

The zika epidemic: perceptions of science and technology in a science communication video

ABSTRACT

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In this article, we took an excerpt from a doctoral dissertation and analyzed a science communication video from the Nerdologia channel on *YouTube*, which addresses the socio-scientific controversies surrounding the Zika virus epidemic and microcephaly. Our objective is to understand discourses on science and technology, particularly in relation to issues of gender and race and their implications for science education. The video underwent a process of decoupage, inspired by French film analysis, and was broken down into its constituent elements, such as shots and scenes. We then analyzed the video based on the theoretical-methodological framework of Franco-Brazilian Discourse Analysis (DA). The video presented a colonial approach that ignores the social inequalities that are systemic in our society. The results point to a silencing of social, racial, and gender issues and to the need to work toward overcoming the effects of coloniality and inequalities in science education. At the end of the article, we present a suggested teaching sequence aimed at continuing professional development of teachers to become critical readers of educational science videos.

KEYWORDS: Science Education; Educational Video; YouTube; Zika Virus.

A epidemia de zika: sentidos sobre ciência e tecnologia em um vídeo de divulgação científica

RESUMO

Neste artigo, fizemos um recorte de uma tese de doutorado e analisamos um vídeo de divulgação científica do canal Nerdologia, no *YouTube*, cujo tema são as controvérsias sociocientíficas da epidemia do Zika vírus e da microcefalia. Temos como objetivo compreender os discursos sobre ciência e tecnologia, especialmente em relação às questões de gênero e raça e às suas implicações para a educação em ciências. O vídeo passou por um processo de decupagem, inspirado na análise fílmica francesa, sendo decomposto em seus elementos constitutivos, tais como planos e cenas. Em seguida, analisamos o vídeo com base no referencial teórico-metodológico da Análise de Discurso Franco-Brasileira (AD). O vídeo apresentou uma abordagem colonial que ignora as desigualdades sociais que são sistemáticas na nossa sociedade. Os resultados apontam para um silenciamento das questões sociais, raciais e de gênero e para a necessidade de trabalharmos pela superação dos efeitos da colonialidade e das desigualdades na educação em ciências. Ao final do artigo, apresentamos uma sugestão de sequência didática voltada para a formação de professores leitores-críticos de vídeos educativos de ciências.

PALAVRAS-CHAVE: Educação em Ciência; Vídeo Educativo; YouTube; Zika Vírus.

INTRODUCTION

Based on the theoretical and methodological framework of Franco-Brazilian Discourse Analysis (DA), we have excerpted a section from a doctoral dissertation (Karat, 2022) completed in 2022. In that study, three science-related educational videos from *YouTube* were analyzed, two of which were published on science communication channels (SC). The video channels were selected according to the following criteria: focus on Biology and Science; channels with many subscribers and views; and focus on recent socio-scientific controversies. The analyses served as a sample of how educational videos function on *YouTube's* educational platforms. For this article, we selected the video “Zika Virus” (Iamarino, 2015), which had the highest number of subscribers and views compared to the other two videos analyzed in the study. The video is 6 minutes and 56 seconds long and was published on the Nerdologia channel on December 10, 2015, at the onset of the Zika virus (ZIKV) epidemic and the microcephaly outbreak, in a highly controversial context of widespread socio-scientific controversies and the spread of *fake news* on social media. The Zika virus epidemic occurred from 2015 to 2016, and during that period, a Public Health Emergency of International Concern (PHEIC) was declared regarding microcephaly in newborns, which was associated with the Zika virus. The national public health emergency was declared over in May 2017, but the Zika virus continues to circulate in Brazil. The problem with mosquito-borne diseases is far from over, and epidemics of dengue, Chikungunya, and Zika always return during the hot and rainy seasons of the year. Thus, this topic remains very important for science education.

At the time the “Zika Virus” video was published, Nerdologia was hosted by biologist Átila Iamarino, who holds a Ph.D. in microbiology and is a professor at USP. The Nerdologia channel is hosted on *YouTube* and was formerly part of the SciComm *Science Vlogs* Brasil (SVBR) network. It is a SciComm channel with 3.43 million subscribers and 1,090 published videos. The channel began in 2010, when Átila associated with the creators of *the Jovem Nerd website*. At the time, the channel promised a scientific analysis of *nerd* culture, with topics ranging from the science behind superheroes to science and technology issues featured in the media. Currently, the videos on the Nerdologia channel are presented by Filipe Figueiredo, who also hosts the Xadrez Verbal channel. In the channel description, we find the *slogan*: “a *nerdy*, scientific, and historical analysis of various aspects of *pop* culture.” From the theoretical perspective of cultural studies, a video can be educational even if it was not intended for use in a classroom setting, implying a different interpretation. Although Nerdologia’s focus is on SciComm, the channel can be considered educational. As of October 2025, the video “Zika Virus” had 666,478 views, 74,000 “likes,” and 2,036 comments, with the most recent one posted in October 2025. In this sense, given the channel’s wide reach, especially among students and teachers in basic education, we believe it is important to understand which discourses on science and technology are present in the video, particularly regarding issues of gender and race, as well as the implications of these discourses for science education and the development of critical audiovisual readers of educational videos. The focus of this research is justified by the lack of studies on the themes of gender and race in science educational videos, as well as on the development of critical readers of science educational videos. At the end of the article, we present a suggested teaching sequence aimed at continuing

professional development of teachers to become critical readers of science educational videos.

Below, we present the DA framework used in this study. This is a theoretical-methodological framework, as its concepts are inseparable from the practice of analysis.

THEORETICAL-METHODOLOGICAL FRAMEWORK OF FRANCO-BRAZILIAN DISCOURSE ANALYSIS

We begin our analysis with the process of audiovisual decoupage, inspired by French film theory, which consists of breaking down the work into its constituent elements, such as shots and scenes. According to Vanoye and Goliot-Lété (2012, p. 14), analyzing a film means “breakdown it into its constituent elements,” and this “deconstruction of the film is equivalent to its description.” We watched the video several times to perform the deconstruction, identifying the shots, sequences, and scenes. In total, we identified 26 shots, of which 3 were excluded from the corpus because they were advertising unrelated to the video’s theme. Next, we numbered the shots and created a table with two columns: one with the description of the images and the other with the description of the sounds.

Once this was done, we proceeded to analyze the verbal and nonverbal texts that make up the audiovisual material, based on the theoretical-methodological framework of Discourse Analysis (DA). Text analysis occurs through the mediation of two devices: the theoretical and the analytical, constructed from the questions posed regarding the materials under analysis, which help us move beyond interpretation and understand the functioning of discourse. For the analyses, we selected the following theoretical concepts: paraphrase, polysemy, silences, and imaginary formations (power relations, relations of meaning, and mechanisms of anticipation). We also employed the concepts of intertextuality, interdiscourse (discursive memory), and discursive formations.

Initially, we looked for paraphrases, which, according to Orlandi (2013, p. 67), are “the presence of historicity in language.” For this author, in the processes of paraphrase there is always something that remains, such as different ways of saying the same thing; that is, “different formulations of the same sedimented discourse are produced” (Orlandi, 2013, p. 36). Thus, paraphrases provide us with clues to meanings that have already been stabilized and belong to specific ideological formations. Discursive formation is a concept proposed by Foucault. According to this concept, identical words can have different meanings depending on the discursive formation in which they are embedded. Discursive formation is related to the socio-historical context and enables certain effects of meaning in the text, determining what can and should be said.

A text, from a discursive perspective, can be a word, an image, sounds, a sentence, or a set of sentences (written or spoken), or even an audiovisual work. The text functions as a unit of meaning, considering its conditions of production. It is the analyst’s task to understand how the text functions and how it produces meanings. A text is part of a broader “discursive process”; that is, we can consider it “an exemplar of discourse” (Orlandi, 2013, p. 72). Every text is heterogeneous, as it is traversed by different discursive formations. Regarding the predictability of

a text's readings, Orlandi (2012, p. 56) notes that "meanings have their own history; that is, there is a sedimentation of meanings according to the conditions of language production." The author points out that "a text is related to other texts (intertextuality)." When the subject writes, reads, or speaks, they are interpreting, and this occurs under specific conditions of production. However, we have the illusion of being at the origin of our speech, but what we say only makes sense because it has already been said—that is, it is part of the interdiscourse, of what has already been said but has been forgotten.

Discursive memory (interdiscourse) is what underpins our present, past, and future utterances. According to Orlandi (2013, p. 40), "in every language there are rules of projection that allow the subject to move from the (empirical) situation to the (discursive) position. What matters in discourse are these positions. And they matter in relation to the socio-historical context and memory." Among the so-called imaginary formations are relations of meaning, according to which a discourse is always related to other discourses, forming part of a broader discursive process. Orlandi (2013, p. 43) explains that "words do not have meaning in and of themselves; they derive their meanings from the discursive formations in which they are inscribed." Another important concept in DA is silence, which always accompanies power relations. The discourse analyst must also consider what is not being said and what cannot be said.

Given that language is not transparent, we present below an analysis of the conditions under which the videos were produced, which includes the socio-historical context of the microcephaly epidemic and the immediate context, comprising the *YouTube* platform and video channels.

THE NERDOLOGIA CHANNEL AND THE SCIENCE VLOGS BRASIL PLATFORM ON YOUTUBE

The Nerdologia channel was once part of SVBR—Átila Iamarino was one of its founders—but today the channel is no longer part of that science content platform. SVBR was created in 2016 by *Numinalabs*, a scientific content generation company, coordinating a network of science channels on *YouTube* that came to be identified by a quality seal, so that the public could identify which *YouTubers* disseminate quality science in Brazil. The seal would serve as a guarantee that the video uses recognized sources representative of the current scientific and academic consensus, and is constantly peer-reviewed.

The creation of SVBR was an attempt to address the rise of misinformation, pseudoscience, and *fake news* on *YouTube*. In 2019, SVBR was relaunched and underwent a change, now including content creators from the fields of mathematics and the humanities. The categories of Patrons and SVBR Friends were also created. In the month of SVBR's relaunch, a video was published about the channel's objectives and the reasons for the relaunch. In one segment of this video, the host explains that a group of scientists decided to come together to create a "seal that certifies a commitment to scientific quality on *YouTube*, to help you more easily discern whether that *online* content is reliable or not" (Calazans, 2019), reinforcing the idea that science is always reliable. There is a reproduction of the "authoritarian scientific discourse, which bestows the seal of truth upon its own

discourses” (Barcelos, 2020, p. 1505). It is worth remembering that, from a discursive perspective, authoritarian discourse is one in which polysemy is contained, leaving no room for other possibilities of expression. Furthermore, it is rare for the discourse of scientific communication in the media to be open to controversy and debate, as there is a tendency to present science as the only possible solution to problems (Pechula, 2007).

On March 4, 2016, around the time of the SVBR network’s launch, Galileu Magazine published an article about the new SciComm platform. In that March 4, 2016, article, a photo featuring the entire SVBR team stands out because almost all the participants are white men. There are few female *YouTubers* in the photo, and all of them are also white. According to Santos’s research (2021, p. 225), the Brazilian science communicator on *YouTube* has the following profile: “male, cisgender, white, young, non-religious, middle class, living in the metropolitan area of a state (most likely São Paulo), with a college degree and, in many cases, postgraduate degrees.” Women working in science communication are in a vulnerable position, “considering that prejudices, stereotypes, and disqualification are components of sociocultural, economic, and political processes that undermine women’s roles in institutions that position themselves as holders of privilege—such as Science” (Costa & Carvalho, 2020, p. 46).

The study by Costa and Carvalho (2020) analyzed a video on sexism from the Nerdologia channel, in which the research *corpus* consisted of comments from users who had the highest engagement. One of the findings of this study indicates a “predominance of negative reactions to the narrative led by a woman in an environment originally dominated by male presenters” (Costa & Carvalho, 2020, p. 42). We can identify the presence of the coloniality of power on the *YouTube* platform. This power structure is maintained through a social classification of the world’s population based on the “idea of race, a mental construct that expresses the basic experience of colonial domination” (Quijano, 2000, p. 201). According to Lugones (2008), the ideas of race and gender function as highly effective and enduring instruments of social domination, being fundamental to the maintenance of coloniality in contemporary societies.

Algorithms have contributed to reinforcing this pattern of power on *YouTube* platforms. There is algorithmic steering on *YouTube* through which people receive video suggestions. According to Kyncl and Peyvan (2019, p. 119), having an open platform where anyone can post their content does not guarantee equal representation, because these algorithms “are designed to be impartial, but statistics show that they are still subject to the same tendencies—unconscious, explicit, or systemic—that exist in society (Kyncl & Peyvan, 2019, p. 119). Although algorithms are considered neutral and unbiased, they exhibit biases, since the technological production environment is also a space in which racism is present. We must remember that digital artifacts are built by people and, unfortunately, racism is structural and manifests itself in various forms in our lives, including on social media platforms such as *YouTube*. In a study that sought to identify manifestations of whiteness in three SciComm videos published on SVBR, Quadros (2023, p. 100) points out that there is a silencing of racial issues in the themes of the analyzed videos and that the invisibilization of non-white voices and perspectives contributes to the perpetuation of structural racism and reinforces the “system of oppression present in all spheres of society” (Quadros, 2023, p.

100). The author notes that it is essential to denaturalize this silencing in order to “combat structural racism. We must recognize racism as a present and persistent reality, promoting active listening and fostering non-white experiences and perspectives” (Quadros, 2023, p. 101).

ZIKA VIRUS AND THE MICROCEPHALY EPIDEMIC: A women’s issue?

The video was produced in 2015, at the onset of the Zika virus and microcephaly epidemic in Brazil. At that time, researchers knew very little about how Zika Congenital Syndrome worked and were seeking answers to many gaps in knowledge, such as the sexual transmission of the Zika virus. The possibility that the Zika virus could be transmitted sexually led to the disease being framed as a “women’s issue (of childbearing age or who are pregnant)” and brought with it the stigma of a “sexually transmitted disease” (Nunes & Pimenta, 2016, p. 37). Statements by the director of the Department of Communicable Disease Surveillance at the Ministry of Health caused controversy by suggesting that women of reproductive age should avoid pregnancy during the Zika virus epidemic. Shortly thereafter, the Ministry of Health reconsidered this guidance and stated that the decision should be a personal one, made by the woman with her family.

At the time, the Ministry of Health issued guidelines for pregnant women, with the aim of reducing Zika virus infections. Authorities in Brazil and other Latin American countries advocated “for pregnancy management, contraception, and even sexual abstinence during pregnancy—reviving an ideological discourse on women’s freedom and sexuality” (Nunes & Pimenta, 2016, p. 29). These discourses fail to take into account the fact that more than half of pregnancies were unintended and that “not all women have access to or control over contraceptive use,” in addition to the existence of “cultural and religious barriers” and “a high prevalence of rape” (Nunes & Pimenta, 2016, p. 37). Furthermore, recommendations for sexual abstinence were not directed at men, highlighting a culture of holding women responsible for reproduction. Regarding women’s reproductive rights, Diniz (2016, p. 3) argues that it is necessary to ensure that women have “access to information and family planning, including long-acting contraceptive methods [...] as well as the right to terminate a pregnancy.”

Women are not equally affected by ZIKV. Women, especially Black women and those living in peripheral areas, were the people most severely affected by the Zika virus epidemic and microcephaly (Silva et al., 2017). Congenital Zika syndrome (CZS) “has a specific geographic and socioeconomic distribution in Brazil: poor women from the Northeast are the most affected by the new disease” (Diniz, 2016, p. 1). Certainly, poor, Black women with low levels of education who live in the poorest regions of the country were the most affected by the ZIKV epidemic. The burden of caring for microcephalic children, victims of ZIKV infection, fell on the shoulders of these women, who were often abandoned by their husbands or partners.

Throughout 2015, the Zika virus epidemic was a constant presence in the news, leading to the circulation of a vast amount of information about new findings regarding the disease. At the height of the ZIKV epidemic in Brazil, dozens of *fake news* stories emerged and were shared primarily through social media. In the

search for quick and simple answers to complex issues, such as the aforementioned epidemic, people often end up accepting as true ideas based on common sense or produced from prejudice. Misinformation linking Haitian immigrants and Cuban doctors to the arrival of the Zika virus in Brazil became common, such as: 1) the Zika virus arrived in Brazil with Haitian immigrants; and 2) Zika came with the Cuban doctors.

At the time, Brazil was undergoing an economic and political crisis, and it was common for the media to portray immigrants negatively, as the “scapegoat for the problems.” Brazil received Bolivians and Haitians, but also Portuguese and Spanish people. However, the press frequently highlights the problems that Haitians bring, constructing a narrative that they are the problem. Discrimination and racism in the press date back centuries and continue to this day in Brazil. In the case of the Cuban doctors, there was a mix of xenophobia, racism, and gender issues. Cuban female doctors made up the majority of medical professionals who arrived in Brazil through the federal government’s “Mais Médicos” program.

During their professional practice, these female doctors faced prejudice, encountering racism and xenophobia regarding their work as medical professionals. These doctors lived here in Brazil on an income well below the average for Brazilian doctors and faced prejudice for two reasons: because they were women in a country where the medical workforce is predominantly male, and because some of these doctors were Black and immigrants from a socialist country. The hate speech against “Mais Médicos” gained traction because the white medical elite felt its traditional position threatened. A comment by a journalist on social media, which reverberated in the media, exemplifies very well the racial and class prejudices common in part of Brazilian society: “Forgive me if this is prejudice, but these Cuban doctors look like maids! Are they really doctors???” (Journalist says that, 2013). The journalist’s comment “reinforces the idea that to be a doctor, one must ‘look like a doctor,’ come from a certain social class, and, above all, be white.” Furthermore, this comment demonstrates prejudice against domestic workers, as it is a low-paying profession that does not require extensive education.

The fear of immigrants, viewed as carriers of disease and as threats, is a phenomenon that has recurred throughout the history of epidemics. A similar situation occurred during the COVID-19 pandemic, when young Black people, migrants from Venezuela, Haiti, and Senegal, faced racial discrimination and xenophobia in meatpacking plants in southern Brazil, where they worked in precarious conditions and struggled to access healthcare and basic rights (Segata et al., 2021).

In March 2016, there was a decline in the number of Zika cases, coinciding with the onset of the coolest and driest season of the year and a decrease in the proliferation of *Aedes aegypti* mosquitoes, with few reported cases of the disease during the summer of 2016. Zika began to receive less coverage in the news, which shifted its focus to the deep political crisis in Brazil, culminating in the *impeachment* process of President Dilma Rousseff. The media stopped paying as much attention to Zika and began to highlight a major international sporting event: the Olympic and Paralympic Games in Rio de Janeiro. Many questions arose at the time regarding the safety of athletes, coaches, and the public regarding the risk of contracting Zika during the event. The conclusion was that this risk would be very

low, since the mosquito that transmits the virus typically decreases significantly at this time of year. The Games went ahead following assessments by the WHO (World Health Organization) and the U.S. Centers for Disease Control and Prevention, but there was a recommendation that female athletes and tourists be excluded from the Rio 2016 Games. We can say that the Zika virus epidemic revealed profound “systemic gender inequalities in highly patriarchal societies” (Nunes & Pimenta, 2016, p. 38).

Below, we present the results and discussions based on the analysis of the video “Zika Virus.”

ANALYSIS OF THE ZIKA VIRUS VIDEO

The video has an opening sequence that begins with an image resembling a blackboard slightly smudged with chalk. On the blackboard, the notes of equations and graphs refer both to scientific work and to natural science classes. One can perceive a relationship of intertextuality, which brings the video closer to the symbolic universe of readers of comic books, video games, and Hollywood films. The background music evokes memories of games and movies, referencing *nerd* culture. Átila introduces himself and welcomes the audience, while also explaining the video’s objectives: “sejam bem-vindos ao Nerdologia! Eu sou Átila, biólogo, pesquisador, e se segurem porque vai dar zica. Hoje vamos entender o que é o Zika e por que ele é tão preocupante” [Welcome to Nerdologia! I’m Átila, a biologist, researcher, and brace yourselves because ‘zica’ is coming. Today we’re going to learn what Zika is and why it’s such a cause for concern¹] (Iamarino, 2015). Next to the presenter’s photo, his name and credentials appear in text: biologist, researcher. Just as in academic texts, Nerdologia videos always include references to the sources cited by the presenter. All Nerdologia videos share this characteristic: they show the presenter’s position. This position is that of a scientist, someone qualified to speak about science.

The presenter provides a background on the Zika virus and the disease it causes: “You probably hadn’t heard of the Zika virus until very recently, but you’re not alone—few people knew about it. Until 2007, we were only aware of 14 cases of Zika infection worldwide, in Africa and Asia” (Iamarino, 2015). During his speech, an animation shows images of a map indicating the location of the Zika Forest. In the comic books published by *Marvel Comics*, Wakanda is a fictional country located in Sub-Saharan Africa, where the superhero Black Panther lives. Átila goes on to explain that, prior to that, the virus circulated mainly among monkeys in the forest: “so much so that its name comes from the Zika Forest in Uganda, where it was discovered in 1947, likely near Wakanda, since they haven’t decided where it’s located in the comics” (Iamarino, 2015). To capture the attention of his young audience, Átila draws on references from American culture, such as the character Black Panther. The target audience consists of young people who enjoy science and technology, video games, comic books, TV series, and Marvel heroes. There are no references to Brazilian or Latin American productions. We can observe signs of a dominant colonial discourse, of the colonization of the imagination and memory.

Using images depicting the route taken by Portuguese caravels from Africa to

Brazil, the host describes the mosquito's journey and normalizes a narrative that objectifies the African peoples who were enslaved. The presenter explains that *Aedes aegypti* likely originated in Sub-Saharan Africa and lived in forests, where it laid eggs in holes in flooded trees and fed on the blood of other animals, but that "with the voyages and the *slave trade* to Brazil, the Portuguese and the Spanish also brought the mosquito and yellow fever to the Americas" (Iamarino, 2015). It is a discourse that evokes a colonial memory of the alienation of Black people, who were denied the possibility of existence as human beings. Oliveira (2017, p. 20) emphasizes that speaking of "slaves" "is different from speaking of enslaved people." The association between Blackness and slavery, made in a naturalized way and without historical contextualization, reinforces colonial discourse, which does not treat Black lives as human but as objects that can be commodified (Oliveira, 2017). By failing to problematize the ways in which racism is produced, this discourse can help reinforce racism in our society. The video carries this discursive memory, which associates Black people with slavery and needs to be decolonized. Thus, we consider it important that teachers, when using this video in the classroom, provide this historical context, thereby denaturalizing the association between Blackness and slavery.

The *biomedical discourse*, which focuses on the causes of diseases, symptoms, modes of transmission, preventive measures, and forms of treatment, dominates the video, both in the verbal paraphrases and in the images, which make up as nonverbal paraphrases and highlight the life cycle of the virus and the mosquito, for example. Typically, this discourse is associated with *blaming and holding* the individual *accountable*, absolving the state of its responsibilities in controlling epidemic diseases. This discourse is present in the video, as we can observe in an excerpt from the presenter's speech: "we must all help combat the *Aedes* mosquito [...] by preventing the accumulation of standing water wherever we can" (Iamarino, 2015). The biomedical discourse is evident in the repetition of certain words that form paraphrases, as shown in an excerpt from the video in which Átila describes the disease cycle: "a sick person is bitten by the mosquito, the virus multiplies inside the mosquito or even in the larvae that grow from the eggs, and is *transmitted* when the *infected* mosquito bites a healthy person" (Iamarino, 2015). *Biomedical discourse* tends to ignore the social and political factors of diseases. This discourse, linked to *mosquito-centric discourse* (centered on the elimination of the mosquito and its larvae), prioritizes pharmacological and technological solutions (insecticides, larvicides, transgenic mosquitoes, and modified mosquitoes).

Images of dozens of mosquitoes, bacteria, old tires, discarded bottles, and other abandoned objects accompany the presenter's speech. The background image depicts a blackboard with a calendar marked "1950" and an arrow pointing to insecticides. The fight against epidemics of diseases such as dengue, Chikungunya, and Zika has kept the focus on exterminating the transmitting mosquito. This type of discourse, focused on vector control—that is, on eliminating mosquitoes and their breeding sites—is dominant in the media and in biology and science textbooks. Átila recalls that mosquitoes were nearly extinct during the 1950s and 1960s, "through the use of insecticides, but they came back with full force" (Iamarino, 2015). Átila explains that the Zika and Chikungunya viruses spread from Africa and Asia to Brazil due to a global infestation of the two mosquitoes that transmit these viruses: *Aedes aegypti* and *Aedes albopictus*, which

are believed to have evolved and become urbanized. In addition to dogs and cats, which have been domesticated by humans, other animals such as “rats, pigeons, cockroaches, and mosquitoes that have come to live more closely with humans have evolved and become urbanized in this process” (Iamarino, 2015). The issue of human mobility around the world, which facilitates the rapid spread of the mosquito, was also not explored in the video, despite the presenter having described the virus’s circulation until its arrival in Brazil. According to Silva et al. (2020), extreme mobility is one of the factors contributing to the rapid spread of diseases. Stating that mosquitoes have evolved and become urbanized, without explaining environmental and genetic factors, ultimately silences the causes of pandemic outbreaks. It is very important that the relationships between environmental degradation and the emergence of epidemics be adequately addressed in science education, but unfortunately, initial teacher education has been “insufficient to deal with such issues in a thorough and connected manner” (Fisch & Schnorr, 2024, p. 1).

Most of the emerging diseases that have emerged in the last five decades are zoonoses. The viruses of many diseases exist in a natural cycle with wild animals, their hosts. These zoonoses only become pandemics as a result of “the destruction of natural habitats, animal trafficking, and the practice of consuming these animals for a wide variety of purposes” (Rabello & Oliveira, 2020, p. 2). Human deforestation activities that remove native vegetation in biomes such as the Amazon and the Cerrado to make way for monocultures and pastures result in the disruption of these cycles. As a result, the virus “which has the capacity for mutation and genetic recombination, is exposed to organisms that have not co-evolved with these viruses and, consequently, have not adapted to them” (Rabello & Oliveira, 2020, p. 2). The Zika virus, Ebola, swine flu, HIV, and, more recently, SARS-CoV-2 epidemics serve as a warning for us to rethink our “modes of production, consumption, and exploitation of natural resources” (Rabello & Oliveira, 2020, p. 6). With regard to science education, an epidemic could be a good opportunity to reflect on the ways in which natural resources are exploited, produced, and consumed in our society, establishing a connection between science and society.

Átila points out that *Aedes aegypti* mosquitoes have adapted very well to urban centers, but he does not explain the reasons for this adaptive success. The presenter notes that the female mosquito “lays her eggs in places with clean or dirty standing water, and cities have no shortage of pots, tires, bottles, trash, and many other places where water accumulates” (Iamarino, 2015). Accompanying the presenter’s narration, images such as photographs of mosquitoes, old tires, and discarded bottles are “pasted” onto the blackboard, along with dozens of mosquitoes drawn in chalk. The blackboard image also features a calendar marked “1950” and an arrow pointing to insecticides. Efforts to combat epidemics of diseases such as dengue, Chikungunya, and Zika have focused on exterminating the mosquito vector and its larvae. Átila recalls that mosquitoes were nearly eradicated during the 1950s and 1960s through the use of insecticides, but that they “returned with full force” (Iamarino, 2015).

The video reinforces the *mosquito-centric narrative* and the image of *the mosquito as a villain*. In one of the video’s images, for example, the mosquito is depicted as a target to be eliminated. Images representing the Zika, dengue, and

Chikungunya viruses appear alongside the mosquitoes. Historically, biomedical discourse has emphasized the elimination of both mosquitoes and their eggs and larvae through the use of larvicides. However, these pharmacological or technological interventions have failed to resolve the problem, and epidemics always return during the rainy and hot seasons of the year. There is a silence regarding the reasons why the use of such methods as a solution to end these epidemics has failed (). The video also does not address the problems caused by the indiscriminate use of insecticides and larvicides in the control of arboviruses, which could lead to mosquito resistance to these products.

A neutral approach prevails in the video, centered on “technological, pharmacological, and biomedical tools,” which may contribute to the perpetuation of the “systematic inequalities” that already exist (Nunes & Pimenta, 2016, p. 36). Technical solutions conceal, under the guise of neutrality and scientific objectivity, the “reproduction of logics of exclusion and neglect; they reflect global political structures and relations that promote inequality, vulnerability, and the disadvantage of certain groups and regions” (Nunes & Pimenta, 2016, p. 25). Although the presenter referred to the poor sanitary conditions in cities, there is no discussion (even a brief one) of the social, economic, and political issues that facilitated the adaptation and urbanization of mosquitoes. It is undeniable that accumulated trash favors the proliferation of mosquitoes, but we must not forget the systems of exclusion responsible for maintaining the social conditions that produce inequalities.

According to the perspective of decolonial studies, capitalism emerged with the colonial process and was based primarily on the exploitation of enslaved African and indigenous peoples, serving as the fundamental milestone for the emergence of a new global power structure: colonial capitalism (Quijano, 2000). Colonial capitalism left a legacy of inequality and social injustice that persists to this day. It is often said that the mosquito is democratic, but the epidemic does not affect everyone equally. The Zika epidemic had different impacts depending on class, gender, or social group (Lesser & Kitron, 2016). According to these authors, it can be said that “Zika is yet another indicator of inequality that persists in contemporary Brazil, even after several decades of democracy” (Lesser & Kitron, 2016, p. 167). According to Diniz (2016, p. 2), the highest number of cases of children with microcephaly was concentrated in the Northeast region: “72% are daughters of women from Bahia, Paraíba, Pernambuco, and Rio Grande do Norte.”

The cities most affected by the epidemic had poor basic sanitation, inadequate waste collection and disposal, and irregular or intermittent water supply, which led the population to store water at home in uncovered containers—conditions that favored the proliferation of the mosquito. Furthermore, in poor neighborhoods, there is a concentration of people living together in small spaces. The situation is quite different for families living in apartments in wealthier neighborhoods. These people receive water regularly, and the maintenance of water tanks in the buildings is carried out by condominium staff (Lesser & Kitron, 2016). This is necropolitics in action, deciding who may live or die (Mbembe, 2018). According to Santos (2025, p. 9), in the Brazilian context, necropolitics also “operates through the lack of healthcare and, consequently, of health in certain areas of the urban context.” The Zika virus epidemic particularly affected poor, marginalized women in northeastern Brazil, the majority of whom are Black. These are women living

under “regimes of precarious living conditions due to markers of gender, race, territory, regionality, and education” (Barroso & Gama, 2020, p. 92). The authors point out that these women were already being neglected by the state before the epidemic and that this neglect continued during the Zika virus epidemic. This situation of social, racial, and gender inequality was repeated years later during the COVID-19 pandemic. According to Pacheco et al. (2024, p. 19), the COVID-19 pandemic “highlighted gender inequalities between men and women, as well as among women of different classes, races, and ethnicities, ages, and other factors.”

When analyzing the phrasing, we find words in the video such as “combat” and “control,” which evoke a *war-like discourse*. Through this *war-like discourse*, the video reinforces the image of the mosquito as a villain to be fought. In one of the video’s images, for example, the *Aedes aegypti* mosquito is depicted as a target to be eliminated. *Warlike rhetoric* makes use of concepts of “containment and surveillance, of military inspiration, which emerged after World War I and are still used today by public health authorities, who adopted the ‘enemy’ framework to combat the health problems of the time” (Ferraz & Gomes, 2012, p. 71). The explanation for this is that most of the information we receive during health crises reaches us through media coverage. Gradually, the media has constructed a discourse based on “the statements of various stakeholders involved in the issue: administrators, doctors, scientists, citizens, and patients” (Ferraz & Gomes, 2012, p. 66).

The media has constructed a memory that repeats and renews itself with each new epidemic, even if these epidemics have distinct characteristics. The media’s memory, part of the interdiscourse, always revisits characteristics and emotions from past epidemics, such as fear, illness, feelings of insecurity, risk of death, and many others. According to Ferraz and Gomes (2012, p. 67), these feelings “mobilize shared networks of memories about diseases in general.” *Warlike discourse* is associated with *the discourse of fear*, which links epidemics to feelings of panic and insecurity. In this type of alarmist discourse, the etiological agents (causes of the disease), as well as their vectors (transmitters), are personified as monsters and villains. The video’s content—which includes the images, dialogue, and soundtrack—is permeated by a discourse of fear. The presenter explains that it is still too early to confirm that Zika is the cause of microcephaly, but that the Ministry of Health and the World Health Organization have established this link.

The following excerpt from the presenter’s speech reflects this *fear-mongering discourse*: “if the link is real, we will have a very, very serious problem. And thousands more cases of microcephaly in the country, with the deaths of babies” (Iamarino, 2015). Other images in the video evoke a climate of uncertainty and scientific controversy, which, combined with a suspenseful soundtrack, news reports announcing deaths, and an image featuring skulls, brings to mind the discursive memory of fear surrounding past epidemics. Some of the presenter’s remarks exemplify this discourse: “if Zika infection causes something similar—which we do not yet know—this could be the *most concerning* period [...] where organs do not form correctly, *potentially leading to death*, and for which *there is no treatment*” (Iamarino, 2015).

In the final scene of the video, we see four women, all white, one of whom appears to be a pregnant teenager. This teenager is shown lying down, apparently undergoing an ultrasound exam and being attended to by a female healthcare

professional. The image of the teenager lying down with her coat open, wearing a skirt over pants and a striped blouse, evokes memories of the 2007 film “Juno,” which was a huge box office hit. This is an example of how the Nerdologia channel uses *pop* culture references as a strategy to attract the attention of young internet users and, in this way, make it easier to approach more complex scientific content. The absence of men in this scene draws attention and evokes the discursive memory of the Zika epidemic, when many women with microcephalic children were abandoned by their husbands or partners (Diniz, 2016). We also note the presence of a prescriptive and authoritarian discourse directed at women, as shown in an excerpt from the presenter’s speech: “pregnant women should protect themselves with repellents and long clothing, in addition to undergoing prenatal care” (Iamarino, 2015). This type of discourse refers to the socio-historical conditions surrounding the Zika epidemic, when the possibility of the Zika virus being transmitted through sex brought back a moralistic discourse that blames and holds women responsible for reproduction. This was the discourse through which health authorities issued authoritarian directives to women, recommending that they avoid becoming pregnant and even that they refrain from having sex during the health crisis. Pacheco et al. (2024) point out that, even today, there is a sexual division of labor, in which women are destined for the reproductive sphere and men for the productive sphere.

The results of the video analysis, linked to the theoretical framework used in the research, provided a basis to develop strategies that aim to foster critical readers of educational science videos. Below, we present a proposed teaching sequence designed for biology teachers in basic education.

PROPOSAL FOR A TEACHING SEQUENCE THAT AIMS TO FOSTER CRITICAL READERS OF VIDEOS

The teaching sequence presented in this section of the article was adapted from the pedagogical strategies developed in a continuing education course offered to teachers during the second phase of the doctoral research that gave rise to this article. This course was designed as a sequence consisting of six teaching sessions, each lasting two hours. For this article, we designed a teaching sequence with six 50-minute lessons. Table 1 presents a summary of the activities proposed for the teaching sequence.

Table 1
Teaching Proposal for Critical Video Reading

General objective: to offer strategies that aim to foster teachers to become critical video readers Target audience: biology teachers in basic education Duration: 6 classes of 50 minutes
Lesson 1: Problem-posing How is the so-called “single narrative” reflected in science education? What is the relationship between the “single narrative” and the way we, as teachers, use videos in biology classes? Objectives: to reflect on how the “single narrative” is present in biology education and what the implications are for teaching? Activity 1: Screening and discussion of the video “The Danger of a Single Story” (Adichie, 2014), which features a talk by Nigerian writer Chimamanda Ngozi Adichie. In this talk, Chimamanda critiques what she calls the dominant narrative about Africa, as told by Americans and Europeans. The writer shows how this single narrative has produced negative stereotypes about the African continent and reflects on how this narrative has power dynamics, potentially being used to justify the domination of one people over another.
Lesson 2: Reading Images from a Discursive Perspective The DA perspective helps us understand that images and audiovisuals are not transparent and that we have versions, products of many choices made by a collective of people. To critically analyze a video, we need to deconstruct the idea of image transparency and the naturalization of the gaze toward the audiovisual. Objective: to deconstruct the idea of image transparency and the naturalization of the audiovisual gaze. Activity 2: Class on some basic concepts of Discourse Analysis: reading, text, and discursive memory (Orlandi, 2013); show images and video clips to explore the concept of visual discursive memory. Activity 3: Discussion on how the sciences circulate, are read, appropriated, and perpetuated through our school practices? Teachers should read the article by Ramos and Silva (2014) in advance.
Class 3: Reading images and decoloniality We understand that decolonizing the imaginary and memory is related to the idea of expanding the possibilities for interpreting audiovisual media, which is important for the formation of a critical reader. Objectives: to decolonize the imagination and memory in the interpretation of images and audiovisual media; to recognize the effects of coloniality in the presented audiovisual productions, as well as the silences regarding social inequalities, machismo, and racism in the presented audiovisual productions. Activity 4: Class on the basic concepts of coloniality (Quijano, 2000). Activity 5: Cinema and the construction of imaginaries and memories. Screening of images and film clips from Hollywood cinema and decolonial cinema. Discussion: What effects of coloniality are present in the audiovisual productions presented? Activity 6: Think of examples of audiovisual productions in which effects of coloniality can be perceived (to be reviewed and discussed at the beginning of the next class).

Class 4: Film analysis as a means of critical interpretation of audiovisual media

It is important to be familiar with the codes specific to filmic language, since understanding a filmic narrative requires an understanding of how this language functions.

Objectives: to deconstruct the idea of the image's transparency and the naturalization of the gaze toward audiovisual media; to present an example of video analysis using theoretical frameworks and analytical tools.

Activity 7: class on the concepts of film analysis and decoupage; class on audiovisual language: the components of a shot, camera movement, and shooting angles (Vanoye & Goliot-Lété, 2012); screening and discussion of the video "Zika Virus" (Nerdologia, 2015); discussion on possibilities for using this video and other SciComm videos in biology classes.

Class 5: collective video analysis (1st stage)

Activity 8: review class on some theoretical concepts of Discourse Analysis (DA) that can contribute to video analysis: production conditions, intertextuality, discursive memory, verbal and nonverbal paraphrases, relationships of meaning, and silences; introduce the basic concepts of socioscientific controversies.

Activity 9: The group of teachers should select a SciComm video that is up to 10 minutes long and refers to a recent socioscientific controversy. Teachers should justify their choice of video. Suggestion: give teachers one week to organize and select the video.

Activity 10: Ask the teachers to divide into groups. Each group should analyze the production conditions (immediate and socio-historical) of the chosen video. Each group of teachers should be responsible for breaking down a segment of the video.

Suggestion: allow at least two weeks for this activity.

Suggestion: Activities 9 and 10 can be started in class and completed at home, organized *online* by the teachers.

Lesson 6: Group video analysis (Stage 2)

Activity 11: Collective analysis of an educational science video (Stage 2)

Discussion of the production conditions of the video selected for analysis.

Decoupage projection created by the teachers.

Collective analysis of the video with the participation of all teachers.

Suggestions for writing assignments as a form of teacher assessment: develop a lesson plan incorporating strategies for using the analyzed video; draft a script for the production of a decolonial video.

Source: Authored by the author (2026).

FINAL CONSIDERATIONS

Overall, the view of science is neutral, and within it, human actions are disregarded or minimized. We need to establish the relationships between science and society in order to deconstruct the model of colonial capitalism, which ignores the social context and situations of inequality and social injustice. The biomedical discourse, focused on technological, pharmacological, and biomedical tools, is dominant in the video, which does not contribute to solving neglected diseases. The research revealed evidence of racial erasure in the video. Black people are not represented in any image in this video, reflecting the coloniality of power and

structural racism in our society. There is a silence regarding social, gender, and racial inequalities related to the Zika epidemic in the analyzed video. As Orlandi (2012, p. 128) states, discourse is always incomplete, such that “to say is to leave something unsaid; in other words, every utterance necessarily silences other words, producing a silence regarding other meanings.” The silences in the video reflect its conditions of production. What we observe in the “Zika Virus” video is consistent with the immediate conditions of production on the *YouTube* platform and with the socio-historical conditions of the epidemic. The racism and sexism present in the video refer to the *nerd* culture that inspired the creation of the channel, but they are also a reflection of the racism and sexism that are structural in our society. The analysis of the “Zika Virus” video highlights the importance of working to overcome the effects of coloniality and social injustices in science education.

Of course, it is not possible to exhaust the full complexity of the Zika virus epidemic in a single video, nor is that the intention of a popular science text. There are science texts “aimed at audiences with varying levels of prior knowledge and different degrees of interest,” which produce different versions of the same fact (Fahnestock, 2005, p. 78). *Vlogs* are an interesting way to promote science communication and make reading more appealing to students and teachers in basic education, who would likely not access other types of texts, such as scientific articles, for example. However, SciComm videos have their limitations, as Rafael Evangelista points out: “a news report, for example, can present other sides [...], while a science channel often presents only the researcher’s point of view” (Pierro, 2016). Recognizing that SciComm videos work with different textualizations, under different production conditions, as well as with different audiences, helps us consider the importance of teaching students to read other types of texts beyond textbooks. By understanding that videos are the result of choices made by a group of professionals involved in their production, it is up to teachers to act as mediators, engaging students in dialogue about potential socio-scientific controversies and other issues that were neither addressed nor explored in depth in the video. It is important to remember that videos are also texts, which produce meanings about science and the society in which we live. Thus, it is important to rethink how videos are used in education, beyond merely motivating and illustrating scientific content. The teaching sequence presented at the end of this article offers another possibility for teachers to denaturalize the interpretation of audiovisual texts and deconstruct colonial imaginaries and memories that remain deeply in schools and *YouTube* videos.

NOTES

1. In Portuguese, the word “Zika” sounds the same as the word “zica”. However, they do not have the same meaning. The expression “vai dar zica” means that a very serious problem is about to happen, while the word “Zika” refers to the disease caused by the Zika virus and transmitted by a mosquito. In his speech, Átila makes this pun not only because of the similarity in sound but also because of the severity of the epidemic caused by the virus.
2. This article was translated into English using an AI-powered machine translation service and reviewed by Cristina Elena Campos.

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