

Pischetola, M., Miranda, L. V. T. & Albuquerque, P. (2021). The Invisible Made Visible through Technologies' Agency: a Sociomaterial Inquiry on Emergency Remote Teaching in Higher Education. *Learning, Media and Technology*, Doi: <https://doi.org/10.1080/17439884.2021.1936547>

## **The Invisible Made Visible through Technologies' Agency: a Sociomaterial Inquiry on Emergency Remote Teaching in Higher Education**

### **Abstract**

We are used to considering human agency as the most important aspect of the educational process. Materials and objects tend to be ignored or dismissed as agents. Technologies, as well, have been considered as inert matter, subordinated to human intention and design, as if they did not have a role in the eclectic combination of teaching, learning, and knowing about the world. Their agency is invisible until a breakdown occurs, a material moment which shows their doing. In this paper, we make digital action visible by focusing on emergency remote teaching in higher education during the Covid-19 pandemic breakdown. Data were collected/co-created in a graduate course in Education in the first three months of lockdown in Brazil. Through a queer assemblage of teaching-researching-writing, we present a sociomaterial analysis that shows multiple entanglements of bodies, material things, and pedagogic time-spaces. In this exercise, social inequality issues, power structures and ethical problems come to the surface, while students struggle for quality participation in the digitised classes.

**Keywords:** breakdown, sociomateriality, higher education, Brazil, emergency remote teaching.

### **Introduction**

The suspension of face-to-face classroom instruction and its switch to what has been called 'emergency remote teaching' (Buttler et al. 2021; Mohammed et al. 2020) during the first year of the pandemic has been widely discussed in literature. Several scholars have pointed out at the interests of data-driven edtech companies (Moorhause 2020; Williamson et al. 2020) and the development and implementation of pervasive surveillance techniques (Jarke and Breiter 2019; Roth and Dwork 2014). The assumption of governments and educational institutions that face-to-face classes can be adapted to be exclusively delivered online is seen as failing to take into account the digital divide (Cleland et al. 2020) and social inequalities that exclude a large

part of the population from internet access (Murphy 2020; Viner 2020). Moreover, a vast amount of literature has focused on supporting students' learning in online spaces (Alvarez 2020; Toquero 2020), supporting teachers to cope with emergency remote education (Green et al. 2020) and designing quality teaching (Affouneh et al. 2020) through a variety of digital tools and platforms (Amin and Sundari 2020; Trust and Whalen 2020). Fewer scholars, however, have focused on the 'relationality' of politics, edtech, pedagogies and technologies during emergency remote teaching (Carvalho and Yeoman 2021; Castañeda and Williamson 2021) and the role of materiality in the assemblage (NLEC et al. 2021; Wood 2021).

Even when manifestly materialised, in educational literature the agency of technologies – the capacity to perform an action – escapes from observation (Schubert and Röhl 2017) and becomes silent, transparent, invisible (Waltz 2006). Some authors claim that technologies should be seen as *performative* in educational settings, as they act together with other things and forces, affecting particular forms of participation in enactments (Fenwick 2011, 2015; Lenz Taguchi 2011). Technologies should be considered as processes of becoming, changing, and varying through emergent patterns that have their own logic (Sørensen 2007).

In this paper, we follow this perspective and propose making digital doing visible (Alirezabeigi et al. 2020) through a sociomaterial analysis focused on the way the pandemic breakdown and emergency remote teaching have affected higher education. We defend that, in order to discuss the ongoing process of digitisation of education (Selwyn 2020; Ugur 2020), there is a need to go beyond the predominance of a humanist point of view, and to enter the realm of a post-humanist perspective. This means analysing the materiality of apparently neutral tools such as digital technologies in education and the way they are accountable for bringing about some material and spatial configurations rather than others.

Our empirical investigation addresses the materiality of technology in an educational setting during the first lockdown and social distancing due to the Covid-19 pandemic in Brazil. It draws on evidence from online university lessons with a small group of graduate students of a course in 'Digital Culture and Education' during the first semester of 2020. The study starts from the assumption that digital tools and virtual spaces are not merely neutral mediators in the learning experience. It seeks to explore students' production and consumption trends, uneven effects and unequal chances, and also how power structures operate at a daily level. The guiding questions are: *How does the materiality of technologies become visible in educational practice and research? What are the consequences of such visibility in a landscape of digitised education?*

## The agency of technologies in educational processes

Through an attempt to address complex enacted materialisations, sociomaterial studies in the educational field - a rich academic effort which is seeking to review the role and agency of matter and material through entangled practices (Edwards and Fenwick 2014) - shed light on the continuous redefinition and reconstruction of the educational space boundaries (Star 2010). We can borrow from Donna Haraway's idea of "border war", according to which territories of production, reproduction and imagination have blurred boundaries (Haraway 1991). This view goes against dualisms and embraces technologies as real and practical entities that somehow overlap/coincide with our social, natural and cultural processes, forming part of our human bodies as prosthetic devices that act and react with us. Materiality does not simply trigger or mediate the learning process, but rather it becomes part of it, and it changes with every interaction (Hasse 2019).

In this perspective, digital technologies are not only tools but rather active participants in the development of teaching practices. Likewise, they should not be understood merely as infrastructure, but as part of complex and cross-cutting configurations of relationships (Braidotti 2016), negotiations, interfaces, situations, and protocols that define agents' communication and learning processes (Pischetola and Miranda 2019). They permit some actions and limit others. Nespor (2012) argues that to understand the agency of technologies, we need to map translations, circuits, performances, as well as practices; spatiality, and time that are part of the assemblage. Looking at technologies and device-mediated educational practices, he observes a multifold transformation. Technologies are a key for improvisation; they slow down or speed up educational processes, and their action redefines work development. Moreover, they re-shape relationships within an organisation or an institution, by processes of weakening, strengthening, including, excluding, and disrupting the established boundaries and relational structures. Lastly, technological devices change actors' roles and make possible the emergence of new forms of agency. In all these changes, we are reminded that people and networks are intertwined and "co-extensive" (Callon and Law 1997, 169).

The understanding of material and social forces as being entangled in everyday activities overcomes the idea that objects and subjects *inter-act*, that is, they connect to each other as separate units. Created by Karen Barad (2003), the neologism *intra-action* consists of agencies that are always intertwined and co-dependent, in a process of mutual constitution (Barad 2003).

In this sense, agential realism will defend that we constitute/create/define technologies as much as they constitute/create/define us. This process leads to emergent complex casualties, which we observe, in education, in the interconnectedness of ideas, organisations, and communication practices. Looking closer, we understand that activity and cognition are harmoniously shaped not only by the social environment and relationships, but through the material entities as well (Fenwick and Edwards 2014). This awareness changes the whole meaning of and methodology for learning through technologies. Sørensen (2009, 39) underlines how technology is a “practical, contingent, and heterogeneous interplay” rather than a stable object. In fact, when technology is considered as a structured thing, its diversified assemblage is made invisible. On the contrary, we should always see it as the result of a relational and continuous entanglement with social aspects. This allows us to observe the “trials of strength” that are always present in sociomaterial relationships. According to the author, this approach can help us to consider technology as a performant agent of the learning process, learning material that has deep and unforeseeable consequences. Any pre-given assumption about a fixed form of learning that will derive from the introduction of a digital technology will be challenged by new forms of knowledge, validation methods and criteria that arise with that technology itself.

### **A methodology to address materiality in education**

A sociomaterial approach aims to show, by observing micro-practices, what things do and how they materialise actions in a “choreography” of human and non-human relations (Taylor 2016). In fact, these kinds of studies question the assumption that the aim of educational research is only to solve problems and find solutions. Instead of identifying problems, they rather expose their profound and complex causes (Biesta et al. 2019). This can be done in different ways which can be challenging from a methodological point of view (Hultin 2019).

Schubert and Röhl (2017) propose focusing on three aspects that they consider common to practice-oriented research and materiality-oriented perspectives. These are: (1) Practical irreducibility: that is, practices are not to be explained by cultural motives beyond them; (2) Sociomaterial irreducibility: humans and non-humans act together, and therefore practices are never isolated; (3) Processual irreducibility: practices and experience are always related to each other, as pragmatist thinkers have defended.

Gourlay and Oliver (2015) suggest “following the actor” and the micro-level of practices that can make visible the entanglements between spaces, objects, and actions. The intention is to avoid the abstraction that individual and decontextualised interviews can lead to. The challenge

put to the researcher is where to focus and on which actor (Gourlay et al. 2021). In this sense, we understand that the above-mentioned notion of assemblage can contribute to *qualifying* the interactions that take place in a network, by recognising them not as a stable structure, but rather as a movement of a hybrid collective, where the action takes place (Callon 2005). Starting from this assumption, some of the following research questions might be asked: “How does the sequencing of assembly interfere in the given outcome? How important is the pacing of composition and the specific mix of associated elements? Are these associations reversible?” (Nespor 2012, 17). Observation and discussion of micro-negotiations arising in the network can help to answer these questions. Another concept, introduced by Sørensen (2009, 86), is “fluidity”, which the author conceives as an empirical discovery itself. Similarly to other post-human researchers, she praises ethnographic work, in which a fluid imaginary can be exercised. Mazzei and Smithers (2020, 104) remind us that it is not enough to recognise an assemblage; we ought to “travel along its mapping” and follow the non-obvious, which allows us to escape from consolidated power structures. Along the same line of thought, Lenz Taguchi and Palmer (2013) suggest that a sociomaterial analysis does not consist of interpretation of data, but rather it can be understood as an enactment of differences, which appear in the process of reading data, identifying patterns and observing emergent meanings.

Taylor (2018) proposes tracking specific ‘material moments’ that can reveal how materials act on educational practices, power relations and bodily enactments. She uses a diffractive methodology and argues that data has to be seen as a “lively matter” (p. 50), which affects the researcher deeply. In researcher’s back-and-forth dialogue between data and theory, Taylor sees a radical interference in the sense-making procedures and interpretations, which “work both to separate and entangle” (Taylor 2019, 51).

Alirezabeigi et al. (2020) propose making the agency of technologies visible through a socio-material analysis focused on what they call “breakdowns” in educational settings. A breakdown is a moment when important references are lost abruptly and, therefore, hidden forces and agencies at work come to the surface. In 1986, computer scientists Winograd and Flores defined a breakdown not as a negative happening, something to be avoided, but rather as a situation where we are confronted with non-obvious relational aspects of a network. Later, Haraway (2000) referred to their idea and conceived breakdown as a painful process of denaturalisation, but one that opens up new conditions of possibility.

Adams and Thompson (2016, 20) also adopt breakdowns as a heuristic that can help researchers and practitioners to investigate digital objects to mobilise post-human insights. By *interviewing objects*, they show how accidents, anomalies and breakdowns can “reveal taken-for-granted

human-technology-world background relations”. Based on their research, Alirezabeigi and collaborators (2020) use the breakdown to investigate “digital doings” at work in the classroom. Through sociomaterial ethnographic research undertaken at school, the authors observed four different breakdowns - orderly, worldly, timetable and infrastructural - that shed light on the way digital devices enact specific spatio-temporal configurations. The authors warn us about the fact that breakdowns might not appear in the researched setting, as they are contingent and unforeseeable events. Our research, however, will take its very first step from a breakdown, investigating the disruption created in higher education by emergency remote teaching.

## **Research**

The exercise we are presenting in this paper is one of entanglement of teaching-researching-writing or, said otherwise, a “queer assemblage” of pedagogy and inquiry (Mazzei and Smithers 2020). We adopt a perspective of post-qualitative research, which seeks to avoid repetition and encourages difference, by overcoming methodological enclosure of inquiry and accepting experimentation as a risky and surprising work (St. Pierre 2017). In this exercise, we will follow three concepts of the sociomaterial theoretical framework as a guide for analysis: (1) assemblage, (2) human/non-human intra-action, and (3) emergency of meanings, patterns and power structures. These elements will be analysed starting from specific “material moments” that we have identified in the reported data, where specific entanglements between human and non-human actors appear.

The data were collected (or rather co-created, in a sociomaterial perspective) in a graduate course in Education at a private Brazilian university during the first semester of 2020, which runs from March until July in the southern hemisphere. The institution is among the most recognised universities in Brazil and the graduate program in Education one of the highest ranked nationally, despite its small size. The Department of Education counts on twenty teachers and each academic year, thirty graduate students (15 M.A. and 15 Ph.D.) are selected for admission to the program, being one third of them funded by public scholarship.

The graduate courses are attended usually by a group of 8-12 students. In the case of this specific course, which was an optional discipline named ‘Digital Culture and Education’, the group of students was even smaller, with 6 students attending classes once a week for three hours. The classes were held in Portuguese, therefore the discussion presented in the following was translated from the original language.

At the start of the semester, after a first week of face-to-face classes, all teaching activities were suspended because of the pandemic emergence caused by Covid-19 and in a two-weeks' time emergency remote teaching started, and still continues one year later (March 2021). It is important to underline that an online or blended teaching format was never contemplated before at the Department of Education at this university, which is also one of the oldest in the country. Therefore, this rapid switch to emergency remote teaching caused a true disruption in the habits, practices and patterns of this program. Teachers had to quickly adapt their courses to a new, mostly unknown, format of digital platforms and online tools, and students did their best to cope with the new situation, despite their poor internet infrastructure, and challenging home and family settings. Structural inequalities, societal exclusion and/or poverty are experienced by the majority of the students at this Department of Education, especially at the undergraduate level. This is related to the career perspectives that a course in Education can offer in Brazil, as the teacher profession is neither socially nor economically recognised. Graduate students have better economic and infrastructural resources than undergraduates, as most of them are educational professionals who wish to pursue an academic career. However, they face other challenges, such as having a family and/or finding a balance between work and research.

The conversation we present below derives from one of the final classes of the semester, held on a digital platform in synchronous mode, in which students were asked to reflect on two readings that introduced sociomaterial theories. Students were not familiar with these perspectives, and the teacher (one of the authors of this paper) dedicated about 40 minutes at the beginning of the class to explain the core concept of non-human agency. Two master's students and three doctorate students participated in the class, while one master's student was absent<sup>1</sup>. The lessons were not usually recorded but this time the student who missed the class had requested to record it in advance in order to watch it later. The dialogue between teacher and students resulted in an interesting entanglement of the subjects, their unique realities, the digital technology, the specific space and time, and the content itself. The richness of this assemblage inspired a discussion among the authors of this paper, during a research group meeting where Barad's concept of intra-action was debated after the class. This is how the recorded class became the empirical material for this paper. It is worth mentioning that institutional ethics clearance was granted beforehand, and written informed consent was obtained from all students for the recorded discussion to be used in this way. Moreover, all

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<sup>1</sup> We will refer to their observations with aliases to preserve their anonymity.

names were substituted by aliases, to ensure students' anonymity. The transcription of the class was also shared with them before data analysis.

It is also relevant to clarify that the sociomaterial examples given by the teacher during this specific lesson resulted from a whole semester of experience and discussions. Therefore, despite our reference here to a single class, the interpretation of this data is founded on material developed over time and from multiple sources. Following Adams and Thompson (2016), we adopted the criterion of using any resource that reveals intriguing information about how digital technologies were embraced, used, integrated, and deployed in students' and teacher's daily experiences during the first experience of Covid-19 lockdown in Brazil. Students presented personal anecdotes, which were selected through the agential interference we applied due to the article's limited space. The reported conversations are indeed also a result of (self-) observations and reflections about enacted technologies carried out during four months of unplanned remote classes in other courses and research group activities, as well as emails from students and institutional requests.

In the mentioned class, the debate starts with a simple question from the teacher: "what does digital technology (computer, digital platform, internet) *do* in this class?". What follows is the transcription of the conversation sparked by that question, here translated from Portuguese. Instead of separating and categorising meaningful excerpts, we have highlighted them along the text, and we will use them to discuss our findings in the next section. This methodological choice is an attempt to give an overview of the 'material moments' during the class, where we could interpret the new information that was emerging from the human and non-human entanglement of the three-hour online class. To underline these material moments, we divide the transcription in three sections (personal experience, power structures and the body), which will be discussed later in the paper.

### Section 1 – Materialising personal experience

***Gil:** May I speak? I see agency [of technology] as an influence, so to speak. The technology allows me to watch from home, not to take public transportation, and get tired of an hour and a half subway ride to get to the university, it influences me like that, keeping a fresh mind... watching from here, instead of rushing from work to go to class.*

***Carol:** I guess, in my case, it brings a psychological burden. Because...this platform means you have to concentrate a little more, pay attention, to try and follow the dynamics, sometimes you can't tell whether... whether others understand what you say, whether you have managed to be clear. I am also unable, for example, to take a look at the news here to see if everything is ok, just like I always do in the classroom, you know? Not that it gets in the way, but you feel*



kind of monitored in this environment, because if I pick up the phone here and stay on the phone, it's not cool, do you understand? So, you feel more constrained. Because if we were in a normal class, you wouldn't be seeing yourself here too, right? You wouldn't be checking on yourself, I think it's this feeling of being under surveillance, more observed too, not only by people, but by yourself.

**Mariana:** what Carol said also reminded me of ... this is the impression that I have, that being in a [face-to-face] class, I become more open, I talk more, I think I interact more. And I realised that with my advisor, I have class with her on Wednesdays [remotely], she always says that I am very quiet. And I'm trying my best to participate...I find this quite funny, because this approach of being in a remote class makes me more intimidated, I think...[...] It looks like I am kind of compensating for what would be very natural in a regular class. I don't completely get it, but it is a different approach, definitely. [...]

**Joana:** I read something in class the other day, about the use of digital platforms, that we are only stimulated through the screen, whereas in other physical environments you would have various stimuli. Somehow, they let your head get some rest, while here you only have one focus; you are both observing and being observed from a central point.

**Carol:** And we are not used to focusing on just one thing ... that's also a problem.

**Teacher:** so, there are missing gestures, codes, movements that we are used to seeing, which are also part of the interpretation by the other [person], and how much of what I am saying is accepted or not, by the group... This is very important, right? When we speak in public, we think: "Did I understand well? Did I set an example that does not fit? Am I talking nonsense?". For example, I am in a research group with 15 participants. Yesterday there were many of us ... I forced my eyes a lot, all the time on the screen, to try to understand whether what I was saying sounded right to anyone, whether anyone thought the same thing, whether we were going in the same direction or not, right? It is very tiring, because it is something that would happen in a more organic way, in person... [...]

**Eleonora:** The best moment was when, at the beginning of the semester, I used to raise my hand to say something and no one was seeing it, because of this thing that you said, the lack of looks, right? There are many faces, or a black screen with people's names, and me raising my hand, and there was a moment when I was frustrated - I thought: "nobody wants to let me talk" - Today I laugh when I think about it. [...]

## Section 2 – Materialising power structures

**Joana:** but there are also things like what Gil said earlier. There are things that are happening 'outside', and this technology, this platform protects us from a possible disease. I mean, we are doing this to protect ourselves, and to protect others from something bad...so there is also this aspect to consider.

**Gil:** *it's not that I prefer it this way...I prefer face-to-face classes too, but speaking... let's say, from a practical point of view, what is the effect for you...I would usually have to leave work, if I had been working, I would have to rush to get to university and then I would have to pay back at work for the hours that I was taking off to attend class. Right now, I don't have to do that, so for me this setting [the online class] makes it easier.*

**Joana:** *and we can also continue taking classes, to study at our pace, more or less normal...*

**Teacher:** *which is good, of course, but think about Isabelle's case [the student who is missing class], for example. She is not here because she is very busy and "drowned" in the work she needs to do, precisely to move forward with it. [...] You notice this by her absence. The person who is suffering from this pressure related to another institution, the institution for which she works, is absent. So, things are so intertwined that the effect of this are her migraines and absences. With a cumulative effect, which materialises in the body and materialises in her absence, and which has led us to using the example of her work/study situation, and which is the reason why we are recording this class.*

**Carol:** *I think one thing that has become much clearer to everyone is how school spaces are much more plastic and they will be moulded according to our needs. For example, if we were presenting a seminar now and my connection went down, my team would have to continue, right? I wouldn't be to blame. Everybody should also know my part of the presentation!*

**Teacher:** *So, you see how a sociomaterial analysis can also show this side. [...] Someone asked in our previous class: is 'neutral' the same as 'invisible?'. Well, I think invisible is an even worse characteristic for an object or an assemblage, because when one says that something is neutral, one recognises at least that the object is there. Otherwise, the object has become naturalised, so much a part of my body or my reality, that it's invisible. [...] So, here is the question: what in the pandemic breakdown that we are experiencing has become, all of a sudden, more visible?*

*(Carol goes offline)*

**Mariana:** *Carol disconnecting! (laughs). It has become more visible that, look, our relationship here is unstable, right? (laughs).*

**Teacher:** *The instability of our relationships ...*

**Mariana:** *Yes! And we are kind of vulnerable, right? I can get disconnected from here at any time! This breaks up the class time and my focus...when I go back, I don't know what you've been talking about anymore...Hi Carol, I see you're back! (laughs)*

*(Carol is online)*

**Teacher:** Carol, you have actually provided us with an example of disruption through unstable connection.

**Carol:** Guys, I haven't been able to follow anything about this second text we are debating! (laughs) [...]

**Teacher:** I can bring another example. Yesterday I was talking to a colleague who has three children, all at different levels of education, one at college, one in high school and one in primary school. They are having classes at a distance the whole day, and she said: "we are lucky because we have several computers at home, old and used, but we do". Each one of my kids manages to follow his class at the right time because he has got the equipment. Now, several of their classmates only have a cell phone at their disposal, so they stay there for five hours watching class... can you imagine classes on a cell phone screen for 5 hours?!"

**Carol:** it is interesting for us to analyze from this perspective because we can see from a breakdown, from a failure, how these relationships that are clearly visible have an impact on people's lives. When such a failure appears, these devices even gain a voice, gain a light, and we can reflect on that. Something that draws my attention, which is interesting, is that at this moment we also have to observe: "what are we, as humans, doing to keep these practices working?". Because sometimes we don't reflect on that either. Only when the object is absent do we think about it. For example, it is only when my internet is bad that I think about it. [...]

**Gil:** the author says in the text that the school is dependent on materials, but the school is also dependent on third parties, which is even more dangerous. There is someone there putting things in the cloud and there is someone providing you with the internet. And what if it disconnects? You are totally in the hands of third parties! I think the text doesn't even say it, but it's definitely something you depend on...

### Section 3 – Materialising the body in the assemblage

**Eleonora:** There is...[noises], did I interrupt someone? There is also the issue of how digital technology has affected our bodies, in general. I'm referring to cognitive issues, emotions, and our [bodily] structure. For example, being exposed to this light, which is not beneficial to our eyes...my laptop says here that it has a filter, it has this and that for protection. I don't really believe in all this protection...It can cause me later, in the long term, vision problems, and spine issues. I bought a cooler to bring the machine, I also bought a keyboard for the laptop...I now need to buy a cozy chair because my back is getting a little crooked. So, a series of things are at play...I believe that in a while, I don't know if I'll be alive to see this...there will be a change in the people's bodies as a result of using cell phones.

The class ends with some more complaints about bodies being constrained due to many hours in front of the computer, to attend class at a distance.

## Discussion

The narrative of this lesson offers multiple examples of entanglement, assemblage and non-human agency, materialised in participants' perceptions on the novelty of the situation of emergency remote teaching due to the pandemic. The new assemblage forced by a breakdown has brought digital technology's agency to the foreground. This appears in different ways along the debate between students and teachers in the above-presented class. We will follow the materialisation of three main emerging aspects related to the assemblage, in the attempt to show human and non-human actors *intra-acting* within it and how emergent meanings and trials of strength (Sørensen 2009) are created in this entanglement.

### Section 1 – Materialising personal experience

Reflecting upon the assemblage of emergency remote education made students aware of different personal experiences, which were put in dialogue with each other. In this sense, the question that sparked the discussion was essential to situate the debate with a focus on technology's *action*.

Despite the benefits of being able to continue to follow classes and academic encounters, affording time saving and, for some students, more comfort, participants stressed limitations and constraints imposed by the unusual format of a synchronous online class. This entanglement is initially made apparent by the testimony of the student named Gil, when he notices the agency of many non-human actors: (i) the pandemic and the transition to remote class, (ii) the lockdown and people's safety, (iii) the finishing of his work on time, which brought him more peace and relaxation, him no longer being late to class, and his professor and colleagues benefiting from his participation from the start of the sessions. All of these elements exercised some kind of agency on the student, and led to him stating, at the start of the debate, that this situation is more favorable for him than the usual setting, despite his recognition that face-to-face classes represent a unique and valuable moment.

However, other students' personal anecdotes and reflections show their discomfort about remote classes. Taking the form of the specific layout of the platform chosen by the institution, with students' images displayed in a grid, remote classes brought out a feeling of intimidation, stress, physical pain, outreach expectations and a perception of continuous focus and surveillance. More than once, students mentioned the distress and the mental exhaustion of being exposed "there" on the screen, while being observed nonstop by all and by themselves.

This emotional distress was also present in undergraduate courses and research group meetings along the semester, as any occasion to meet online would turn into a reminder of what was (and still is, one year later) the sanitary, economic, and political crisis in the country. Moreover, most of the students, both graduate and undergraduate, did not feel comfortable to show their home settings through a webcam. Mixed feelings were also emerging in critical moments, when a teacher would ask students, for example, to turn on their cameras in order to prove their presence in class. The usual flow of teacher-learner dialogue was deeply compromised in these situations.

## Section 2 – Materialising power structures

It is possible to develop our analysis of the social context through the role that technology has assumed in the entanglements observed along the semester, in addition to this specific class. The new assemblage of remote learning, on one hand afforded protection from the disease and the completion of the university calendar; however, on the other hand, it was responsible for leading to exaggerated demands. This latter aspect was evident in one of the students' experiences (Isabelle), who was absent in this specific class because of demands from her workplace, which had resulted in her distress and health problems. In this entanglement, we can see multiple agencies at work, relating to both human and non-human actors: (i) the institution where the student works, which is a private kindergarten located in the Zona Sul of Rio de Janeiro (the wealthiest area of the city); (ii) the work she is realising for the school, which consists of a big amount of recorded and edited videos with activities for children, to be done at home during the lockdown; (iii) the physical discomfort she is experiencing because of the sudden work overload; (iv) her consequent absence from class; (v) the recording of the class, which turned into (vi) data for this article.

A sociomaterial analysis of this data allows us to observe what emerges by this student's absence, which marks and enacts a difference from other students who are attending the class. By following the non-obvious (Mazzei and Smithers 2020) and map the actors that are entangled in this absence, we also try to understand who or what could be held accountable for Isabelle's absence. Is it the student herself, who does not manage to cope with work and study? Is it the institution for which she works? Or is it the parents of pupils at that kindergarten, who are making pressures on the institution because they pay a high fee and want to be assured a service for it? Is it the digital technology that is accountable for the high demands that the student is experiencing, both at university and at her workplace?

The presence/absence difference was *intra*-acted both in the ‘real’ absence of the student who was ill, and in the ‘on/off presence’ of another student (Carol), who experienced intermittent access due to a poor internet connection. In fact, remote classes shed light on the quality and importance of the internet connection. Connection was decisive for allowing for momentum, quality of participation and the ability to follow the ongoing discussions. Students who had an unstable connection would have their webcam turned off, resulting in difficulties in actively and effectively contributing to the debate being held. As an object with power (Taylor 2019), the internet connection gained meaning, bringing to the fore profound inequalities in Brazilian society and acting in defining individual and collective identities (Nespor 2002).

Yet another entanglement is worth mentioning among those that materialise the social context of this study. During class, the teacher refers to a colleague from her lab, who is mentioned because of her personal experience with three children attending school remotely, and who happens to be another author of this paper. In this example, the teacher points at the material and spatial configuration of an apartment where three students are attending classes at different educational levels, and on different devices, while parents work at their devices. Multiple challenges can be envisioned in this situation, from the point of view of the actions that need to be performed (studying, working, parenting) and at the same time from the point of view of space boundaries. This aspect shows how a post-human analysis is influenced by an agential cut (Barad 2007) that depends upon direct experience, not only as researchers and educators from the same institution, but also as parents challenged by social distancing and telecommuting during the pandemic.

### Section 3 – Materialising the body in the assemblage

The body was always present in students’ analysis, either as a panoptic (Foucault 1979) enacted through the screen, or as discomfort and bodily submission to the new situation. It was interesting to note how the students would refer to the computer as a real actor, which was *causing* a backache or tiredness in their eyes. The internet connection is also presented as an actor that the students depend on, as it provides them, in this particular moment, with the social interaction they otherwise would not have. In different occasions along the semester, two students of this class also mentioned how the computer had become their sole contact with the world, as they lived alone and would not meet other people due to social distancing.

All the mentioned entanglements are capable of demonstrating a multitude of human and non-human *intra*-actions, which show how the breakdown – emergency remote teaching – made visible the invisible. Trials of strength (Sørensen 2009) are displayed in these moments, as the materiality makes itself present in different ways and translates into diverse attitudes. The digitised class speeded up some processes to the same extent as it slowed others. It simplified some phenomena despite adding complexity to others. For example, it facilitated attendance on time, but challenged quality participation due to poor connection; it offered ease due to the time saved in the non-necessary commute to the university, but improved physical/emotional distress through the demanded focus; and it afforded remote classes that were mostly productive for the students, but had adverse consequences for (at least) one student among the six participants of this class, who was not able to cope with the new demands from the institution she worked at as a teacher.

### **Conclusions: reframing ethics from a post-human perspective**

Emergency remote teaching has given rise to unforeseeable changes in higher education, revealing nonlinear processes arising out of improvisations and unanticipated effects. Not only was there questioning on the third parties involved in the process of transferring classes to the remote format, but also on how power and influence is actually enacted through remote access and digital settings.

During the lockdown in Brazil, the adoption of digital services and devices was supported and celebrated by governments as a quick and effective solution to give continuity to school and university education. However, as several scholars suggest, there is no causal relationship between technology and education (Abbott 2015; Biesta 2010) and a multitude of routine individual performances can lead to a mismatch between intentions, actions, and consequences (Pischetola 2020). The greatest unseen and unexpected outcome of emergency remote teaching in higher education is the lack of access to the internet due to financial adversities raised by the pandemic (Beaunoyer et al. 2020; Williamson et al. 2020), which in the context of our study already pre-existed Covid-19. These adversities are embedded in Brazilian social inequalities, where most students in primary schools are at this moment excluded by remote classes because of lack of infrastructure and internet access (Chagas 2020), and the national drop-out rate in high schools has risen massively since the pandemic breakout reaching 3.8%, which represents 1.38 million students out of school. In poorer regions such as the Amazon, these numbers grew up to 15% (UNICEF 2021). At the same time, privileged students who can afford to attend

private schools continue their education online with no interruptions despite the pandemic, and the social divide becomes even deeper.

The research presented here has allowed for the disentanglement of agents and opened up the possibility of accountability for boundaries delimitation. The new assemblage of the pandemic scenario and emergency remote teaching in higher education courses have constituted a unique phenomenon defined by original relational, spatial and material developments. In the small-scaled assemblage of the class we have examined, asking the students the question “what does technology *do* in this class?” triggered a reconceptualization of bodies, material things, and pedagogic space as a dynamic intertwinement of vital agencies. Such a non-static relationality has translated into a continuous re-enactment of boundaries among different actors, which involves inclusions and exclusions, or agential cuts, in baradian terms. These exclusions incite questions about ethics and accountability (Barad 2018) of teachers, administrators, organisations, researchers, institutions and stakeholders. These human and non-human actors are collectively responsible for whether or not a decision, an action, a path, a prevention or an exclusion is performed.

If we agree with Barad (2003, 817) that the world is “an ongoing open process of mattering”, where meaning is created through different agential possibilities, we will see why being ethical is also being political, as both ethics and politics aim at transformations in the relational structure of subjectivity. This ethical responsibility is prior to any knowledge of the other. In agential realism no neat line distinguishes facts and values; rather facts are always value-laden; they embody normative preferences that give rise to certain configurations rather than others. We are accountable for the exclusions that we participate in enacting (Barad 2018).

Being ethical and being political in an educational environment means being more attentive and aware, thinking differently, and acknowledging all material-discursive agents. It also means considering local situatedness every time we evaluate what material consequences the knowing we produce of a specific phenomenon will have for the agents involved (Lenz Taguchi and Palmer 2013). As an entanglement of cohorts, classroom dynamics result from pedagogical interactions, with each scenario being only one in a multitude of possible others. Perhaps, educational practices based and studied through a sociomaterial approach might be a less comfortable alternative for a practitioner and a researcher, but they offer emergent and creative ideas for what might be the future of education and the role of digital technologies within it.

## **Acknowledgments**



The authors sincerely appreciate the participant students' contribution.

### **Disclosure statement**

No potential conflict of interest was reported by the authors.

### **Funding**

This work was supported partially by the Fundação Carlos Chagas Filho de Amparo a Pesquisa do Estado do Rio de Janeiro (FAPERJ) – under Grant E-26/202.337/2019, and partially by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) under Grant 88887.363051/2019-00.

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