

Denialism and antiscience criticism: Decolonial questions

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With a heavy heart, we begin this editorial, as we came to know that another young black man was killed, in a highly violent way, due to xenophobia and racism, or, as some authors prefer, xenoracism. To the Congolese Moïse Mugenyi Kabagambe and his entire family, we ask forgiveness and cry out against the ignorance, truculence and fascism that plague Brazil. Fleeing the war in the Democratic Republic of Congo (DRC) – a country of immense mineral wealth, albeit ranking 179th out of 189 in the Human Development Report (UNITED NATIONS DEVELOPMENT PROGRAMME, 2019) – his family was looking for a better and safer life but ended up victim to Brazil's many setbacks in politics and increasing intolerance and hatred: a condition that promotes racism, femicide, homophobia and, of course, racial xenophobia, or xenoracism (FAUSTINO; OLIVEIRA, 2022).

When asked to comment on this barbaric murder, the executive director of Amnesty International Brazil Jurema Werneck stated that Brazilian xenophobia is linked to racism: "A foreigner with a pale skin will not be treated as an equal, but those who are dark-skinned are treated like their dark-skinned compatriots: with violence and exclusion" (BRASIL..., 2022, our translation). Her statement follows, "[...] all positions of power here in this country are of Italian, Swiss and German descent". On the other hand, Haitians, Angolans, Senegalese, Bolivians, and Peruvians, for example, do not experience the same thing: "They are rejected all the time" (CASO Moïse..., 2022, our translation). Perhaps, what best sums up xenoracism can be found in the painful observation made by Lina, a Congolese refugee in Rio de Janeiro: "Brazil admits you but does not welcome you" (BRASIL..., 2022, our translation).

As if the struggles faced by the black Brazilian population were not enough, violence and discrimination affect the immigrants mentioned by Werneck in the same way and due to the same racial motives, forcing them into harsh living conditions.



The country also faces an aggravation of hunger and social inequality in recent years. According to the Brazilian Institute of Geography and Statistics (IBGE, 2019):

- extreme poverty increased from 5.8% of the population in 2012 to 6.5% in 2018 – a record in seven years;
- a quarter of the Brazilian population – 52.7 million people – live in poverty or extreme poverty;
- among extreme poverty, black or brown women make up the largest group: 27.2 million people.

These data do not reflect the pandemic crisis, making the situation much more complicated. Nonetheless, they reveal the structural racism that is part of a slave-holding colonial past, where capitalism was installed – when Brazil and the Democratic Republic of Congo (DRC) were still colonies – and established itself with a network of power based on Eurocentric hegemony. Anibal Quijano (QUIJANO, 2009) names this process coloniality of power, a very different approach to what Europeans called modernity. Thus, the consolidation of these ideas was permeated by a religious view that regards native peoples as less human, atheists, and soulless creatures that needed to be saved. However, in this "salvation", they were enslaved, killed and raped – genocided (GROSFOGEL, 2016). It is since the eighteenth century that some philosophers and naturalists, such as Emanuel Kant and Carlos Lineu, contributed to the idea that "[...] a conception of *humanity* was consolidated according to which the differentiation of world's population is superior and inferior, rational and irrational, primitive and civilized, traditional and modern" (QUIJANO, 2009, p. 75, author's emphasis, our translation).

In the nineteenth century, the correlation between true knowledge and its use to classify individuals and social groups became hegemonic. Thus, the religious narrative infiltrated into the scientific one, contributing to a magnification of those considered to have good genes. Through the science of heredity, Francis Galton, Darwin's cousin, provided:

[...] the eugenics movement, an academic requirement in which biological specificities, currently we would say genetics, would serve as the basis for reproduction – regulated in scientifically oriented marriage unions – to obey criteria defined by the science of heredity: eugenics. All in the name of conserving and perpetuating traits that would improve the racial conditions of humanity. (COURT, p. 214-215, our translation).

Therefore, this eugenics movement became a parameter to implement policies that accentuate the exclusion and persecution of the non-white population. According to Dávila (2005, p. 31, author's emphasis, our translation), eugenics "[...] combined different theories about race, heredity, culture and environmental influences into practices and prescriptions aimed at to '*improve*' a national population".

In the twentieth century, eugenics found support in several countries, including Brazil. Scientists and intellectuals have proposed projects to whiten the population, mainly through incentives for marriages between descendants of enslaved people with European immigrants, or through other more violent means, such as the sterilization of black people, prizes for those who accepted to be sterilized or social hygiene policies that

deprived black and poor people of privileged regions (CHALHOUB, 2017). These measures asserted that some people were expendable and not meant to pass on their genes.

Unable to whiten a mixed population through genetic isolation – that is, by depriving individuals who had unwanted traits to produce offspring – as a preferred method adopted in countries such as Germany, Great Britain, and the United States in what constitutes the Darwinist eugenics), the forces in power established what Dávila (2005, p. 31, our translation) calls *Lamarckist eugenics* in the country. Based on symbolic and material values rooted in European cultural norms, this eugenic modality recognized another type of whiteness to affirm the "Europeanness" of the population.

Much of Latin America and some parts of Europe adopted this modality with "[...] pre-and neonatal care, public health and hygiene, and an attention to psychology to general culture and fitness" (DÁVILA, 2005, p. 31, our translation). The author documents how such eugenic measures were instituted in the educational field in the first three decades of the twentieth century, especially in the country's capital. These Europeanized cultural standards were set as educational criteria that could grant a 'diploma of whiteness', obtained by students after being selected by rigorous criteria, which included numerous forms of cognitive and anatomical testing. In several countries, Darwinist or Lamarckist apartheid policies were assimilated and, in world proportions, hatch the egg of the serpent of Nazism laid by eugenics.

The idea of white supremacy is still an open historical wound for humanity. Even with the end of World War II in 1945, racism continues to perpetuate and reinvent itself under many disguises. For example, in the United States in the 1970s, in an interview in the 1970s, a renowned black journalist David Brown, famous for his role in the Black Movement, asked William Shockley, awarded the Nobel Prize in Physics for the discovery of the transistor effect:

*Dr. Shockley [...] Do you really believe that black people are inferior in intelligence because of their heredity? [...] that the primary cause of the American negroes' intellectual and social deficits is hereditary and racially genetic in origin.*¹

The documentary that brings this interview emphasizes at least three historical farces that impacted and still impact these societies, namely, the IQ tests were taken:

1. on the arrival of immigrants to New York;
2. with 11-year-old boys from England;
3. in the affirmation of white supremacy in the United States.

The documentary *I.Q.: the story of a farce* takes place in 1912, in New York, United States, when European immigrants arrived and were subjected to a test with a translator, as they did not know the local language². The documentary explains that the I.Q. test asked about light bulbs or sports for people, not part of that immigrant's culture – many from the countryside. These subjects were submitted to these tests, which defined the course of their lives in the United States, where they would go or what assistance they

¹As seen from the title, the documentary addresses how the French scientist Binet created the Q.I. concept at the beginning of the 20th century. It is a potent tool in the struggle for anti-racist and decolonial education. Retrieved Feb. 7, 2022 from: <https://mi.tv/br/programas/q-i-a-historia-de-uma-farsa>. In a complementary way, the book *The mismeasure of man*, by Stephen Jay Gould, presents a study that highlights the racist intricacies of I.Q. tests.

²We cannot forget to mention the East-Timor students applying for a scholarship in Brazil. They had to submit to Celpe-Bras, a certificate of proficiency in Portuguese for foreigners, in a language different from their local culture.

would receive. Consequently, the test determined the future of these people who were so vulnerable after a long trip and in a country different from the one they had left.

For the proponents of these tests, it was necessary to understand the 'seeds of evil' and how to eliminate them to save or improve the human race. At that first moment, the theory gave eugenic scientists strength because of the I.Q. test, they had 'proof for racial theories'. It is an example of xenophobia that still happens, both in the USA, towards Mexican and Latin immigrants, and here in Brazil, towards Haitians, Congolese or other black immigrants. The eugenics compulsion to improve the human race, far from being abandoned, persists in our time in different social metaphors.

The second farce takes place in England, where a crook called Cyril Burt, who received the title of Sir, sure did a terrible deed: from 1954 to 1971, he tested 11-year-old boys to determine and evaluate them genetically. These tests have taken place for decades, and there are testimonials of lives that have been torn apart by this classification, with terrible impacts. This horrible farce came to an end when it was possible to prove that Burt manipulated many data to scientifically explain and justify his views on social order, the origin of social classes, inferiority, and biological determinism.

Data manipulation is not unprecedented in the history of science. Although Gould (2003, p. 43, our translation) states that "[...] conscious fraud is probably rare in science", the findings by the American physician and scientist Samuel George Morton (1799-1851), who published three works on the size of human skulls between 1839 and 1949, were used as evidence for one of these scientific frauds.

In the third farce, the documentary discusses white supremacy in the United States, from which we got the excerpt of the interview between David Brown and William Shockley. Discourses like these contributed to thousands of young black people being incarcerated and killed, promoting racism and the idea that science is not neutral, neither in its epistemic nature nor in its racist practices.

Although these farces took place in the Global North, we recall that the Global South is also present in the Northern Hemisphere, as this form of classification does not simply refer to geographical location. All the forms of oppression present and reported in the documentary, altogether with many witnessed historically, show how we are also affected by these scientific farces. The challenge posed to us is to learn a lesson from this, as it is undeniable that the scientific enterprise's importance must be ascribed to the institutionalization of racism on a geographical scale.

However, as we have seen, racism is not something in the past. As Schucman (2012) explains, the concept of whiteness, which is also a racial identity, was constructed and marked by subjectivity and "[...] has internal borders and distinctions that hierarchize whites through other social markers, such as social class, gender, origin, regionality" (SCHUCMAN, 2012, p. 108, our translation). Thus, whiteness is a colonial construct that assimilates privileges and oppression.

If, on the one hand, science is one of the most important human endeavors in its history, on the other hand, the three farces show that it can contribute to the social injustices that various groups still suffer today – blacks are unintelligent; women are weak; homosexuals are not 'normal'; the poor do not reason – not to mention the oppression and the context of suffering, which is inundated with so much violence constantly. According to the *Atlas of Violence*, 77% of people murdered in 2021 are

black. Brazil ranks fifth in the world in the number of femicides – 67% of these women were black – and fourth for violence against human rights defenders. The country is the first in numbers that kill homosexual and trans people (IPEA, 2021).

Despite the misdirections and ulterior motives of Eurocentric scientific production, which has historically played a significant role in racism, would it be too much to think of science and science education as a way to promote social justice?

As a community of science educators, we ask to what extent are our research production and practices aware that we live in the country that kills *Moíseses*, *Joões-Vítores* and *Miguéis* (CASO Miguel..., 2022; CORPO..., 2022) and not in the homeland of the authors of a considerable part of our theoretical references? How can decolonial education help us envision a socially engaged science?

Such questions emerge with more evidence nowadays, especially in Brazil, when denialism has challenged us to face the attacks on science. Is it possible to correlate scientific denialism and science education perspectives that do not challenge Eurocentrism and its racist outcomes?

Denialism proves to be even more insulting in times of pandemic, such as when Brazilian ministers call the coronavirus a communist hoax. Statements like these tend to associate the reliability of science with political ideologies, putting the work of the scientific community under suspicion. However, this misplaced association contrasts with a vast academic production that has insisted on the criticism of scientific neutrality, the appreciation of difference, and the denunciation of the inequalities that divide those who have the right to knowledge and the benefits of health care. By borrowing the beautiful words of our friends, "[...] the celebration of differences, creations, transgressions, resistances and the stubborn freedom to seek alternatives" (SATO; SANTOS; SANCHEZ, 2020, our translation) we challenge ourselves to face denialism and its forms of exclusion, dialoguing with the decolonial critique.

In pandemic times, at the same time that denialism attempts to take over political life and competes with the needs of society, we envision a science that contributes with simple guidelines such as how to wash hands properly with soap to deal with the coronavirus. In addition, several scientists from different countries have joined together in a solidarity network to share their activity and information and test methods by opening access to their journals. The search for treatment, development and production of vaccines on an international scale is unprecedented in the history of science. Though within capitalist rationality, the forms of solidarity and compassion in such a difficult time, especially towards those who suffer the most, cannot fail to be recognized as a result of collective work among researchers. This finding does not prevent us from continuing to question the limits of scientific activity and even encourages us to ask whether, by criticizing science, by exposing its colonialist roots, we would be giving arguments to the denialists and the advance of fake news?

Science education cannot ignore these issues in this political moment of the rise of far-right ideologies and hardships caused by Covid-19, not only in Brazil but across the globe (REZENDE; OSTERMANN; GUERRA, 2021). On the contrary, it is a field with countless possibilities to explore questions contributing to education and research. It has been the case for decolonial studies in science education (AIKENHEAD; ELLIOT, 2010; CASSIANI, 2018; CASSIANI; LINSINGEN, 2019; MONTEIRO *et al.*, 2019) and proposals for decolonial pedagogies (WALSH, 2013), which seek to explain how coloniality operates

and jolt us out of old ways of seeing the world. These tragic flaws in the construction of science must be seen for what they are so that we do not repeat the same mistakes.

It is worth considering that scientific denialism cannot be considered an innovation of our current time, let alone the Brazilian context. Throughout the history of scientific knowledge production, controversies and denials have operated as resistance to socially circulated knowledge, causing rejections and obstacles. However, denialism seemed to be restricted to a minority of the literate population, and little to no cases of impact on public educational policies – particularly the sanitary ones – have been recorded. The U.S. case shows that denial toward the theory of evolution, or even the Earth's sphericity, has existed there since the last century.

Vilela e Selles (2020, p. 1.725, our translation), in an article that discusses issues of denialism and post-truth, state that, in Brazil,

[...] the denial of concepts and theories well confirmed by science began to gain strength and visibility, especially from the worldwide rise of far-right conservatism [...] This phenomenon emerges fueled by the internet and social networks that aggregate and strengthen identity groups and promote an uncritical consumption of disinformation.

Cordeiro *et al.* (2021) have examined the issue more closely, using the concept of "disinfodemic". The authors borrowed this concept from Posetti and Bontcheva (2020), who coined it in a document released by the United Nations Educational and Scientific Organization (Unesco) to highlight the specific misinformation about the SARS-CoV-2. It includes characteristics such as "[...] the confusion about medical science, which impacts the entire world population, being classified by the authors as more toxic and lethal than fake news on other topics" (CORDEIRO *et al.*, 2021, p. 5, our translation).

The advance of denialism makes use of new modes of sociability disseminated through social media, which favor accusatory discourses with not enough time and space for answers, causing immediate consequences. Conspiracy theories multiply rapidly, hinder the debate, and use provisional research results that still lack greater legitimacy in terms of methods and conclusions. The false controversies are then publicized and accompanied by contending currents of opinion that take partial research results for granted. Thus, "[...] deconstructing false arguments by showing real facts seems to have little relevance in an argument. Evidence and scientific consensus have been easily contested based on personal convictions or lived experiences [...]" (ROQUE, 2020, our translation).

The inherent doubts and uncertainties of the scientific production process are misjudged for fragility and inconsistency, which leads to distrust in science and allows for conspiracy theories to be presented as certainties to the population. In this way, they feed scientific denialism. As Vilela and Selles (2020, p. 1.730, our translation) point out:

Thus, explanations without commitment to factual evidence become a comfortable but unreliable truth. In other words, explanations are produced for what people want to be true, preserving the maintenance of social order and the values they cherish, thus keeping them attached to such explanations, even if evidence comes to deny them.

Due to their simplistic and linear character, theories intended to compete with scientific ideas and evidence spread faster than ever. It directly impacts mechanisms for collaboration and funding of public policies. An example that comes from the last three years in Brazil is the censorship of disseminating research data from renowned institutions such as Fiocruz. While laws and policies aimed at protecting the environment were overruled, *i.e.*, surveillance of Brazil's Amazon and Pantanal wetlands, a good part of the population was convinced that fires are inevitable because of geo-climatic conditions of these regions in an intent to minimize the proportion of the devastation. Never in Brazil's history, the impact of scientific denial cost so many lives and assume such inhuman proportions as it did during the Covid-19 pandemic. Meanwhile, like sitting ducks, scientists could only watch as funding for research was slashed, affecting several different fields of study, including cutting-edge research on SARS-CoV-2.

Dramatically, poor management of the pandemic in Brazil resulted in the death of more than 630,000 people, primarily due to the anti-vaccine stance taken by the country's president. From 2021 to 2022, the Omicron variant of COVID-19 led to a rapid surge of cases to levels not reached since 2020. Despite the excellent immunization coverage of 70.8% of the Brazilian population (WORLD IN DATA, 2022), people are still arguing over health protocols such as wearing masks; there is nothing but the silence over a vaccination passport, and the country finds itself in the imbroglio over the vaccination of children and young people between the Brazilian Health Regulatory Agency and the president – who even encouraged public gatherings. According to Cordeiro *et al.* (2021, p. 2, our translation), we are experiencing a moment of "disinfodemic", because

[...] disinformation was a trend in 2016 that reemerged during the pandemic. Thus, we witness the creation of new words that help us understand the challenge that we are currently facing. It is possible to identify that, along with all the suffering resulting from the health crisis, we also have to deal with various issues at the communication level, and that directly affect the classroom through the increase in the spread of misinformation – the so-called fake news.

It is worth remembering that the scientific method is about doubting its certainties. In this sense, denialists arrogate to themselves the right to doubt scientific knowledge as well, though without going through the same processes regarding the empirical testing of laboratories and educational facilities. As highlighted by Vilela and Selles (2020, p. 1.732, our translation):

Rather than accepting comfortable answers, the scientific community validates its queries after refuting theories on proposed factual findings. In other words, scientists also refuse facts: the difference is that they test them into oblivion and reach conclusions that are not precisely the truth, but consensus exhaustively checked for refutations in a collective process of validation among peers. On the other hand, denialists avoid and refuse frustrations, which produce a comfortable response at the individual level that get people that think alike together and need to belong to an identity group (PERINI, 2019). In the process of producing conservative rhetoric, denialists raise doubt to generate false scientific controversies and present anti-frustration narratives, attacking scientific consensus as a conspiracy in favor of political-ideological interests.

Given this situation, we see daily in Brazil how ultraconservative positions are gradually seeping into different social circles. The case of denialist group Escola sem Partido ('Nonpartisan School')³, claims that school education must reject any social, cultural or political approach (PENNA, 2017). Faced with the insistence on promoting science teaching of a neutral and uncritical nature, it is up to the academic community to invite the school community to debate issues related to the scope of science education and the threats posed by denialism.

The rise of denialism, coupled with the dissemination of fake news and conspiracy theories, brings science education to the center of the discussion because it has historically been committed to training children and young people to mobilize scientific knowledge critically. In this sense, formal and non-formal scientific education plays a significant role in addressing controversial issues. Science education is committed to questioning the foundation of denialist assertions and providing arguments for their refutation (see the special issue organized by Massarani, Marandino and Silva (2021).

In this context of denialism and post-truth all over the news and social media, we must deal with this challenging issue. On the one hand, science education needs to be based on critical foundations that include the historicity and the political, social and cultural commitments that support and prove the non-neutrality of the scientific enterprise. On the other hand, the transient nature of scientific production and knowledge should not make them seem less relevant to a worldview that intends to expand the horizons of human knowledge. Although it cannot be ruled out that scientific knowledge is doomed to be considered "superior" to other forms of knowledge, subordinating them, its contribution in dealing with sanitary, environmental and technological dangers is indisputable.

It is important to understand science as one kind of knowledge among many other ways of knowing/doing relevant to different cultures. This realization is the push for the emergence of the dialogic action, which allows the co-construction of new knowledge and solutions to perceived/felt problems and provides help in facing them. In this sense, we cannot afford to admit the symbolic and material devaluation of scientific production nor neglect its political role in the projects of a nation.

Finally, we understand that tracing the traps of scientific denialism must be an urgent task that brings together teachers of all levels in a shared enterprise to discuss and deepen our understanding of the false premises of this denialism so that pedagogical actions can be taken to guide this debate in the classroom. These actions must include questioning the Brazilian curriculum with due diligence to evaluate the recent changes to rules and guidelines in favoring or disfavoring the confrontation of scientific denialism.

In addition, it is crucial to develop a critical view about the power of the autonomous and combative work of education professionals concerning scientific, citizen and democratic learning of all students.

³The movement was founded in 2004 by lawyer Miguel Nagib, arguing for defending the family and social values aligned with Christian beliefs. It brings together several public sectors, including different Catholic and Protestant leaderships that straightforwardly accuse the left-wing party that ruled Brazil from 2002 to 2016 of hyper sexualizing students and developing critical thinking instead of teaching content neutrally. The members lobby conservative parliamentarians to amend the Federal Constitution and the National Education Guidelines and Framework Law/1996, proposing a bill that contains a series of interventions in schools. The movement aims to control the curriculum, with explicit references to the disciplines of Science and Biology, on the teaching of evolution, sex education and other topics.

Faced with the reductionism of business and ultraconservative groups that dispute the curriculum as a neutral construct (given the suppression of the word gender from the national curriculum guidelines) and assuming it merely as training on mercantilist and moralistic bases, the issues raised by the new curricular guidelines are crucial to combat denialism scientific (OSTERMANN; REZENDE, 2021). Education is not about teaching science regardless of the country's cultural, social, economic, and political context, focusing abstractly on knowledge without confrontation with this same context.

Fighting denialism is an urgent calling that demands a collective and sensible attitude towards the students, to their lives and cultural belongings, and taking into account how global trends operate upon them so that they cannot be mindful and critical of their realities.

Thus, in order to reflect on flaws, weaknesses, resistances and other ways of doing and teaching science, not only do we need to link education to the social issues and political contradictions of our time but also think of ways of bringing knowledge together so that we can ultimately address social injustice. As long as the 'beloved homeland' – as stated by the current government – continue to murder *Moíseses*, *Joões-Vitores* and *Miguéis*, science education needs to do much more against racism and push for anti-racist education.

Perhaps it is crucial to think that Science Education urgently needs to 'welcome' students into its practices – as the Congolese refugee Lina puts it – and make them realize that they are the people for whom all epistemic and political efforts need to aim. Mensah and Jackson (2018), when analyzing the experiences of teachers of black students, invite us to reflect on the meanings of whiteness as a part of the training of science teachers. They propose that we think not only about the students' needs but also about the teachers they will have and what training allows breaking through the perpetual cycle of alienation, exclusion and inequality in science. Nascimento (2019) blames whiteness in science education, affirming the importance of critical racial literacy for anti-racist education. To this end, it is necessary to review our research agenda and training practices as part of our epistemic and political commitments.

We argue that if science education focuses only on the critique of an epistemic neutrality rooted out of the evils of coloniality, we run the severe risk of losing sight of denialism for not aiming at the right target. This issue cannot be addressed through knowledge and methods from national standards that deny our past and mishandle the present. There will be no social justice if we teach and perform research backwards to our colonial past.

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