

A Framework for the Dialogic Contact between Digital Anthropology and Science Education

Uma Proposta para o Contato Dialógico entre Antropologia Digital e Educação em Ciências

Una Propuesta de Contacto Dialógico entre la Antropología Digital y la Enseñanza de las Ciências

Daniel Pigozzo,  e Matheus Monteiro Nascimento 

Abstract

Since the internet is present in virtually every domain of human activity, including academic research, the relationship between science education and fields such as digital anthropology must be strengthened. Our goal is to propose strategies for investigating how scientific knowledge and science-related educational knowledge are created, shared, and used in cyberspace from a cultural perspective. After examining theoretical aspects of the relationship between anthropology, education, science studies, and science education, we present our proposal. First, we delineate the terminology and conceptual categories appropriate to the study. Next, we discuss the importance of theoretical-methodological frameworks, highlighting theories and authors that are fundamental for a holistic perspective. We then explore possible research questions, objects, and scopes of inquiry. We also examine the online/offline dichotomy, showing that fieldwork must account for the specificities and contradictions inherent to cyberspace. Finally, we propose a spatiotemporal framework that helps illuminate how ethnographic descriptions can operate in an environment such as the internet. With this, we aim to facilitate the development of research on how people use the internet in their everyday lives to create and sustain cultures or communities that, in some way, involve science and science education.

Keywords: science education, digital anthropology, virtual ethnography, internet, cyberspace

Resumo

Como a internet está presente em praticamente todos os campos da atividade humana, incluindo a pesquisa acadêmica, a relação entre a educação em ciências e áreas como a antropologia digital deve ser fortalecida. Nosso objetivo é propor estratégias para investigar como conhecimentos científicos e saberes educacionais relacionados às ciências são criados, compartilhados e utilizados no ciberespaço a partir de uma perspectiva cultural. Depois de explorar aspectos teóricos da relação entre antropologia, educação, estudos das ciências e educação em ciências, apresentamos nossa proposta. Primeiro, fazemos uma demarcação de termos e categorias conceituais adequadas ao estudo. Em seguida, discutimos a importância dos referenciais teórico-metodológicos, destacando teorias e autores(as) fundamentais para uma perspectiva holística. Depois, exploramos possíveis questões, objetos e escopos de pesquisa. Também examinamos a dicotomia online/offline, mostrando que o trabalho de campo precisa considerar as especificidades e contradições próprias do ciberespaço. Por fim, propomos um enquadramento espaço-temporal que ajuda a compreender como descrições etnográficas podem operar em um contexto como a internet. Com isso, buscamos facilitar o desenvolvimento de pesquisas sobre como as pessoas usam a internet no dia a dia para criar e manter culturas ou comunidades que envolvem, de algum modo, as ciências e a educação em ciências.

Palavras-chave: educação em ciências, antropologia digital, etnografia virtual, internet, cyberspace

Resumen

Dado que internet está presente en prácticamente todos los campos de la actividad humana, incluida la investigación académica, es necesario fortalecer la relación entre la enseñanza de las ciencias y áreas como la antropología digital. Nuestro objetivo es proponer estrategias para investigar cómo los conocimientos científicos y los saberes educativos vinculados a las ciencias son creados, compartidos y utilizados en el ciberespacio desde una perspectiva cultural. Luego de explorar aspectos teóricos de la relación entre antropología, educación, estudios de la ciencia y enseñanza de las ciencias, presentamos nuestra propuesta. En primer lugar, realizamos una delimitación de términos y categorías conceptuales adecuadas para el estudio. Luego, discutimos la importancia de los marcos teórico-metodológicos, destacando teorías y autores fundamentales para una perspectiva holística. Después, examinamos posibles preguntas, objetos y alcances de investigación. Asimismo, analizamos la dicotomía online/offline, mostrando que el trabajo de campo debe considerar las especificidades y contradicciones propias del ciberespacio. Finalmente, proponemos un marco espacio-temporal que permite comprender cómo las descripciones etnográficas pueden operar en un contexto como internet. Con ello, buscamos facilitar el desarrollo de investigaciones sobre cómo las personas usan internet en su vida cotidiana para crear y mantener culturas o comunidades que, de algún modo, involucran a las ciencias y a la enseñanza de las ciencias.

Palabras clave: enseñanza de las ciencias, antropología digital, etnografía virtual, internet, ciberespacio

Introduction

In public debate, science education is commonly associated with psychology, history, philosophy, and sociology, but not always with anthropology. Maddock (1981, p. 23) highlights this omission, concluding that “science educators as a group have tended to neglect this field [anthropology] to date and it is important that steps be taken to remedy the situation.” Carlone and Johnson (2012, p. 151) also note that, “historically, science education research has rested on psychological notions of learning, and only in the past 25 years or so have anthropological perspectives surfaced with any traction.” That is, anthropology does not receive the same level of recognition as other research fields, despite its undeniable influence within science education.

Even in recent years, when science education is in fact associated with anthropology, this connection does not always unfold in the expected ways. Carlone and Johnson (2012, p. 151) also recognize how “science educators may not question or understand the nuances or historical roots of the concepts of culture they take up in their work”. They argue that, despite researchers’ investment in a cultural-difference lens, that is, an approach that acknowledges and leverages cultural differences in classroom settings, “science education scholars have taken up this lens uncritically, without attention to its limitations” (Carlone and Johnson, 2012, p. 169–170). Our argument aligns with this critique, and for this reason, we aim to strengthen the association between anthropology and science education whenever possible.

This negligence overlooks significant developments in science studies that have inspired science education research such as ethnographies conducted in laboratories and research centers (e.g., Knorr-Cetina, 1981), readings of primary scientific sources as cultural artifacts (e.g., Shapin and Schaffer, 1985), or analyses of groups of individuals in scientific institutions as communities (e.g., Traweek, 1988); archetypal examples of what the anthropological labor is. It also obscures later developments within science education itself, such as research on the culture of science and on cultural differences in educational settings (e.g., Hammond and Brandt, 2004).

Nevertheless, science education scholars still try to reevaluate their premises and approaches, investing in alignments between our research field and others such as anthropology, especially when our works take us from fields where science education research traditionally articulates knowledge (schools, universities, laboratories, museums, etc.) to new environments. One such case is the internet.

In its early days, when still mostly text-based with direct messages, blogs, and forums, the internet was able to create a rift, dividing social experiences into two: those online and offline. Nowadays, based mostly on images, audios and videos — with social media and applications available at any time and on any device — the landscape has changed. The internet is more incorporated into everyday life and into many fields of human activity, including academic research. However, the scope and range of technocultural contexts on the internet have created theoretical-methodological challenges for many research fields (Caliandro, 2018). To conduct effective internet research, it is important to explore established fields that have focused on these issues for decades. For instance, the connection between science education and anthropology is not always emphasized, and its link to digital anthropology, which has a rich history of internet-related research, is even less recognized. By digital anthropology, we refer broadly to the anthropological study of cultures and communities existing with and within the internet; a field which examines both the technocultural infrastructures that sustain cyberspace and the discourses and cultural practices that emerge through them. This article is part of this context.

Our objective here is to develop strategies and the necessary elements to investigate the creation, dissemination, and application of scientific (and science-related educational) knowledge in cyberspace through a cultural approach. We start by contextualizing our work, establishing our premises, and exploring existing ideas about the relationship between anthropology and education (Galli, 1993; Gusmão, 1997, 2015), anthropology and science studies (Fujimura, 1999; Martin, 1998), and anthropology and science education (Maddock, 1981; Hammond and Brandt, 2004). After delineating the relevant nomenclature and conceptual categories, we present our proposal, which encompasses four essential aspects: (I) engaging with theoretical and methodological frameworks that sustain a holistic perspective; (II) formulating research questions, objects, and scopes of inquiry that take the internet explicitly as a field of investigation; (III) attending to the specificities and contradictions inherent to online/offline dynamics; and (IV) adopting a spatiotemporal framework that supports the construction of robust ethnographic descriptions.

By doing so, we provide an overview of the relation between science education and digital anthropology to elevate it to a truly dialogic contact between research fields. Drawing on existing literature, we advocate for the study of dynamic interactions in online environments and their circulation of scientific knowledge, particularly within educational contexts. Anchoring our analysis in a worldview-oriented perspective, we offer constructive contributions while offering a novel approach that fully integrates digital anthropology and science education, attempting to bridge persistent gaps in their connections.

Contextualizing Our Work

It is important to note that we do not claim to be offering the first evaluation of the relationship between digital anthropology and other research fields. Rather, we build upon diagnoses that have already been articulated.

For instance, a review by Pigozzo and Nascimento (2023) identifies a lack of thematic balance among anthropological and internet-related ethnographic studies within educational research. They observe that several studies overlook anthropological dimensions by focusing almost exclusively on educational aspects such as descriptions of learning processes, while others fail to emphasize educational issues because of their theoretical frameworks or because they address broader topics, such as research methodologies.

Complementarily, Paoli and D'Auria (2021) show that, among studies whose research questions situate education as a domain of inquiry, there is an uneven distribution of labels (e.g., digital ethnography, virtual ethnography, netnography), which does not correspond to the broader pattern observed in other areas of inquiry.

Similarly, a review by Jensen et al. (2022, p. 1159–1160) about digital ethnography in higher education concludes that “higher education research could benefit from a deeper and more rigorous use of digital ethnography.” They suggest, among other recommendations, “a more reflective engagement with the practical and ethical issues related to the dual role of teacher-researchers; and the inclusion of more diverse sources of rich data, such as participant diaries, student outputs, and system usage data”.

These diagnoses indicate that, although the relationship between digital anthropology and science education does exist, it is not as developed as more established anthropological approaches within science education. What emerges, instead, is a relationship that lacks the characteristics of a genuine dialogue, one in which each field informs the other reciprocally, not necessarily in perfect agreement, but through the exchange of references and the gradual formation of a shared identity involving negotiations of meaning as well as the appropriation of theories and practices.

This existing convergence between digital anthropology and science education highlights a significant gap in current research. Since many contemporary social interactions are primarily mediated through the internet, exploring methodological approaches suitable for investigating human behavior in virtual environments is crucial.

Once this gap is acknowledged, we address a pressing need by proposing a framework that brings insights from digital anthropology into the domain of science education. Through this interdisciplinary perspective, we aim not only to deepen our understanding of the online circulation of scientific knowledge but also to refine methodologies for studying human interaction and behavior within digital settings.

Premises

How can we transform the relation between science education and digital anthropology into one with the characteristics of a true dialogue? Our attempt to conceptualize this relation as a dialogic contact rests on three premises:

- Reassessments of the relation between anthropology and different research fields are essential for understanding how it has influenced internet-related science education research.
- Necessity to delineate appropriate terms and establish conceptual categories consistent with studies in digital anthropology.
- Presenting exemplary research questions, references, and theoretical frameworks can benefit any researcher interested in approaching the internet anthropologically.

Background

Anthropology and Education

From the 1950s onwards, educational research became increasingly attentive to the sociocultural contexts in which it is produced and began recognizing that every way of researching and perceiving reality carries with it a pedagogy that contributes either to the perpetuation or the disruption of the status quo. Consequently, the 1970s became fertile ground for the social sciences in general and for ethnographic work focused on education, as well as for a closer convergence between education and sociology. Anthropology of education is sometimes considered a more appropriate label for these movements, given the slow but steady popularization of what came to be known as educational ethnography, particularly after the 1970s due to significant shifts in how culture was being conceptualized (Eisenhart, 2001, 2018).

However, according to Latour (1990) and Lévi-Strauss (1963) — who argued that while sociology is concerned with producing the social science of the observer, anthropology produces the social science of the observed — the distinguishing feature of anthropological studies lies in their ability to provide robust descriptions of groups and individuals contextualized not only in social and historical terms (a form of external contextualization), but also in interactionist and relational terms, by situating an observed “other” through the interpretive lens of an observing “I” (a form of internal contextualization). Their reflections offer an apt synthesis of what emerged from the convergence between education and anthropology during the 1970s.

With Gusmão's (1997) historical reconstitution, which reiterates observations by Galli (1993), it becomes evident that, despite some initial distance between anthropology and educational concerns, anthropologists have, since the late 19th century, tried to interpret a culture of childhood and adolescence, intercultural processes of youth and informal educational systems. There were even anthropologists who participated in curriculum reforms and social movements related to education during the first half of the 20th century, culminating in academic and political debates that shaped public discourse and contemporary views on schooling due to, among other factors, the active participation of researchers from well-established anthropological traditions, such as Margaret Mead and Ruth Benedict.

Gusmão (2015, p. 28–29) frames the movements between anthropology and education along two axes: research themes and anthropological theories. She argues that “from the 2nd half of the 20th century to the present, ‘theories of conflict’ have become catalysts behind the transformation of anthropology as a science”. From the 1960s to the 1990s, themes such as decolonization from post-functionalist, structuralist, and Marxist perspectives became prominent, portraying education as a process for reproducing social structures, as a state apparatus and as a site of alienation. From the 1990s to the present day, however, research has shifted toward themes related to the increasing complexity of societies, focusing on “inculturation processes” (such as learning), and based on interpretative, critical, and reflective anthropological traditions that see education as a process of transformation and liberation, as a “political field of many possibilities”, particularly with respect to diversity.

Anthropology and Science Studies

In general, the intellectual movements that emerged after World War II are considered the beginning of a political, social, and cultural turn in the study of science and education. In the 1960s, for example, we see the publication of *The structure of scientific revolutions* by Thomas Kuhn (1962/2012) and *Silent spring* by Rachel Carson (1962/2002). Alongside, but somewhat later, came the strong program in the sociology of knowledge developed by Bloor, Barnes and collaborators, the actor-network theory developed by Callon, Latour and collaborators and the sociological ideas developed by Bourdieu.

At first glance, the anthropological inspirations of these authors seem straightforward, since many early publications associated with science studies, particularly during the 1970s, are, in essence, ethnographic descriptions. However, much of the literature on this topic, despite the range of works and authors, focuses primarily on sociological disputes and influences (such as the laboratory studies, the conjecture that science as a social construction, etc.). Meanwhile, its anthropological foundations are often reduced to the mere provision of a “method” — ethnography — and represented through broad labels such as “cultural approach”. A closer look at Fujimura's writings (1999) reveals that research in science studies grounded in anthropological traditions

managed to avoid alternative labels and a dilution of their inspirations because their authors were situated within anthropology departments and insisted on publishing in anthropology journals.

Fujimura (1999) also shows how the “science wars” debates played an important role in bringing anthropology into closer dialogue with fields such as science studies. However, it is the work of Donna Haraway — as noted by Escobar et al. (1994) and Franklin (1995) — that really ignites this connection. She takes us into a cat’s cradle game between science studies and anthropological concepts aimed at the study of culture (Haraway, 1994), but she also offers a manifesto on the human condition, especially the lived conditions of women, in the face of narrowing boundaries between ideas of ‘humanity’, ‘nature’, and ‘machine’ (Haraway, 1991). Her contributions opened the doors to feminist studies related to the internet in times closer to her own (Correll, 1995) and also inspired studies that build bridges between digital anthropology and frameworks currently influential science education such as Bakhtin’s philosophy of language (Sniukaite, 2007).

Anthropology and Science Education

In one of the earlier attempts to address the relation between science education and anthropology, Maddock (1981) proposes an anthropological viewpoint for our field grounded in the recognition of a wider societal context in which science and science education function as cultural enterprises. In this viewpoint, they become components of educational systems and institutions that must adapt to the needs of all citizens.

In a more recent approach, Hammond and Brandt (2004, p. 41) advance similar ideas, arguing that “[c]entral to an anthropological approach to science education is the notion that science is a cultural activity, which developed as a subset of Western culture and is socio-historically situated”. Hammond and Brandt (2004, p. 2) also suggest that an anthropological approach to science education has epistemological, pedagogical and methodological implications for academic research.

In another recent framework, Lima and Nascimento (2021) reinforce and defend a remodeling of science education. With it, science education studies should address scientific and educational issues related to the natural sciences drawing on theories and methodologies associated with sociological and anthropological studies of science by authors such as David Bloor, Pierre Bourdieu, Joan Fujimura, Bruno Latour, Isabelle Stengers, Sharon Traweek etc.

Carlone and Johnson (2012), echoing Eisenhart (2001), indicate what perspectives have been used by science education studies while dealing with the concept of “culture”: funds of knowledge, third space/hybridity, and practice theory. These perspectives are informed, respectively, by (I) a conceptual model of culture in which culture is the shared knowledge, common practices, and patterns in lifestyle that are passed on generationally by well-defined groups of people (Carlone and Johnson, 2012, p. 152–153), (II) an expanded definition of culture as something not so delimited and transmissible between

generations of easily identifiable groups; a definition that eventually becomes grounded in the notion of social interaction (Carlone and Johnson, 2012, p. 155) and (III). a culture understood as “a shared set of meanings, continually produced in everyday practice” in which “new meanings can be congruent with what came before but also might have the potential to alter what came before” (Carlone and Johnson, 2012, p. 157).

Similarly, Hammond and Brandt (2004, p. 11–12) synthesized a decade of United-statesian science education research between 1993 and 2003 along three axes: “1) articles that deal with the culture of science in schools, 2) articles that deal with the impact of science education in disenfranchised groups ‘within’ the United States or ‘first world’ societies, such as minorities, women, or working-class youth, and 3) articles that address international and indigenous issues affecting science education outside the first world and among indigenous peoples of any country”.

Our work expands the implications of these perspectives by incorporating more recent developments. We aligned with all aforementioned ideas, but particularly with Hammond and Brandt’s approach in the sense of not trying to “reinvent the wheel” by redefining what constitutes an anthropological study of science or science education. Instead, we build upon what has been established within science studies, anthropology of education, and science education itself so that our field continues to engage critically with new concepts and perspectives, especially those related to digital anthropology.

If science education scholars aspire to develop “an all-embracing, community-based, science curriculum programme” as Maddock writes (1981, p. 20), then such a goal requires “deep knowledge of the background culture, its beliefs, attitudes, technologies, languages, leadership and authority structures, which in turn requires an anthropological insight on the part of programme planners and programme implementers”. Similarly, when trying to answer “what kinds of research are most effective in sorting out science education approaches that work in the complex realities defined by country, class, gender, race and other intersecting factors?”, Hammond and Brandt (2004, p. 9–10) argue that “we need research that can manage several levels of inquiry at once”; research focused not only on traditional educational settings, but also including broader aspects, focusing on “their families, their communities, their environments, and even the larger socio-historical context in which they are situated”.

Expanding the hall of implications of an anthropological approach to science education so that it includes digital anthropology accomplishes exactly this. It de facto incorporates new levels of inquiry so we can analyze a new environment, the internet, which is a great representation of the larger socio-historical context where we can develop a deep knowledge of the background culture of all sorts of individuals relevant to science education research — students, teachers or else — and where they can be found spontaneously uttering discourses related to science, to its nature and culture.

The culture of science typically presented in schools is highly idealized and grounded in a formulaic ‘scientific method’ used to solve problems (Hammond and Brandt, 2004, p. 13). This portrayal can also be found in some science education studies

and contrasts sharply with the culture of science in its context of production, outside of classroom settings, that is, where scientists do their work and where the products, concepts, artifacts, and solutions constructed by them (and by other science-related workers) might undergo societal evaluation.

Nowadays, the internet is an important stage for this process of societal scrutiny. Science-related discourses that occur online take multiple forms and serve multiple purposes, such as everyday interpersonal conversation, large-scale public debates, and even political deliberation; all of which leave traces, digital footprints that can be examined through immersion in online cultural settings. If contemporary science education research aims to develop more accurate representations of science culture, of how science works, and then bring it to educational settings, it must not ignore the central role the internet now plays.

The Proposal: A Dialogic Contact

Our main concern is to introduce new ideas on how to conduct science education research with an internet-oriented anthropological gaze, with particular attention to scientific — and science-related educational — knowledge.

Here, rather than offering a step-by-step guide to specific research methods for the internet, which are relatively common in the specialized literature, we reflect upon methodological aspects of the relation between science education and digital anthropology. Most importantly, we are highlighting relevant authors and well-established concepts.

Furthermore, we explore which theories may be referenced, which objects or research questions may be interesting, and how to identify where they might be most relevant — apps, websites, social media platforms. We also consider how the fieldwork may be described and where it might be conducted. What is its range of validity? To which periods or places can it be extended? Which analytical categories can be prioritized to enhance its explanatory power? These are the issues we explore.

Terminology and Demarcations

In internet-related anthropological studies, there is a wide diversity of terms: digital anthropology, anthropology of social networks, cyberanthropology, anthropology of the internet, anthropology in cyberspace, anthropology of cyberculture, techno-anthropology, etc. The same can be said about internet-related ethnographic descriptions: netnography, virtual ethnography, post-API ethnography, internet ethnography, online ethnography, digital ethnography, computer-mediated ethnography, etc.

Many of these labels are near-synonymous, but some carry specific meanings or refer to distinct frameworks. Anthropology in cyberspace and digital methods for ethnography, for instance, are more closely aligned to Latour's concepts such as human and non-human actors, socio-technical networks, and so forth. Netnography, in contrast, emerges from divergent reference points: on the one hand, anthropological traditions

(often connected to cultural studies and critical theories) and, on the other, commercial frameworks (informed by consumer research in fields such as management, tourism, marketing, advertising, etc.) with a focus on behavioral and consumption trends.

Labels tied to anthropology denote a general area of inquiry rather than a single, directly unified theory. They are all, in essence, anthropology itself, striving to consolidate themselves as a specific field because, after all, identity can be empowering. These labels stand as a common vantage point from which objects of study are examined and within which fieldwork is conducted, but they do not necessarily prescribe specific theories, concepts, or methods that must be prioritized.

Despite this terminological diversity, some degree of demarcation is necessary to avoid total incommensurability. Hence, we use digital anthropology as the broader label for internet-related anthropological studies, sometimes using anthropology in cyberspace or anthropology of cyberculture when appropriate. Declaring a study as digital anthropology is analogous to declaring that a study is grounded in educational psychology: it identifies a general perspective without specifying a particular school of thought or theoretical lens.

Although digital anthropology may be understood exclusively as the work of Heather Horst, Daniel Miller, and collaborators (2012), we argue that the label has come to represent, since its early dispersed appearances in the 2000s (Cohen and Salazar, 2005; Rieu, 2007), the field in its entirety rather than a single perspective. When referring specifically to those authors' contributions, we opt for expressions such as Horst, Miller, and collaborators digital anthropology, anthropology of social media or anthropology of mobile phones; terms now used in the second edition of *Digital anthropology* (Geismar and Knox, 2021).

Conversely, labels related to ethnography (such as virtual ethnography) refer more to methods or the practical components of a methodology. They indicate relatively specific goals and sets of concepts to be mobilized, but they do not constitute full theoretical frameworks. Instead, these sets and objectives tend to stand as bridges between ethnographic practices and other methodologies approaches, enabling more articulated descriptions.

However, as noted, terminological demarcation is essential to avoid incommensurability and, for the sake of consistency, we treat digital ethnography and virtual ethnography as interchangeable umbrella terms for internet-related ethnographic work. Although netnography is a popular term, arguably more popular than the aforementioned two, it is not the most appropriate descriptor for studies grounded in an anthropological approach, as nowadays it has become strongly with market-oriented research values, and approaches. It also echoes outdated notions of computer-mediated communication, whereas virtual ethnography, while also having notoriety, arises from a proper anthropological gaze with epistemological and methodological dimensions akin to contemporary understandings of ethnography (Máximo et al., 2012).

The term virtual ethnography can be associated exclusively from Christine Hine's perspective, and some authors (Jensen et al., 2023), supported by textbooks and handbooks (Hjorth et al., 2017; Pink et al., 2016; Varis, 2016), promote digital ethnography as the umbrella term. However, we understand that virtual ethnography also represents, despite its particularities, a sufficiently comprehensive descriptor for internet-related ethnographic works and, again, not reducible to just a single author's perspective. Moreover, much as digital anthropology has come to denote more than the contributions of particular scholars, Hine currently has shifted toward alternative labels (e.g., "ethnography for the internet"), indicating that virtual ethnography was never a self-enclosed framework. It could also be argued that virtual ethnography and digital ethnography have roughly equivalent suitability — the latter having initially emerged from a smaller circle of anthropologists such as Sarah Pink and Heather Horst before gaining broader popularity and consolidation in academic books.

Labeling becomes even more complex due to the terminological diversity used to describe the field of work itself: internet, web, cyberspace, virtual world, digital world, social network, etc. Some terms indicate where the work is situated — social media, for example, designates research focusing on specific platforms such as Facebook. Other terms, such as cyberspace and internet, indicate holistic approaches concerned with the whole, asking how to, or if we should, put a frame on this totality. The issue is aesthetic; except for terms tied to specific platforms, the vast majority of these labels are synonyms whose differences are overstated. We prefer internet and cyberspace because they are two of the most recognized and descriptive terms.

There are also ongoing debates on the adequacy of adjectives such as cyber, digital, virtual which are associated with dichotomies, i.e., digital-analog, virtual-real, and online-offline. Even Hine (2017) acknowledges that sometimes simply enunciating ethnography instead of virtual ethnography is legitimate. The existing adjective-based labels do not lose explanatory value: many researchers continue to find meaning in them — and some labels, such as cyberanthropology, have evolved to articulate deeper meanings, including efforts to position itself as the anthropology of the contemporary (Knorr, 2011). These efforts should not be dismissed. With these labels, there is a recognition of pre-existing material contradictions that spontaneously materialized in public and academic discourse. It is a way of drawing attention to the dialectical nature of culture and the frameworks we use to study it. A label that foregrounds contradictions in this context is not a problem because the culture and human experience are themselves contradictory. Dialectics can and should be embraced. That is, we consider it not a bug, but a feature (in a positive way).

In conclusion, through this examination and demarcation of specific terms, our goal is not to regulate, but to facilitate communication about anthropological and ethnographic research related to the internet — or cyberspace.

Worldview

Ethnography is neither a mere methodological tool nor an atheoretical method. Ethnographic works are both the process and the product of anthropological research, materialized in dense descriptions of acts and utterances lived through immersion-observation-participation in cultures and communities. At the same time, however, they do not constitute full bodies of theory; even when mobilizing grounded concepts, they do not present all the characteristics expected of full theoretical frameworks. Research carried out through virtual ethnography therefore needs to be articulated with some theory or ideology capable of positioning it within a broader range of validity. When recognizing this, we must ask: on which theories can we ground our work?

Some theories can be considered because they have been articulated, at least preliminarily, with virtual ethnography. The previously mentioned review by Pigozzo and Nascimento (2023) indicates internet-related educational studies already exhibit some theoretical diversity. In their diagnostic, materialist conceptions of history (Álvares and Pinheiro, 2019), cultural tribalism (Valentim and Moreira, 2020), matricentric feminism (Lehner-Mear, 2018), and Bakhtin's philosophy of language (Souza and Ferreira, 2015) exemplify such diversity. Beyond these, we can also highlight Latour and collaborators' actor-network theory contributions to the field (Caliandro, 2017; Máximo et al., 2012; Rifiotis, 2013; Segata, 2014) as a strong example.

Other theoretical lenses should also be explored, although it is essential to consider the explanatory power of whatever theory chosen. Can it articulate something relevant about culture and its materiality? It is necessary to reflect on this since an important discussion of digital anthropology seeks precisely to address the question: how can we say something meaningful about a community, a culture, or even about reality when the field of work is constituted largely by text on a screen?

Mikhail Bakhtin's philosophy of language (Bakhtin, 1986; Voloshinov, 1986) is one example of a particularly adequate worldview for fostering a dialogic contact between science education and digital anthropology (Couto Jr., 2013; Sniukaite, 2007). It is a philosophy that enables us to make concrete analytical utterances about the nature of discourse and how it materializes in text. Conversely, other theories may be better suited to encompassing detailed descriptions of connections, non-linearities, practices, and narratives uttered by practitioners and participants of a given culture, depending on the context under study. In this regard, Gregory Bateson's (1967, 1987) cybernetic perspective is appropriate, particularly when addressing the relationships humans establish with different contexts and environments (Budka, 2011; Cesarino, 2021; Knox, 2021).

When studying the internet, it is important to accept a certain level of cultural relativism and to critique the global nature of digital connection, maintaining a critical view of the presumed homogeneity of cyberspace and its supposed capacity to give voice and visibility to those at the periphery of other worldviews, always recognizing the "productive nature of description" (Rifiotis, 2016). Thus, when considering the limits of

descriptive narratives and repopulating the field of study by recognizing the objects that constitute it, it is necessary to (re)assess whether the “distinction between environment, observer and referent” being made is adequate to the chosen worldview, whether it is relevant to the ethnographic description, and whether the networks established among different actors truly become visible when “submitting to unplanned or controlled situations” and “experiencing cultural difference and expressing it” (Rifiotis, 2016, p. 90).

We explore these points to demonstrate our awareness of the broader critique concerning the reduction of anthropological studies to the application of a “single” and “true” method. In digital anthropology, the goal is not to reduce the field of study merely to the methodological pathways of virtual ethnography. This includes avoiding the assumption that all ethnography is exceptional or capable of generating innovative concepts (Cesarino, 2021). The theoretical contributions of an ethnography may be redundant or unable to confront broader conceptual formulation. As Cesarino (2021, p. 312) argues, “not limiting anthropology to ethnography means opening it up to a meaningful dialogue with other disciplines” and it is precisely these dialogue-starting paths that we seek to cultivate here.

Object and Scope

Delimiting the research object and the scope of the fieldwork are essential tasks. In other words, it is crucial to answer questions as “which research objects are relevant?” and “in which apps, websites, or social networks are the search objects relevant?” in order to justify why a platform, or specific settings of cyberspace, can yield insights into communities or cultures related to scientific knowledge or science-related educational knowledge.

It is important to adopt a holistic perspective, one oriented less toward totality and more toward diversity, prioritizing life, online or offline, as it is actually experienced. Hine (2000) has long emphasized this point by acknowledging the need to incorporate multiple forms of transcription and data collection based on constant online presence so that all forms of interaction with informants, participants, and any individuals related to ethnography as part of the work — such as direct messages, mentions, audio or video calls — may be regarded as legitimate means of communication and immersion in the field of study. Virtual ethnography must therefore be adapted to the contingencies of the fieldwork, with research questions emerging from the observations and records themselves.

Some variables may help delimit the scope: a significant presence of agents recognized as members of academic societies on the platforms under examination, or evidence that users perceive these platforms as educational (or at least informational). Connections between the analyzed content (i.e., comments, messages, posts) and scientific discourse may be highlighted even when the platform seems misaligned with such discourse, provided these links are properly justified.

In situations where these variables are absent, it may be necessary to (re)assess whether another platform would be better or whether a broader scope (considering multiple environments) would be wiser.

Fieldwork

Something that permeates several principles of digital anthropology as described by Horst and Miller (2012) is the idea that cyberspace and its artifacts are neither more nor less material than any other space. Put differently, the networks that constitute and sustain the internet are not exclusively digital, and not all sources of information, data collection strategies or analysis methods need to depend solely on the internet.

When conducting fieldwork related to cyberculture, ethnographic descriptions should avoid rendering “the media, electronic components, computational devices, software, physical networks, etc.” entirely invisible (Rifiotis, 2013, p. 572). The act of analyzing technical elements must be accompanied by the act of examining how culture materializes on the internet. Thus, not only should one focus on the internet and its devices, but they also ought to consider the ways in which human actors access cultural artifacts in cyberspace and the means of production and maintenance of this access.

Cyberspace has, after all, a material infrastructure and it is an informational dimension that hosts and virtualizes a wide range of experiences; it is a space in which technical and human aspects are inseparable (Levy, 1999). For this reason, it is necessary to interpret and incorporate interaction spaces (websites, platforms, etc.) and technical elements that support them (companies, institutions, etc.) when describing the object of study. This allows the research to identify which platforms or devices are relevant, to engage with them during fieldwork, and to discuss them in the final ethnographic description (Hine, 2000). Similarly, mapping the connections among individuals, communities, platforms, but especially between what is conventionally considered as “real” and “virtual”, is crucial. Mentions, hyperlinks, hashtags, and so forth form networks that must be tracked and described by the researcher.

Cyberspace also contains material contradictions and particularities already present in society more broadly, precisely because digital phenomena intensify the dialectical nature of culture. This idea aligns with Escobar et al.’s (1994, p. 217–218) description of cyberculture and of the ethnographic domains for anthropological studies: the internet reflects the fact that we now live in techno-biocultural environments that produce new bodies and new forms of life through the intervention and structuring of new technologies.

Fieldwork does not need to be conducted exclusively on the internet, nor must it address only cultural objects; offline contexts may also be taken into consideration. In such cases, researchers must ask: should the research take place online, offline or across both? And how should it be described?

In the case of science education and the dialogic contact we propose, the research design may require engagement with funding agencies, governmental institutions, or

other actors. Depending on the cultural artifacts, cultures and communities examined, it may be necessary to reconceptualize fieldwork as an activity across multiple field(s). For instance, a study focused on teachers participating in a continuing-education program through a virtual platform might later incorporate offline components such as in-person meetings in formal education settings.

Space-Time Frame

The points of view and processes involved in observing, experiencing and participating on the internet, its cultures and cultural artifacts can be (re)examined in spatiotemporal terms. All worldviews are situated in time and space, and all ethnographic descriptions are written in ways that create particular modes of observing the research object by representing and translating it through narratives; what Rifiotis (2016) refers to as the “gaze metaphor”.

Digital anthropology must acknowledge the nature and limitations of its “descriptive narratives” when exploring the networks established between technical elements and human agency. Hine (2000) also emphasizes the partial and contextual character of the ethnographic description on the internet, highlighting the importance of avoiding notions about the pre-existence of communities and cultures, and their sociocultural position in time and space. Every perspective — especially the ethnographic description — is essentially unique, situated in a specific moment and location. All descriptions and analyses produced by ethnography are contextual and conditioned. This raises questions regarding the range of validity of the research and invites us to ask: when and where are the research objects and subjects situated?

In studies conducted through virtual ethnography, especially considering developments in cyberspace over the last two decades, these issues become even more compelling. Every advertisement, page refresh, feed scroll, content suggestion, search query (and so on) is mediated by algorithmic black boxes that render each online experience essentially unique. Unless specific measures are taken — such as altering privacy settings or, in more advanced cases, using VPNs, operating systems and browsers with privacy policies aimed at data security — it is reasonable to assert that even when individuals view virtually identical content within temporal and spatial frames, each person observes and participates in a different kind of internet.

Hence, there is a need to move “spatially” and “temporally” during fieldwork so as not to reduce the research to a space (either online or offline), website, location, platform, app, or to a specific temporal framing without acknowledging that the internet is a space of constant and situated recordings, but not always enduring ones. Experiencing discourses, cultures and communities on the internet is to live your present and your past side-by-side being instantly materialized and dematerialized in front of you, in a continual co-construction of current moments.

Prioritizing either participation or observation for the sake of generalization is unsuitable for ethnographic work in general, and equally so for the dialogic contact explored here, because nowadays all participation, such as all observation, on the internet is essentially non-replicable. However, the relative permanence of digital traces of interactions, behaviors, and conversations can facilitate ethnographic work. It is now possible to construct, co-construct and reconstruct certain conditions to (re)visit and (re)explore cases and episodes of interest to science studies through the perspective of digital anthropology. Feeds, threads, posts and comment sections from days, months, or years past, can be accessed through APIs or the Web Archive when no longer accessible or available in their original form.

With retrospective and synchronous analysis together a rich horizon of methodological possibilities is open by foregrounding the impossibility of existing independently. For instance, a case of scientific controversy prominent in recent public debate can be studied both “live”, following hashtags and mentions, and, retrospectively, investigating forums, news, and comment sessions from earlier periods or even the same hashtags and mentions, just going back to a previous point in time.

Another example is that one can synchronically follow the semester of an undergraduate course in a remote schooling situation. If, during or at the end of the study, comparisons with another class become relevant, it is possible, depending on the platform, to access video recordings, text exchanges, and other interactions records.

Conclusion

One central motivation for developing this paper was the recognition that many recent events — such as the post-truth phenomenon from 2016 onwards and the epistemic conflicts during the COVID-19 pandemic — have intensified the need for a renewed perspective on the internet within science education research. Among the possibilities explored, we have strongly identified with digital anthropology. Our examination highlighted its potential as a framework for understanding how scientific and educational knowledge is articulated and interpreted by diverse communities. This approach requires an in-depth analysis of the discontinuous, non-linear, and obscure processes that underpin the circulation and public engagement with scientific knowledge.

We soon noticed that proposing an anthropological perspective for researching science education on the internet fundamentally depends on describing how scientific and science-related educational knowledge is uttered and interpreted by different communities or cultures. We also realized that such research must focus on the discontinuous, non-linear, and obscure dynamics connecting the production of this knowledge and know-how through which the sciences reinforce their reach and relevance for those who are not scientists, technicians, or teachers. Science education and scientific communication as they currently exist on the internet embody precisely this discontinuity, non-linearity, and obscurity, as they reflect much of what Martin (1998) describes as the “movement between experts and scientists” and the “space in which science and culture are co-constituted”, a space that is “discontinuous, fractal, complex and in constant change”.

In essence, our proposal is that, for comprehensively investigating the creation, dissemination, and application of scientific and science-related educational knowledge in cyberspace through a cultural approach requires attention to four major dimensions: is the chosen worldview capable of stating something meaningful about culture and its materiality? Are the research objects and scope — as in the apps, websites, or social networks selected — relevant to science education research? Should the investigation be performed online, offline, or across both? How can the research be positioned in both space and time through synchronous and retrospective methods? Any academic study focusing on the dialogic contact between science education and digital anthropology should be able to address those questions.

Finally, we conclude by affirming that digital anthropology and virtual ethnography can indeed enable a deeper understanding of the language, metaphors, and images that people use in everyday life to describe objects and phenomena that come to embody, or sustain, a particular culture or community around them. This is precisely the kind of endeavor with which science education research is, or at least ought to be, both familiar and deeply concerned.

Author's Contribution

Conceptualization: Pigozzo, D.; **Writing — Original draft:** Pigozzo, D.; **Writing — Review & editing:** Pigozzo, D., Nascimento, M. M.; **Investigation:** Pigozzo, D.; **Methodology:** Pigozzo, D.; **Project Administration:** Nascimento, M. M.; **Supervision:** Nascimento, M. M.

Data Availability Statement

The data will be provided upon request.

Acknowledgements

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior — Brasil (CAPES) — Finance Code 001.

References

- Álvares, C. C. D. O. T., & Pinheiro, V. (2019). A Espetacularização da Educação a Distância nos Meios de Comunicação. *Indagatio Didactica*, 7(3), 8–23. <https://doi.org/10.34624/ID.V7I3.2824>
- Bateson, G. (1967). Cybernetic explanation. *American Behavioral Scientist*, 10(8), 29–29. <https://doi.org/10.1177/0002764201000808>
- Bateson, G. (1987). *Steps to an ecology of mind: Collected essays in anthropology, psychiatry, evolution, and epistemology*. Jason Aronson Inc.
- Bateson, G. (1999). *Naven: A survey of the problems suggested by a composite picture of the culture of a New Guinea tribe drawn from three points of view*. Stanford University Press.

- Budka, P. (2011). *From cyber to digital anthropology to an anthropology of the contemporary?*. Working Paper for the 38th E-Seminar of European Association of Social Anthropologists' Media Anthropology Network.
- Caliandro, A. (2018). Digital methods for ethnography: Analytical concepts for ethnographers exploring social media environments. *Journal of Contemporary Ethnography*, 47(5), 551–578. <https://doi.org/10.1177/0891241617702960>
- Carlone, H., & Johnson, A. (2012). Unpacking 'culture' in cultural studies of science education: Cultural difference versus cultural production. *Ethnography and Education*, 7(2), 151–173. <https://doi.org/10.1080/17457823.2012.693691>
- Carson, R. (2002). *Silent spring* (40th anniversary ed.). Houghton Mifflin.
- Cesarino, L. (2019). Identidade e representação no bolsonarismo: Corpo digital do rei, bivalência conservadorismo-neoliberalismo e pessoa fractal. *Revista de Antropologia*, 62(3), 530–557. <https://doi.org/10.11606/2179-0892.ra.2019.165232>
- Cesarino, L. (2021). Antropologia digital não é etnografia: Explicação cibernética e transdisciplinaridade. *Civitas - Revista de Ciências Sociais*, 21(2), 304–315. <https://doi.org/10.15448/1984-7289.2021.2.39872>
- Cohen, H., & Salazar, J. F. (2005). Introduction: Prospects for a digital anthropology. *Media International Australia*, 116(1), 5–9. <https://doi.org/10.1177/1329878X0511600103>
- Correll, S. (1995). The ethnography of an electronic bar: The Lesbian Cafe. *Journal of Contemporary Ethnography*, 24(3), 270–298. <https://doi.org/10.1177/089124195024003002>
- Couto Jr., D. R. (2013). Etnografia virtual e as contribuições de Mikhail Bakhtin na pesquisa com internautas. *Revista Teias*, 14(31), Article 31.
- Eisenhart, M. (2001). Educational ethnography past, present, and future: Ideas to think with. *Educational Researcher*, 30(8), 16–27. <https://doi.org/10.3102/0013189X030008016>
- Eisenhart, M. (2018). Changing conceptions of culture and ethnography in anthropology of education in the United States. In D. Beach, C. Bagley, & S. M. Silva (Eds.), *The Wiley handbook of ethnography of education* (pp. 151–172). Wiley. <https://doi.org/10.1002/9781118933732.ch8>
- Escobar, A., Hess, D., Licha, I., Sibley, W., Strathern, M., & Sutz, J. (1994). Welcome to Cyberia: Notes on the anthropology of cyberculture [and comments and reply]. *Current Anthropology*, 35(3), 211–231. <https://doi.org/10.1086/204266>
- Franklin, S. (1995). Science as culture, cultures of science. *Annual Review of Anthropology*, 2, 163–184.
- Fujimura, J. H. (1999). Authorizing science studies and anthropology. *American Anthropologist*, 101(2), 381–384. <https://doi.org/10.1525/aa.1999.101.2.381>

- Galli, M. C. (1993). *Antropologia culturale e processi educativi*. La Nuova Italia.
- Geismar, H., & Knox, H. (Eds.). (2021). *Digital anthropology* (2nd ed.). Routledge. <https://doi.org/10.4324/9781003087885>
- Gusmão, N. M. M. de. (1997). Antropologia e educação: Origens de um diálogo. *Cadernos CEDES*, 18(43), 8–25. <https://doi.org/10.1590/S0101-32621997000200002>
- Gusmão, N. M. M. de. (2015). Antropologia e educação: Um campo e muitos caminhos. *Linhas Críticas*, 21(44), 19–37. <https://doi.org/10.26512/lc.v21i44.4463>
- Hammond, L., & Brandt, C. (2004). Science and cultural process: Defining an anthropological approach to science education. *Studies in Science Education*, 40(1), 1–47. <https://doi.org/10.1080/03057260408560202>
- Haraway, D. J. (1991). *Simians, cyborgs, and women: The reinvention of nature*. Routledge.
- Haraway, D. J. (1994). A game of cat's cradle: Science studies, feminist theory, cultural studies. *Configurations*, 2(1), 59–71. <https://doi.org/10.1353/con.1994.0009>
- Hine, C. (2000). *Virtual ethnography*. SAGE.
- Hine, C. (2017). Ethnography and the Internet: Taking Account of Emerging Technological Landscapes. *Fudan Journal of the Humanities and Social Sciences*, 10(3), 315–329. <https://doi.org/10.1007/s40647-017-0178-7>
- Hjorth, L., Horst, H. A., Galloway, A., & Bell, G. (Eds.). (2017). *The Routledge companion to digital ethnography*. Routledge.
- Horst, H. A., & Miller, D. (Eds.). (2012). *Digital anthropology*. Berg.
- Jensen, L. X., Bearman, M., Boud, D., & Konradsen, F. (2022). Digital ethnography in higher education teaching and learning—A methodological review. *Higher Education*, 84(5), 1143–1162. <https://doi.org/10.1007/s10734-022-00838-4>
- Knorr, A. (2011). *Cyberanthropology*. Peter Hammer Verlag.
- Knorr-Cetina, K. D. (1981). *The manufacture of knowledge: An essay on the constructivist and contextual nature of science*. Pergamon. <https://doi.org/10.1016/C2009-0-09537-3>
- Knox, H. (2021). Traversing the infrastructures of digital life. In *Digital anthropology* (2nd ed., pp. 178–196). Routledge. <https://doi.org/10.4324/9781003087885>
- Kuhn, T. S. (2012). *The structure of scientific revolutions* (50th anniversary ed.). The University of Chicago Press.
- Latour, B. (1990). Postmodern? No, simply amodern! Steps towards an anthropology of science. *Studies in History and Philosophy of Science Part A*, 21(1), 145–171. [https://doi.org/10.1016/0039-3681\(90\)90018-4](https://doi.org/10.1016/0039-3681(90)90018-4)
- Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford University Press.

- Lehner-Mear, R. (2021). Good mother, bad mother?: Maternal identities and cyber-agency in the primary school homework debate. In *Gender and Education* (Vol. 33, Issue 3, pp. 285–305). <https://doi.org/10.1080/09540253.2020.1763920>
- Lévi-Strauss, C. (with Ralph Ellison Collection (Library of Congress)). (1963). *Structural anthropology*. Basic Books.
- Levy, P. (1999). *Collective intelligence: Mankind's emerging world in cyberspace*. Basic Books. <https://www.basicbooks.com/titles/pierre-levy/collective-intelligence/9780738202617/>
- Levy, P. (2001). *Cyberculture*. University of Minnesota Press.
- Lima, N. W., & Nascimento, M. M. (2022). Not only why but also how to trust science: Reshaping science education based on science studies for a better post-pandemic world. *Science & Education*, 31(5), 1363–1382. <https://doi.org/10.1007/s11191-021-00303-1>
- Maddock, M. N. (1981). Science education: An anthropological viewpoint. *Studies in Science Education*, 8(1), 1–26. <https://doi.org/10.1080/03057268108559884>
- Martin, E. (1998). Anthropology and the cultural study of science. *Science, Technology, & Human Values*, 23(1), 24–44. <https://doi.org/10.1177/016224399802300102>
- Máximo, M. E., Rifiotis, T., Segata, J., Cruz, F. G., & Maldonado, A. E. (2012). A etnografia como método: Vigilância semântica e metodológica nas pesquisas no ciberespaço. In M. E. Máximo, J. de S. Lacerda, & G. Bianchi (Eds.), *Epistemologia, investigação e formação científica em comunicação* (pp. 293–319). UNIDAVI.
- Paoli, A. D., & D'Auria, V. (2021). Digital Ethnography: A Systematic Literature Review. In *Italian Sociological Review* (Vol. 11, Issue 4S, pp. 243–267). QuiEdit. <https://doi.org/10.13136/isr.v11i4S.434>
- Pickering, A. (1992). *Science as practice and culture*. University of Chicago Press.
- Pigozzo, D., & Nascimento, M. M. (2023). Estudos antropológicos e etnográficos relacionados à internet na pesquisa em ensino: Uma revisão integrativa da literatura. *Indagatio Didactica*, 15(4), 291–314. <https://doi.org/10.34624/ID.V15I4.33979>
- Pink, S., Horst, H. A., Postill, J., Hjorth, L., Lewis, T., & Tacchi, J. (Eds.). (2016). *Digital ethnography: Principles and practice*. SAGE.
- Rieu, A.-M. (2007). Digital anthropology: The internet as virtual museum. *Kanagawa University CEO Program Bulletin*, 3–33.
- Rifiotis, T. (2013). Desafios contemporâneos para a antropologia no ciberespaço: O lugar da técnica. *Civitas - Revista de Ciências Sociais*, 12(3), 566–578. <https://doi.org/10.15448/1984-7289.2012.3.13016>
- Rifiotis, T. (2016). Etnografia no ciberespaço como “repopoamento” e explicação. *Revista Brasileira de Ciências Sociais*, 31(90), 85–99. <https://doi.org/10.17666/319085-98/2016>

- Segata, J. (2014). A etnografia como promessa e o “efeito Latour” no campo da cibercultura. *Ilha Revista de Antropologia*, 16(2), 069. <https://doi.org/10.5007/2175-8034.2014v16n2p69>
- Segata, J., & Rifiotis, T. (2016). *Políticas etnográficas no campo da cibercultura*. ABA Publicações.
- Shapin, S., Schaffer, S., & Hobbes, T. (1985). *Leviathan and the air-pump: Hobbes, Boyle, and the experimental life*. Princeton University Press.
- Sniukaite, I. (2007). *Feminist cyberdialogics: Speech-action and online community – A case study* [PhD Thesis]. University of Warwick.
- Souza, E. M. de F., & Ferreira, L. G. (2020). Ensino remoto emergencial e o estágio supervisionado nos cursos de licenciatura no cenário da Pandemia COVID 19. *Revista Tempos e Espaços Em Educação*, 13(32), 1–19. <https://doi.org/10.20952/revtee.v13i32.14290>
- Teixeira, A. C., Beutler, D. L., Trentin, M. A. S., & Folle, D. (2017). Complexities of cyberculture in Pierre Lévy and developments in education. *Creative Education*, 8(1), 119–130. <https://doi.org/10.4236/ce.2017.81010>
- Traweek, S. (1992). *Beamtimes and lifetimes: The world of high energy physicists*. Harvard Univ. Press.
- Valentim, S. D. S., & Moreira, J. (2020). Africanidades e tribalismo cultural: experiencias de professores(as) da cidade africana de Obuasi, Ghana. *Práxis Educacional*, 16(39), 115–137. <https://doi.org/10.22481/praxisedu.v16i39.6362>
- Varis, P. (2016). Digital ethnography. In A. Georgakopoulou & T. Spilioti (Eds.), *The Routledge handbook of language and digital communication* (pp. 55–68). Routledge.
- Voloshinov, V. N. (1986). *Marxism and the philosophy of language*. Harvard University Press.
- Walstrom, M. K. (2000). “The eating disorder is not you”: Applying bakhtin’s theories in analyzing narrative co-construction in an internet support group. In N. K. Denzin (Ed.), *Studies in Symbolic Interaction* (Vol. 23, pp. 241–260). Emerald Group Publishing Limited. [https://doi.org/10.1016/S0163-2396\(00\)80040-X](https://doi.org/10.1016/S0163-2396(00)80040-X)



Daniel Pigozzo

Universidade Federal de Santa Maria
Santa Maria, Rio Grande do Sul, Brasil
danielpigozzo@protonmail.com



Matheus Monteiro Nascimento

Universidade Federal do Rio Grande do Sul
Porto Alegre, Rio Grande do Sul, Brasil
matheus.monteiro@ufrgs.br

Editor in charge: Sylvania Sousa do Nascimento 

Translation revised by: Raquel Rossini Martins Cardoso

Journal financed by Associação Brasileira de Pesquisa em Educação em Ciências — ABRAPEC



Manifestation of Attention to Good Scientific Practices and Exemption from Interest and Responsibility

The authors declare that they are responsible for complying with the ethical procedures provided by law and that no competing or personal interests could influence the work reported in the text. They assume responsibility for the content and originality, as a whole or in part.

Copyright (c) 2025 Daniel Pigozzo, Matheus Monteiro Nascimento



This text is under a **Creative Commons CC BY 4.0 License**

You are free to Share (copy and redistribute the material in any medium or format for any purpose, even commercially) e Adapt (remix, transform, and build upon the material for any purpose, even commercially). Under the following license terms:

Attribution: You must give appropriate credit , provide a link to the license, and indicate if changes were made . You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

No additional restrictions: You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.
