South epistemologies to invent post-pandemic science education

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Abstract

Besides being a country with high inequality, Brazil faces an alarming sociohistorical moment in which the coronavirus disease 2019 (COVID-19) pandemic is exacerbating a disastrous political situation that promotes polarization and social division. The context of this situation is described here through a critical lens, as a justification for conceiving a counter-hegemonic proposal based on different views that share the perspective of Global South epistemologies. Santos' (in Santos (ed) *Epistemologias do Sul*, Coimbra, Edições Almedina, 2009) fundamental principle is that there is no global social justice without global cognitive justice, which is represented by the concept of ecology of knowledge. In a recent publication, Santos (*A cruel pedagogia do vírus*, Coimbra, Edições Almedina, Santos, 2020) demonstrates that the negative effects of the pandemic on the planet and humanity were exacerbated by the planetary dimensions that capitalism has taken on. The author states that the current health crisis is connected to the ecological crisis, since both are manifestations of this model of society, which is based on the unlimited exploitation of natural resources. Building on these ideas, we envisage a science education that fights for the preservation of the planet, is critical of the capitalist model of society, and values the knowledge of the Global South.

Keywords COVID-19 · Post-pandemic · Critical science education · South epistemologies

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Experts have attested that South America's difficulty in overcoming the COVID-19 pandemic stems from the fact that this is one of the regions with the greatest social inequality in the world. Besides being a very unequal country, Brazil faces an alarming sociohistorical moment in which the health catastrophe is exacerbating a disastrous political situation that promotes polarization and social division: on the one hand, the pandemic, which plagues the entire Brazilian population, and on the other hand, a government that ignores it and promotes conflicts with the National Congress, the Supreme Court, and the population in general.

Since the beginning of the pandemic, Brazil has been the second-ranked country in terms of number of deaths due to COVID-19, behind only the USA. It is no coincidence that the countries whose presidents underestimated the pandemic and denied the data on the disease and the recommendations of science are the hardest hit. Negationism of science is not a new phenomenon, but has gained strength and visibility in contemporary times, especially with the rise of ultra-right conservative governments. This phenomenon is associated with the alleged philosophical current defended by the ideological basis of these governments. Because of negationist views, in these countries the politicians were slow to adopt, or have not adopted, the necessary attitudes to prevent the virus from spreading and to impose restrictions such as social isolation and the closing of street commerce. In the Brazilian case, we see that the pandemic reveals and worsens social inequality, since maintaining social distance, staying at home, and even washing hands are more difficult actions for those living with relatives in reduced spaces and often without access to drinking water.

Thinking of the pandemic as a global threat to all humans has led us to draw a parallel with the global threats of the Anthropocene, the geological era in which we live, considered very risky for the planet. Often associated with over-exploitation of nature and global warming, in the midst of a pandemic, the Anthropocene seems less threatening, more abstract and slow. Our reflection brings these phenomena closer together by placing uncontrolled human exploitation of the planet's resources as a factor responsible for the degeneration of the environment as well as for the emergence of the pandemic.

We start from the context of the pandemic outbreak in Brazil, which, in a way, can be seen as a microcosm of both the Anthropocene and the pandemic, serving as a justification for conceiving a proposal of a counter-hegemonic and critical science education that is aligned with the perspective of Global South epistemologies (Santos, 2009).

The chaotic context of the outbreak of the pandemic in Brazil

The context in which Brazil was hit by the COVID-19 pandemic assumes a chaotic aspect, mainly outlined by political facts that have worsened the already precarious situation in the fields of education, science, health, and environment, with which science education is directly related.

Education

Since 2016, we have seen growing setbacks in Brazilian educational actions and policies, which have resulted in the devaluation of teachers and greater privatization of education. The current Brazilian government took office in January 2019, intensifying policies of the previous interim government and further reducing resources for public education. The reaction of students, teachers, and the population came right after. On 15 May, there

were protests in more than 222 cities, in all states. The president reacted by saying that he blocked the money for education “because he needs it” and called the protesters “idiots.” Two protests followed in defense of education and against the welfare reform.

Under this government, three ministers have already been in charge of the Ministry of Education (MEC), a position destined to give support to the far-right ideology of the government. The first minister to take office was a philosopher and theologian whose administration was marked by controversy, such as the request to school principals to film students singing the national anthem and reciting the current government’s slogan: “Brazil above all things, God above all.” This minister remained in office for 3 months, being fired under the allegation of “lack of expertise and management.”

The second minister at the head of MEC, a financial market executive and current executive director of the World Bank board, remained in office for 14 months. Conflicts with the press, false accusations against public universities, racist attacks, and offenses against the Supreme Court marked his actions, as well as the total absence of strategic planning for Brazilian education. In his administration, the implementation of the goals of the National Education Plan was paralyzed and only 4.4% of the amount for MEC investments was spent from January to July 2019 (Amaral, 2019). The current minister of education is a Protestant pastor, lawyer, and theologian, and is certainly aligned with the executive power in its conservatism and privatism of all levels of education.

The main curriculum policies approved for basic education—Common National Curriculum Base (Brazil 2018) and High School Reform Law (Brazil 2017)—are in effect under the current government. Among many arguments against the implementation of a curricular base on a national scale, experts highlight how such standardization hinders or prevents the development of local projects that could frame curricular assumptions according to necessities of schools (Ostermann & Rezende, 2020).

The High School Reform Law extended the minimum student time in school and divided it into two stages: one aimed at general education and the other implemented from five possible formative itineraries, four of which correspond to the high school syllabus (Mathematics and Its Technologies, Languages and Its Technologies, Nature Sciences and Its Technologies, and Applied Human and Social Sciences) and one aimed at technical and professional training. At present, schools are adapting to this new legislation, with autonomy to decide which formative itineraries they will offer. Given the lack of teachers with a full degree in science, especially in physics, public schools may be restricted to the technical and professional itinerary, as it requires non-teaching staff with “notorious knowledge.” Such conditions may configure a technical education for most of the population.

As if the continuity of these policies were not enough, the federal government created an Undersecretary in MEC (Brazil 2019) whose function is to foment the implantation of civic-military schools, focused on civic values and qualification for the labor market. Taking as reference the teaching standards and pedagogical model employed in military schools, this policy intends to attend, preferably, to primary and secondary schools in situations of social vulnerability. Although these schools apparently correspond to legitimate aspirations of the population for quality education, they materialize an exclusionary and elitist policy that revisits educational legislation enacted during the military dictatorship in Brazil (1964–1984).

On the other hand, despite the disastrous actions of the federal government, there was a historic moment for Brazilian education during the pandemic: after 3 years in the House of Representatives, the Fund for Maintenance, Development of Basic Education and Valuing of Education Professionals (FUNDEB), one of the main mechanisms for financing education in the country, was approved. The text, elaborated without any protagonism from the

federal government, which, on the contrary, tried to delay its vote and make last-minute changes, will result in an increase in the Union's participation in this fund, which will guarantee the fight against the disqualification of education and the transfer of State responsibilities to private initiative.

Throughout the exceptional situation due to the pandemic, there has been the educational challenge of maintaining the schooling process for children and young people. While children from resourceful families can continue studying at home using laptops, smartphones, and the Internet, millions of Brazilian students are completely disconnected and without school lunch, sometimes their only meal of the day. Therefore, the digital transformations precipitated by the pandemic have definitely accentuated the social abyss that spans centuries.

To mitigate these inequalities, actions articulated by social movements for the democratization of telecommunications services and Black, Quilombola, and Indigenous organizations began to pressure public power to expand the infrastructure needed to provide broadband Internet in communities. However, while collective actions organized by social movements are surely fundamental, they are not sufficient. Confronting the process of hyperdigitization that the pandemic is exacerbating will require broader policies of universalization of telecommunications and education services that combat the disparities that structure our country.

Science and health

In 2018, the spread of fake news, considered largely responsible for the adhesion of part of the Brazilian population to the current president, already defamed public universities as places of drug trafficking, ideological indoctrination, and inaction, in short, as harmful places.

Since 2016, public universities and research institutes, responsible for almost 90% of the scientific production in the country, have been suffering from drastic cuts in funding. The current president has not interrupted these cuts and has implemented new policies that have hugely damaged scientific research. In mid-2019, scientists mobilized and took a letter with more than 900,000 signatures to the National Congress, requesting a change in this situation. In view of this mobilization, the Congress ordered the government to complement the funds of the National Council for Scientific and Technological Development (CNPq), the main Brazilian research-funding agency.

One of the government's actions that would harm Brazilian scientific production was the attempt to merge the CNPq with the Coordination for the Improvement of Higher Education Personnel (CAPES), which has the function of expanding and consolidating graduate studies. Again, a cry from the scientific community and the engagement of civil society succeeded in preventing the merging of the two agencies. However, the government established priority fields of research and excluded the funding of research in the humanities, social science, and basic research. After new pressure, a government ordinance was published establishing that basic research, humanities, and social science projects would also be considered a priority, given their essential and transversal characteristics.

It is in this context of the scrapping of Brazilian science that we had the news of the first victim of COVID-19 in the country. At first, Brazilian society was called to stay at home. The street commerce, schools, leisure places, and public offices in big cities were closed. Solidarity networks of support to the most unassisted were built. The Minister of Health, who had taken office in January 2019, representing one of the parties that supported the

elected government, declared the quarantine to be fundamental and held a daily press conference, informing the public on the pandemic situation in Brazil and presenting plans to combat the virus. In all his interviews, he appeared wearing a vest from the Brazilian Public Unified Health System (SUS), to attest to the importance of the system in facing the pandemic, which was confirmed later.

On the other hand, every weekend we could watch the president in the streets, promoting agglomerations. When questioned by journalists about the number of deaths, he said, "People are going to die, okay?" Following the US President, whom he calls a great friend and supporter, the Brazilian President began to promote hydroxychloroquine as the solution for COVID-19. He started to finance large-scale production of chloroquine by the Brazilian army, which used to produce it for military personnel who worked in places where malaria is prevalent. From March to June 2020, the production of the drug by the army laboratory was expanded 100-fold (Junqueira, 2020). Although studies developed during the pandemic indicated the drug's ineffectiveness, the government continued to promote it. In June 2020, we have a stock capable of supplying the country's need for 18 years; however, no resources for drugs needed by public hospitals were available (Junqueira, 2020).

At the beginning of the pandemic, many Brazilian researchers started studies focused on COVID-19, following the same direction of research efforts carried out in response to the Zika epidemic in 2015. Nevertheless, as more was known about the pandemic, the Minister of Health and the Brazilian President took opposite sides: the minister taking the side of science and the president denying it and defending chloroquine. Thus, the minister was discredited by the government and ended up resigning from office in April 2020. A renowned oncologist took over in his place, changing protocols of distribution of respirators to the states and of information regarding the pandemic. Without taking a clear stand on social distancing, the new minister did not recriminate the president's walks to the streets and the agglomerations promoted by them. One month after taking office, this minister also resigned. In May, an interim army general, who has no experience in health care, took office. In the position, he sought to alter the accounting of the cases, claiming that it was important to disclose the number of cured and not that of infected or dead.

Following the president's orientation in May 2020, the Ministry of Health released a document guiding the use of chloroquine and hydroxychloroquine in patients with COVID-19 in SUS (Verdelio, 2020). The guidance document mentions scientific studies to support the recommendation of the drug in patients with mild symptoms, although at that time, the World Health Organization (WHO) pointed out side effects of the drug and its ineffectiveness. Since Brazilian doctors are not obliged to follow the recommendations of the Ministry of Health, the drug was not widely used, despite being stored in public hospitals.

We understand that the Brazilian scenario of disqualification of national scientific production, of cutting research funding, of restriction to research in certain areas, and of a negationist government—in relation to science and to the pandemic—was responsible for the alarming COVID-19 data. And despite the Brazilian expertise in the production of vaccines and in the process of vaccinating the population, there were no government investments in our epidemiology institutes to boost vaccine production or to purchase vaccines until the moment we were writing this article (August, 2020).

Environment

One of the goals of the articulators of the elected president's candidacy was to transform the Amazon Rainforest into merchandise, since it was considered as a stock of land

available for the advancement of mining, logging, and agribusiness. The first steps of the government in this direction occurred in January 2019, when the environment minister began the dismantling of the Amazon Fund, dissolving its two committees. His attempts to re-create the committees controlling its composition were rejected by Norway and Germany, the main donors. As part of his anti-environmental policy, other funds and resources managed by the National Social Development Bank (BNDES) were not used throughout the year.

Another front for dismantling environmental policies began with speeches that aimed to demean or slander officials of public agencies focused on research and environmental protection, such as the National Institute for Space Research (INPE). Its director was a victim of this kind of strategy when he was accused by the president of giving false data about the deforestation of the Amazon during a conference with the international press. Scientific societies and prominent scientists manifested themselves in director's defense, arguing that INPE had always worked in a technical and righteous way. The president's accusation was disproven when the official deforestation data issued by the Real-Time Deforestation Detection System confirmed INPE's forecasts. The director asked for resignation a few days after this episode and was named by *Nature* as one of the ten most important people in science in the year 2019 (Galvão, 2020).

In August 2020, INPE released the data regarding the deforestation of the Amazon in the period from August 2019 to July 2020, pointing to 34% growth over the same previous period (Escobar, 2020). Parallel to that, the vice-president of Brazil, the current coordinator of the National Legal Amazon Council, created in February 2020, celebrated the 27% reduction in the deforestation of the Amazon, considering only the month of July 2020 compared with July 2019. However, such celebration is a fallacy because the alleged positive result hides the fact that the month of July 2019—6 months into the current government—was the record month of deforestation in the Amazon, considering recent historical series of INPE (Escobar, 2020).

The path of deregulation of environmental laws initiated in 2019 continues in 2020. At a ministerial meeting in April 2020, the minister stated that the Brazilian government should take advantage of this moment, when the press is focused on the pandemic, to “pass the cattle,” referring to the approval of deregulation rules that could be questioned in court. The desired deregulation involves the release of agrochemicals, mining on protected lands, and the end of environmental protection areas. These practices would result in the destruction of wild areas and areas of the Quilombola, Indigenous, Riverine, and Caiçara peoples, which are capable of supporting the ecological processes that sustain biodiversity.

As a result of these anti-environment politics, Brazil was responsible for one-third of the world's rainforest loss in 2020, and the fires in the Amazon rose significantly. Since then, the government has been suffering severe criticism from other countries and losing international investors owing to the dismantling of environmental policy promoted by the current management. An unprecedented front of former environment ministers was formed and accused the current government of promoting a systematic, constant, and deliberate policy of destroying environmental policies (Gortázar & Betim, 2019).

Implications for the planet

The attenuation of environmental policies by the Brazilian government since 2019 has led to the destruction of biomes and accelerated deforestation in the Amazon, making Indigenous villages unviable. The dislocation of Indigenous People leads to the loss

of knowledge about the forest that is fundamental for its maintenance. These destructive actions, which subsidize agribusiness and mining, have been financed by predatory ventures of transnational ultracapitalist groups and are a problem not only for Indigenous Peoples, as they accelerate the imbalance of the planet, such as through the rapid increase in global warming.

Beyond the environmental issue, public policies implemented by the government aiming to dismantle scientific institutions, public education, and health systems created a propitious scenario for the frightful growth of the pandemic. In this context, Brazil has become a breeding ground of new variants of severe acute respiratory syndrome coronavirus 2 (SARS-CoV) and a threat to the vaccination efforts of all countries. This alarming scenario has led the country to be considered a health threat by the international scientific community (Andreoni et al., 2021) at the time we were revising this article (April 2021).

Towards a post-pandemic science education

The still incipient social relevance of science education is evident in the face of the anti-science movements and, consequently, in the face of the pandemic itself when it is observed that the health crisis was greater where the negationism of science was greater. In this sense, science education failed in the face of the emergence of the pandemic for not promoting empathy and trust in the lay population. In this section, we invest in a critical discourse, which seems to us a promising way to make science education more relevant. We propose a counter-hegemonic science education articulated to political and social objectives (Rezende & Ostermann 2019), aimed at preparing individuals for a post-pandemic world that can promote more respect for the environment and improve the conditions of human existence.

We rely on the ideas of Portuguese sociologist Boaventura de Sousa Santos, Brazilian anthropologist Aparecida Vilaça, and Brazilian Indigenous author Ailton Krenak, which in some way complement each other, to defend the urgency of fighting for new life alternatives. Ailton Krenak (2019), even before the pandemic, was attentive to the risks of dangerously exploiting the environment, a process that characterizes the era of Anthropocene. Aparecida Vilaça (2020) contrasts Indigenous culture with Western modern culture, reinforcing the ideas of Santos (2020), who, in addition to relating the pandemic to the destruction of the environment, blames the capitalist model for all these problems.

Santos (2020) demonstrates that it would be possible to predict harmful phenomena for the planet and for humanity since capitalism began to have planetary dimensions and the world began to live in a permanent state of crisis—a crisis whose objective, according to the author, is not only to remain unsolved, but also “to legitimize the scandalous concentration of wealth and boycott effective measures to prevent the imminent ecological catastrophe” (p. 5). According to Santos (2020), the health crisis caused by the new coronavirus is connected to the ecological crisis, since both are manifestations of this model of society, which is based on the unlimited exploitation of natural resources. The continuity of this process has caused an imbalance in the environment, which responds with attempts at self-defense, manifested in pandemics and other phenomena of the ecological crisis.

Thus, attributing the current global humanitarian crisis to the capitalist model of society, Santos (2020) believes capitalism has no future. The author then questions humanity about its possible loss of preventive imagination and political capacity to put other social models into practice. The author considers the time is opportune for us to think about “alternatives

to the way of living, producing, consuming and living in these first years of the twenty-first century”; otherwise, we will not be able to avoid new pandemics. Such paths would depend on spontaneous mobilizations of citizens to put an end to the separation between political and civilization processes that occurred symbolically after the fall of the Berlin Wall, when the idea that there was no alternative to capitalism was consolidated. This separation meant that societies could no longer think of life alternatives that would have less impact on nature and, therefore, fewer epidemics and pandemics. Santos (2020) believes that, if capitalism’s way of life continues to prevail, it is likely that other organisms on our planet will defend themselves from human aggression in an increasingly lethal way.

Alternatives to avoid future health or ecological disasters presuppose, according to Santos (2009), “an epistemological, cultural and ideological turnaround that sustains political, economic and social solutions that guarantee the continuity of dignified human life on the planet” (p. 31). The author considers that production and reproduction of knowledge in the last two centuries have taken place in a decontextualized way, and understands that this process, which attends to the universality of modern science, “was only possible on the basis of force, with which the political, economic and military intervention of modern colonialism and capitalism were imposed on non-Western and non-Christian peoples and cultures” (Santos et al. quoted by Santos and Meneses 2009).

Santos and Meneses (2009) defend the epistemological diversity of the world through the expression epistemologies of the South, conceived as a “field of epistemic challenges that seeks to repair damage and impacts historically caused by capitalism in its colonial relationship with the world” (p. 12). The term “South” in this expression coincides mostly with the geographical South, since it is in this region of the globe where the countries and regions that were submitted to European colonialism are located and, with the exception of Australia and New Zealand, did not reach the economic development of the Global North. However, the overlap is not absolute because, within the geographic North, very broad classes and social groups (workers, women, Indigenous, Afro-descendants) were subject to capitalist and colonial oppression. On the other hand, in the interior of the geographical South, there have always been small local elites who have benefited from capitalist and colonial domination, and who continued to exist after independence. Santos (2007) links social justice to epistemological justice and defends as a fundamental principle of epistemology of the South the idea that “there is no global social justice without global cognitive justice, that is, without justice among knowledges” (Santos, 2007 p. 40).

The sociological theorization of Santos (2009) regarding the epistemological diversity of the world offers an interesting framework to think about issues involved in the alarming situation we live today. The epistemology of the South is metaphorically conceived by the author as “a field of epistemic challenges, which seek to repair the damage and impacts historically caused by capitalism in its colonial relationship with the world” (Santos, 2009, p. 12). A set of epistemological interventions denounce this suppression, value the knowledge that has successfully resisted, and investigate the conditions for a horizontal dialogue between knowledge.

Santos (2009) argues that every social experience produces and reproduces knowledge, and epistemology is thus “any notion or idea reflected or not on the conditions of what counts as valid knowledge” (p. 9). In this sense, all social relations are cultural and political, and all valid knowledge derives from social relations, being, therefore, all contextual epistemologies, marked both culturally and politically. The author argues that assuming the epistemological plurality of the world presupposes that different cultures imply different criteria of validity, without, however, implying that anything is acceptable. Validity criteria are culturally and politically established and answer specific questions, with answers

built from empiricism, demonstration, and argumentation, without reflecting exclusively on individual and relative positions. As a consequence, it is reasonable to pay attention to “more complex analyzes of the different types of interpretation and intervention in the world produced by different types of knowledge” (p. 12).

According to Santos (2009), modern science has, in the opposite sense, among its validity criteria, the assumption of universality, that is, the assumption that what it builds as valid knowledge is true at any time and in any place. In this sense, the epistemology of modern science ignores other epistemologies, and in the process of its construction and establishment, it erases any explicit contextualization of the constructed knowledge, adopting the dichotomy truth versus falsehood and the assumption that the knowledge produced under the legacy of modern science is the true one and all the other knowledge is fake.

Santos (2009) advocates that the erasure of contextualization is behind the movement to universalize modern science and the consideration that only the knowledge produced based on the assumptions of modern science was true. This process would be directly linked to the concept of appropriation violence, since it was important to make those who did not belong to the culture of modern science, and therefore did not share their validation criteria and their truths, appropriate it. Thus, Santos (2009) links the process of universalizing science to the ideologies of colonialism and patriarchy. These ideologies, by seeking to deconstruct any perspective that meant to be only locally relevant, reinforced and disseminated the universality intended by modern science. Different epistemologies—for example, the epistemologies of colonized peoples such as Indigenous People of Latin America and Africa—were, throughout the process of consolidating modern science, understood as false and, therefore, liable to be despised and even destroyed.

Colonialism, in addition to all the dominations for which it is known, was also an epistemological domination, an extremely unequal relation of knowledge–power that led to the suppression of many forms of knowledge typical of colonized peoples and/or nations. According to Santos (2019), the political movement of colonial and capitalist domination was built by eliminating/appropriating different ways of life and epistemologies. In this process, Western modern science was built and imposed in the colonial world, denying the rationality of alternative knowledge and considering despicable anything that did not follow the epistemological principles and methodological rules established by it.

The concealment of native epistemologies produced a waste of valuable knowledge. A range of experiences around the world, often broader and more varied than scientific tradition, were wasted when hidden and despised within the political process of colonial domination (Santos 2019). Many of these experiences, different from the ones developed by Western modern science, had a non-exploitation relationship with nature, which allowed creation of life forms without destroying other life, for example, to plant without deforesting.

Inspired by the idea of justice among knowledge, we sought knowledge alternative to the orthodox scientific knowledge created in the Global North, aiming to prevent pandemics such as the current one from happening again. Habits that are crucial for Indigenous Peoples could help us to rethink science education to minimize the uncontrolled exploitation of nature and at the same time reduce the chances of new diseases appearing among humans. We agree with Vilaça (2020) that at this time “we are all Indigenous” and, therefore, we need to seek a connection with the environment, maintaining a relationship of respect and balance with the cohabitants of the forest.

Vilaça (2020) teaches us that many South American Indigenous People think of the world as humanity, distributed by spirits throughout the forest, including animals, plants, and even socially related objects. Most importantly, such relationships cannot be

exploitative: they involve spiritual norms of respect, hunting, and eating. If the norms are disrespected, Indigenous believe that a spirit can come and take away a member of the group, making them sick and die. The author concludes that Indigenous Peoples can help us to (re)think about the environmental chaos we experience, leading us to understand that we need to stop seeing ourselves as isolated beings and assume the understanding that we are part of an inseparably connected system.

Ailton Krenak (2019), a member of the Krenak tribe, which was recently devastated by the rupture of the Fundão dam, recalls that, before the idea of capitalism, society was to preserve a forest space so that Indigenous Peoples could survive; now the idea has become to preserve the environment to preserve all humanity. Krenak (2019) explains that before it was only the Indigenous who were threatened with losing the meaning of their lives, but today this loss can be for all humanity, because we are facing the imminence of the Earth not supporting our demand. This situation was created by a conception of a world where everything is merchandise, “to the point of projecting in it all that we are capable of experiencing” (p. 45). As a conclusion, the author wonders where and how we can reconcile our visions to get us out of this state of nonrecognition of each other.

Based on these authors, it is clear that the future depends on overcoming our relations of exploitation and destruction of environment that have occurred since the colonial process and the rise of the capitalist model of society. Taking these considerations as starting points for our preventive imagination, we envisage a science education that fights for scientific knowledge committed to the preservation of the planet; is critical to the capitalist model of society; and values dialogue with the knowledge of the Global South.

Concluding remarks

The description of the context of the outbreak of the pandemic in Brazil is our denunciation of social inequality, destruction of the environment, and total neglect of education and science by the Brazilian government. In this scenario, fighting for the improvement of public education, science, health, and environment in Brazil today can be considered a revolutionary act, since the government’s policies go in the opposite direction in all these sectors. For the government, an environmental icon such as the Amazon Rainforest is only valuable insofar as it will give way to mining and other predatory ventures, in which, according to the president, Indigenous Peoples must integrate to become “peoples.”

Recent studies (Gibb et al., 2020) confirmed the centuries-old Indigenous beliefs, showing that, when the Earth is transformed for cultivation, more species that can host disease-causing microorganisms are favored. The authors show that human advancement reduces biodiversity, while the species that thrive on it become the best hosts for pathogens that can infect humans.

Therefore, the fight for environment and for health involves the possibility of reducing the advance of wild land occupation, the predatory use of rivers, lakes, and seas, and the destruction of biodiversity, which implies increasing the environmental responsibility of all communities on the planet in relation to enterprises that occupy areas that are still uninhabited or wild.

Native knowledge about the environment is now perceived as vital to humanity. We consider that the proposal of ecology of knowledge (Santos, 2009) represents an important theoretical possibility to invent epistemological possibilities from all kinds

of knowledge developed in the world, including modern Western science, to think about non-epistemological problems, such as the salvation of the environment, or to make social justice possible.

By questioning the universality of modern science, Santos (2009) recognizes the impossibility of identifying a general, essential, and definitive way of describing, ordering, and classifying processes, entities, and relations in the world. This observation leads the author to defend that mutual recognition between different cultures that share a given sociocultural space is essential, not only because of the existence of many epistemologies, but also because of what is lost when all possible existing epistemologies are ignored. Such a process implies an ecology of knowledge, which is an epistemology that is based on the recognition of the plurality of heterogeneous knowledge, one of which is the epistemology of modern Western science (Santos, 2009). Culture is understood here as constituting different kinds of knowledge, and the existence of different cultures implies recognizing that explanations of reality derive from an epistemology, such as that of modern science, are not the only possible ones. Since culture is dynamic, the ways of knowing are partial and produce different effects on the world, and the intercultural perspectives may allow the recognition of the existence of plural knowledge systems, alternatives to modern science, or articulations within it in a new configuration of knowledge.

Santos (2009) makes it clear that the ecology of knowledge is an epistemological and political proposal, which always involves a limited set of knowledge, defined according to objectives. Knowledge that aims at civilization change requires social transformation. The concern for the preservation of the planet, for example, can lead “to an ecology between scientific knowledge and rural or Indigenous knowledge” (Santos, 2009, p. 470). Exercises of ecology of knowledge are guided by the aspirations of social groups that can only succeed in articulation with other social groups and their knowledge. These practices mean “the transition from a policy of social movements to a policy of inter-social movements” (Santos, 2009, p. 471). The value of a given knowledge is given by its “pragmatic contribution to a given practice” (p. 472), which, for the author, deactivates the epistemological fascism that has been exercised by modern science in relation to other knowledge, and transforms all knowledge into experimental knowledge. Santos (2009) believes that, throughout the colonial process, a massive epistemicide has occurred and, thus, an immense wealth of cognitive experiences has been wasted. To recover some of these experiences, the ecology of knowledge uses its most characteristic attribute: intercultural translation. Embedded in different Western and non-Western cultures, these experiences not only use different languages, but also different categories and different symbolic universes and aspirations for a better life.

Santos (2009) relates the profound differences between knowledge to the question of incommensurability, an issue used by Northern epistemology to discredit the mere possibility of an ecology of knowledge. However, he argues that there are many epistemologies, making possible the dialogue between them and mutual enrichment. This position, often faced with the problems of incommensurability, incompatibility, and unintelligibility, could be resolved in ways of complementarity.

Santos (2009) considers that the possibilities of approximation depend on the use of appropriate procedures for intercultural translation. Through intercultural translation, it becomes possible to identify common concerns, complementary approaches, and also insurmountable contradictions. In this area, problems are often associated with language, and the author confirms that language is, in fact, a key instrument for the development of an ecology of knowledge. As a result, translation must operate at two levels: linguistic and cultural.

If, on the one hand, we understand that science has been brutally attacked by obscurantist and denialist antidemocratic governments and, therefore, that it must be defended in the scope of science education, we believe that there is still no way to defend neutral objectivist scientific knowledge, which is thought of as disconnected from culture and from human beings. Our position is that such an effort must be assumed and defended by science education, which, driven by capitalism, has been taken to a state of total reproduction of the capitalist system. In this sense, Brazilian curriculum policies, mostly aimed at technical education (Ostermann & Rezende, 2020), as well as the science, technology, engineering, and mathematics (STEM) curriculum in the USA, focused on the need to train competitive professionals for the global economy (Zouda, 2018) and the need to be deconstructed to build a counter-hegemonic and critical science education. In this sense, it is interesting to note that STEM acronym begins with science and technology, the same concepts mentioned in STS, which was initiated as a counter-hegemonic discourse in science education. Perhaps the substitution of S (society) for EM (engineering and mathematics) explains by itself the conceptual and political turnaround and the change of course that is underway. The STS curriculum proposal, which aimed to question science and technology relations with society, gave rise to a proposal that is clearly geared towards production through engineering and mathematics and to favor capitalism. A great effort must be made to change the conformation of science education to capitalism, and we believe epistemology of the South can be a robust framework to build this counter-hegemonic path.

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