understood if it is to be effective, and we owe that to teachers.

Again, this is a job that is by no means complete. A number of world leaders have been at pains to demonstrate that a lack of scientific knowledge is not an insuperable obstacle to high office. And one would not have to go very far in any society, I imagine, to find somebody who has fallen prey to the misinformation and rumours that have been spread by anti-vaxxers. We need better education, and even more fellow citizens who can evaluate risks on the basis of simple, everyday science. But the majority of people do understand, at least in principle, what a virus is, and what measures are necessary to restrict its spread. Nobody today believes that diseases are spread by mists, miasmas and bad smells. And for a citizenry that is primed with the basic knowledge that a call to public health measures depend on, we have to thank public systems of education.

Nobody thinks that those systems of public education are perfect, are equitably distributed, or serve only the interests of the public, any more than they believe that the vaccines have been equitably distributed in a timely manner. But I reiterate, what is remarkable is that we are able to do anything at all in the face of a deadly disease.

Conclusion

And so, in conclusion, when thinking about reinterpreting success in the post-Covid world, I am suggesting that we need to be realistic in terms of the standards we hold ourselves to. It is usual in such circumstances to ask whether one is an optimist or a pessimist; does one see the glass as being half full, or half empty. Certainly, I am saying that we should see this as a job half done, as a glass that is half full. But I think that I am saying more than that. I am saying that, were it not for science and for science education, we would not have a glass at all.

Because we can intervene and act to limit the spread of disease, new problems are raised, not least questions of social justice about how those actions are dis-

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tributed around the world. And even in populations that we think of as highly educated, we can still find individuals who believe that wearing facemasks causes disease rather than preventing it. There is no room for complacency. We need to learn from our current efforts, and improve the way that we do things in the future. But if we were looking for an attitude that typifies science and education it would be that: learn from the past and do better in the future. And everybody, from the primary school teacher to the Nobel laureate, contributes to that effort.

I think that we can confidently anticipate that more and better education will be needed, and hope that everyone will play their part.

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