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**Editorial**

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**Power, knowledge, subjectivity: Science education and questions of collective existence<sup>1</sup>**

Over the last two and a half years a number of colleagues in science education have correctly pointed to the COVID-19 pandemic, and its political entanglement, as something worthy of attention (SHARMA, 2020; DILLON; AVRAAMIDOU, 2020; ALSOP; HOEG, 2020). The pandemic sparked a great deal of discussion around the politicization of science, the collective responsibility of science in keeping communities healthy, as well as the oppressive hierarchies that rendered some people safe and some people at risk. However, the COVID-19 pandemic changed almost nothing in terms of the sociopolitical and ecological relations that shape our (unevenly) shared reality (virus or no virus). Although it's tempting to view the pandemic as a watershed moment, all it did was expose important questions of collective existence. Before the pandemic, the wicked hierarchies between the Global North and the Global South—and let's not forget the hierarchies within—the 'North of the North vs the North' and the 'the South vs the South of the South' (MACHADO DE OLIVEIRA, 2021). Attention to the epistemologies of the Global South has become a very important focus for science education (REZENDE *et al.*, 2021). There were also large numbers of precarious people living outside the meagre provisions of capitalist economic and social life. Even more longstanding are the social hierarchies created by colonialism, patriarchy, and white supremacy. Lastly, right wing populism and authoritarianism emerged well before the People's Republic of China reported its first COVID-19 cases. Brazilians understand all these realities well, perhaps especially right wing populism. When it comes to engaging major issues/phenomena like pandemics, the best thing science educators can do is remain connected to the sociopolitical, historical, cultural, and ecological contexts that give shape to them. It's through these contexts that something like a pandemic has any meaning whatsoever. In other words, the pandemic on its own is a relatively meaningless event. Therefore those educators not in-tune with the many sociopolitical contexts already at play are unprepared to teach about pandemics in ways that touch on vital questions of collective existence.

One of the ways science educators can make sense of major issues, events, and phenomena is by looking at how scientific knowledge is intricately connected to the many ways power is exercised. More specifically looking at the intricate relations between knowledge (science), governance (power), and subjectivity (the relations people have with themselves, others, and the world). Some of the work that helps pave the way for this frame of understanding comes from historian and philosopher Michel Foucault, who was heavily

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<sup>1</sup> Poder, conhecimento, subjetividade: educação científica e questões de existência coletiva

influenced by the prominent historian and philosopher of science Georges Canguilhem. Admittedly, I will not be able to lay a satisfactory theoretical basis for understanding issues/events involving science through this frame, but hopefully it suffices as a start. For me, it was the pandemic itself that reinforced the need for robust sociopolitical, cultural and historical frames for understanding its own salience (which again is negligible outside this framing). The pandemic itself was ‘foggy’ in that what comprised the key issues kept changing. Was it global vaccine equality or the threat of science denial? My good colleague Aswathy Raveendran and I wracked our brains trying to determine the quintessential socioscientific issue or political question of the pandemic. And, to be honest, we were unable to pinpoint any one issue or question. But besides the exposure of existing inequality, we felt the pandemic exposed a wide-spread thirst for collective forms of living (ŽIŽEK, 2020)

The nature of how power works in the social world is complex, but there’s a few things we can say about it here. Foucault’s work details the shift in how power is exercised in modern Western nations – from techniques that brutally target individual bodies such as corporal punishment and public executions to techniques that intervened at the level of populations in terms of how people lived their everyday lives (FOUCAULT, 1990). One of the things that made this change possible is the development and dissemination of ‘objective’ knowledges such as the sciences, economics, medicine, cartography, etc. These knowledges were sometimes actually developed alongside the ‘art of governing’. The result was the development of more systematized forms of exercising power through things like education systems that evaluated students, census forms, public health measures, juridical apparatuses, and economic policy that shaped labor forces. The way power was exercised over bodies became invested in ‘caring’ for populations and helping them grow for the purposes of economic competition, war, and the general functioning of society. This kind of power is sometimes referred to as (bio)power, the power over life (populations), and biopolitics the entanglements with, or resistance to, this (bio)power (Lemke, 2008). The exercising of power can be brutal as can be seen from the treatment of colonized peoples by European powers, or more ‘neutral’ such as a master protegee relationship, and often even good as in the provision of free healthcare. Power simply ‘does things’; it doesn’t just repress (FOUCAULT, 1990). However, over the centuries power has been exercised over colonized and marginalized peoples for the clear benefit of dominant groups (e.g. white heterosexual European men). The strange predicament of power is that it is exercised bi-directionally: from above through governing organizations and from below through the demands and relations of collective life (FOUCAULT, 1982).

One of the things the COVID-19 pandemic enabled us to see a bit better was how power was exerted over individual bodies and populations simultaneously. All of the ways of exercising power governments employed during pandemic were definitely available to them before the pandemic. Power in the social and political sense targets the conduct of individuals and populations. COVID-19 regulations regulated the movement and proximity of individuals

as well as basic hygiene such as hand-washing. These directives were passed through state-corporate media, educational institutions, and within government institutions themselves (hospitals, schools, etc.). A key point to note here is that science is integral to the legitimacy of governance today. Another key point is that techniques of governance, say masking rules or social distancing regulations, also come from below through the demands of populations for their governments to do things to protect them. This power exercised from below also comes in the form of demands for freedom from these controls.

Since educational institutions are integral to the exercising of power, educators can study, and sometimes intervene in, these discourses that target and shape the conduct of students. The discourses operating through science education have a kind of double-authority in that they are sanctioned both by government and prevailing scientific consensus (most of the time). In other words they carry the effects power in a way other educational discourses do not. Teachers sit at the nexus of power relations. They are instruments of (bio)power, because they're involved in shaping the conduct and attachments of students. However, they are also agents of resistance in that they, along with their students and communities, can resist and make demands on institutional power. Students and teachers protesting against climate change is a good example of this. In terms of community engagement and political activism science education is vitally important for changing systems of oppression and environmental destruction. Science is a huge part of power relations today and greatly influences how people come to understand their very being (e.g. as a member of a species, body-type, or their place in the cosmos).

The stakes of the COVID-19 pandemic resided in how people would come to live everyday life in ways that kept them safe, sheltered, responsible, and economically viable. Conduct, whether COVID-19 related or not, is the very stakes of power relations. According to Foucault's (1982) criteria for power struggles it's clear to see that the COVID-19 pandemic provoked entanglements with power. These entanglements: i) were international in scope; ii) targeted the conduct of populations; iii) demanded a response from government to raise or remove restrictions; iv) invoked questions of identity (e.g. where attempts by colonial governments to refuse or force medical procedures on colonized peoples became relevant); v) employed 'truth' discourse or objective knowledges to demand protections or remove them (e.g. epidemiology, economics, psychology, etc.); vi) a reconfiguration of a subject's attachments (e.g. asking whether working in capitalist economies is really worth it). Again, the relevant coordinates involving precarity, capitalism, colonialism were already present. Pandemic measures and interventions simply (re)activated them. These sociopolitical entanglements with power looked different in places like China, Brazil, or Canada. During times of disaster the conduct and relationships people have with themselves and others can become the object of intervention and scrutiny. This is because the everyday conduct and material circumstances of peoples' lives are at stake.

So what does this mean for science educators? Simply that educators have an ethical responsibility to consider the way educational discourses and practices exercise power, and

that science is intricately connected to the governing of everyday life and self-understanding (subjectivity). It's easy to think our public health systems are benevolent, and certainly they are worthy of much praise, but their history is not just one of protection and healing. Public health systems, or social medicine, were also developed to control, administer, and 'harness' populations for the aims of the state (MURPHY, 2017). This is especially true when it comes to the subjugation and erasure of black and brown bodies (TALLBEAR, 2013). In fact, the way forms of modern governance developed was very much in relation to 'the colonies' (STOLER, 1995). Historically speaking, interventions aimed at diseases such as smallpox were also about urban sanitation, protecting the economic life of the city, and the wellbeing of elites. The spatial reorganization of the sick was also part of the reorganization of the marginalized classes to remove sewage, loitering bodies, and reserve bodies for labour and war (FOUCAULT, 2003). While this might seem commonsensical, the point is that it wasn't (only) for reasons of benevolent care that public health was introduced in Europe. Socialized medicine didn't emerge from isolated medical practices joining together and becoming more systematized, but from a concerted set of social and political practices right from the beginning. Consider for a moment how the mega-rich have significantly increased their wealth during the pandemic while many precarious workers have lost the means to support their families.

When science educators teach about public health measures, which they should do, they should also understand the political contexts that surround these measures. These measures call on subjects to embrace changes in individual conduct in the name of the health of the population. But, through these measures who is enabled to live and who is left to die? Why are severe global disparities in preventive health care allowed to exist? In the case of Canada, their global wealth comes directly from colonial exploitation. How twisted is it then that Canada would be one of the countries hoarding vaccines? Or is Canada's actions simply in keeping with modern governmental logic and power. In a strange way teachers are like doctors, because they're also involved in disseminating official health discourses that shape the conduct, attachments, and attitudes of populations. There will always be resistance on the part of those subjected to power, for example from marginalized or colonized people who resist exploitative or abusive medicalization, and at the same time demand equal access to quality healthcare (SACKS, 2018). The marginalized often have good reason to question socialized medicine (in the Canadian context see DASCHUK, 2021). Practices like social distancing and service closures, while necessary and responsible, also effectively decide 'who' can work and under what conditions (and often those rules don't apply to elites).

Another interesting issue the pandemic exposes is the way modern governments rely exclusively on modern Western scientific knowledge as opposed to more holistic medical knowledges such as Ayurveda, Unani, Siddha and Homeopathy (in the Indian context). This is a point my colleague Aswathy Raveendran raises in a recent article we co-authored on public health discourses and subjectivity in India (RAVEENDRAN; BAZZUL, 2021). It is

also a point that Flavia Rezende *et al.* (2021) make concerning southern epistemologies – those marginalized knowledges that are employed by many Indigenous people who have the potential to mend the global destruction caused by modern capitalism. There are two things about how the pandemic put modern science in relation to more traditional knowledges I'd like to quickly mention. First, that modern governments *must* employ modern science to secure their legitimacy. It's not just that it's a desirable thing to do, it's that there's absolutely no choice if a modern government wants to keep its legitimacy. That's a point for those that say that science is independent of governing! Secondly, one's approval or disapproval of holistic knowledge systems has largely to do with one's own relationship to knowledge, governing institutions in terms of who we think we are (e.g. our spiritual nature). It is this deep reflection on science and epistemology that Rezende *et al.* (2021) ask educators to consider. That is, the way modern Western science has historically foreclosed Indigenous and/or local knowledges that do not fit the universalizing 'templates' of modern Western science. The pandemic provoked ongoing political-philosophical-spiritual debates in the nature of knowledge and being. Debates that have to do with how we are subjects of knowledge, governing practices, and sanctioned attachments. One of these debates has to do with the assault on scientific knowledges for right-wing political purposes, which of course began well before the pandemic and continued throughout with the questioning of public health recommendations and the basic science of vaccination.

Besides the very important issue of global vaccine inequality, there was also vaccine (mandate) resistance. Certainly it was confusing for many North Americans, where there was an abundance of vaccines, infrastructure to distribute and administer them, and fairly high levels of scientific literacy and effective science communication. In North America, vaccine resistance was only partly to do with science communication. It was frustrating to see so many scientists and educators not understand that vaccine (mandate) resistance was also a matter of politics and identity. Vaccine mandates brought issues of governance and freedom to the surface for many communities. Again, issues and standpoints that were present before the pandemic. In Canada, there were the infamous 'Trucker Protests' that challenged the right of governments, acting on public health advice, to institute mandatory vaccinations in exchange for access to community resources and workplaces. It's worth remembering that the distribution of vaccines unjustly favored nations in the Global North. And while there many kinds of resistance based on historical betrayals and exploitive medical practices, in North America attitudes and positions concerning vaccine mandates were split along political lines. To simply, if someone were on the political right wing there was a much higher chance they would oppose vaccine mandates. People on the political left wing and centre tended to support these mandates (with exceptions of course). This made teaching in conservative communities interesting to say the least. It meant science educators had to find ways to teach across political divides.

What seems clear is that a mixture of right-wing populist and radical libertarian views have now gained a foothold in many conservative communities. The neoliberal erosion

of public institutions and the very notion of ‘the public good’ likely contributed to the apparent rise in these ideologies. That is, the idea that *only* individuals can know their interests, government scientists and medical professionals are *always* secondary. This is because under neoliberal regimes the state’s knowledge, or access to knowledge, is severely challenged, because only individuals can truly know what is best for them in a marketplace of ‘free’ choices. Resistance to the mandates, in a sense, wasn’t about science, but a fundamental challenge to the relationship between individuals, government, and the collective. Again, this is where the science communication folks had some of it wrong. Just like the Canadian Trucker protests were not about the best interests of truckers, who were highly vaccinated and needed to be in order to gain entry into the USA anyway. It’s clear the Truckers were largely used in the service of a larger political movement that wanted to reconfigure the idea of social responsibility in the face of government restrictions. Restrictions that were based on sound scientific knowledge. Again, the relationship between knowledge (science), power (governance), and subjectivity (relations of self) emerges as a central theme. One of the common slogans that emerged, one that was quite shocking to many in Canada, was: “I’m not responsible for other people’s health care!”. Some have argued that linkage between right-wing identity and vaccine refusal had much to do with being opposed to any widespread practice that would equalize people’s wellbeing and circumstances in a population (SORAL; BILEWICZ, 2021). For them the world is a place of winners and losers – the entitled and the unfortunate. This seems to fit with the idea that the political right is interested in preserving hierarchies in societies. Not tearing them down. One has to wonder whether vaccine resistance in North America’s white conservative communities is more about a refusal of collective responsibility than anything else. So when educators facilitate deep conversations about vaccines how could they possibly avoid this political dimension?

My own research and thinking in this area has taken a bit of a side-turn, but in my view it’s a fairly productive one. I think it’s worth asking whether the differences between vaccine (mandate) proponents and vaccine (mandate) resisters are really so great. In a politically polarizing world it would definitely seem like people need to find all the common ground they can. In taking a long historical view of modern Western forms of governance, it may be that the two generalized reactions, or positions, to vaccine mandates are not so fundamentally different. It may be that these two positions share a fundamental aspect of how subjectivity has been constituted since the early days of Christianity. The early Christian church leaders developed practices such as confession and baptism that compelled individuals to tell deep moral truths about themselves to an overarching juridical apparatus (essentially the organization of the church). Writers such as Clement of Alexandria and St. Augustine of Hippo developed the philosophical and theological groundwork for such practices. Foucault’s (2018) latest book, the *History of Sexuality Volume 4: Confessions of the Flesh* attempts to locate the attachment of subjects to a juridical or governing authority during the 2nd to 5th centuries. When (some) people declare their vaccine status or stance on vaccines they are, in



some sense, also declaring a deep truth about their bodies, their identity, and their ‘morality’. While it might seem like this line of thinking is outside the field of science education, it’s important to remember that to engage important issues/events of collective existence, including those directly related to science like pandemics, educators must deeply engage with the social, historical, and political contexts that frame them. It’s on this long standing need to declare the truth about ourselves to power that I’d like to bring this discussion of power (governance), knowledge (science), and subjectivity (relations of self) to a conclusion.

It might be said that the different ways people tell the truth about themselves today have proliferated since the early days of the Christian church. For example, people tell the truth about their sexualities – either proudly declaring their sexual difference or constantly reaffirming their heterosexuality. In the case of sexuality, there are both moral and legal consequences to this declaration – for example in the form of 2SLGBTQAI rights or punishments that are still rendered by many religious organizations (though things are changing rapidly). The key point I want to make is that aspects of the basic structure of a subject’s address in modern Western societies have remained similar: subjects still relate deep personal-moral truths about themselves to a juridical power. Flash forward to vaccine (mandate) debates in modern Western countries and one can see that both ‘sides’ are declaring a fundamental truth about themselves and their bodies in relation to a juridical power—for example in the form of vaccine passports. Vaccine mandates essentially regulate bodies such that people must ‘confess’ the truth of their vaccine status, and ultimately their position on vaccine mandates. Their declarations are assessed by a governing power that either approves or disapproves of this declaration for the purposes of employment, access to services, social venues, etc. While not all positions on vaccine mandates are ethically-morally equal, these two basic positions, support or resistance, both involve a response to the modes of subjection and control employed by governments (for better or worse). Let me reiterate an important point here: there’s a relationship between science (knowledge), governance (power), and subjectivity (how individuals view themselves and their bodies) playing out in the seemingly straightforward socioscientific issue of mass vaccination and/or vaccine (mandate) resistance. It is not enough to just communicate the science. Educators, including public health officials, must engage the detailed historical and political contexts in the interest of the public good.

Interestingly, the political right needs ‘alternative’ scientific facts to bolster their positions and give them legitimacy. Media literacy involves critically assessing the scientific arguments and social media posts used by the political right to achieve their political ends, which overall value personal autonomy and individualism ahead of collective wellbeing (which only works to maintain social hierarchies). This literacy also involves understanding how powerful markers of identity and ideology operate and influence decisions we might think of as ‘free’. Vaccine (mandate) resistance looks different in different countries and when the next deadly pandemic strikes, educators need to be on the front lines saving lives through the communication of sound science, but also its many relations to governance,

power, and questions of collective existence (which have historically been both nurturing and destructive).

I'll conclude by repeating something about the COVID-19 pandemic that I think is important. The pandemic, in itself, has very little significance. Rather its meaning lies in the way it's entangled in the relation(s) of science (knowledge), power (governance), and subjectivity (relations of self). Any relevant social, ecological, or political context existed well before the pandemic – as did all relevant questions of collective existence that the pandemic provoked. Furthermore, science plays a very crucial role in engaging these questions because objective knowledges and governance are intertwined in modernity. This is because knowledges with 'truth' value have a greater capacity to wield the effects of power. All of us are entangled with power relations, however the marginalized and oppressed very often feel the effects of these relations more brutally. Educators sit at the ends of power relations and have a great ethical responsibility to consider how they both distribute the effects of power and resist them. What educators can do when major catastrophes and issues arise is critically examine how power outlines conduct and our relation to others, both human and nonhuman, in such times. The great stakes of these issues, of which science is an integral part, involves how the vast majority of people conduct their everyday lives. As educators we can take up this great ethical responsibility by taking the intricate ecological, social, and political entanglements of science seriously with our students.

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