What Matter(s) in Education Beyond the Human?:

Learning as Sympoietic Storyworlding

by

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ABSTRACT

The current sustainability crisis is born from a specious notion that humans are separate from and in a position of control over nature. In response, this dissertation reconceptualizes education beyond its current anthropocentric model to imagine education as learning through relationality with all that is 'beyond' the human. The study leaves behind hegemonic binary distinctions (human/nature, teacher/student, formal/non-formal education) to reimagine education as a multidirectional process of learning as worlding and becoming-with Earth (Haraway, 2016a). It explores what matters in education and how it comes to matter.

This dissertation introduces the concept of storyworlding to describe what occurs when multispecies, multi-mattered assemblages (re)write Earth's narratives through their relationships with one another. Taking its inspiration from the work of the Common Worlds Research Collective, Donna Haraway, and Isabelle Stengers, storyworlding acknowledges that the relationships between and among all biotic and abiotic forces on Earth make stories through their interactions, and these stories make a *pluri*verse of worlds.

The study is structured as a natureculture (Haraway, 2003) ethnography. This innovation on ethnography, a traditionally human-centered method, focuses on agential, multispecies/ multi-mattered assemblages rather than the description of human culture. Data is not generated and then labeled as fixed in this study. It is emergent in its assemblages as a co-narrator in sympoietic storyworlding (Haraway, 2016b).

Data generation took place over 6 months in a small, coffee-producing region of Southeastern Brazil. Data generation methods included walking conversations with

children and the more-than-human world, participation in a multi-grade, one-room schoolhouse, and the collection of visual and audio data such as drawings, photographs, videos, and audio recordings.

Using an intentionally slow, messy, and fluid diffractive analysis, I follow the data where it leads as I think *with* the concept of storyworlding (Barad, 2007; Mazzei, 2014). Drawing inspiration from Donna Haraway, Isabelle Stengers, and Iveta Silova, the dissertation concludes with an Epilogue of speculative fabulation (SF) imaginings through which I invite the reader to engage in the thought experiment of reimagining not only what matters in education, but what education, itself, is.

Dedicated to my family, everywhere that you are.

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PROLOGUE

My earliest memory is of bees and my mother. I was 18-months old. I remember that our garage had two windows. I wanted to see my mom inside the garage. She wasn't in there, but I didn't know that. I toddled toward the windows, and that is where the memory ends.

What my parents tell me happened next is that I screamed, "Daddy! Bugs! Bugs!" Bees swarmed around me and chased me inside the house as my father – who is allergic to bees – swatted them away. I had stepped on their home. They stung me ten times. This is my first memory of encountering a winged storyteller.

Figure 1

Fieldwork Photo of a Brazilian Bee on an Orange Flower That Has Since Perished

CHAPTER 1

INTRODUCTION

Even though we may all become extinct, we can still leave our footprint in the sand.

-Dr. Seuss

Overview

Our presence is ephemeral, but our footprints outlast us. When read from a posthumanist perspective, looking beyond the human, the 'we' in the Dr. Seuss quote above includes the more-than-human world that can leave footprints even without feet. For example, the winds and waters of the Colorado river left their footprints etched in the many layers of the Grand Canyon over the course of millions of years and continue to do so. While we all leave footprints, some are bigger (or more destructive) than others. Moving away from the metaphor of a footprint as leaving behind a positive impact or legacy, we can see how the human footprint on Earth tells a different story. The coal we burn leaves a carbon footprint on our atmosphere. The plastic we use enters the waste stream and marks the oceans with its footprints. Our rising global air temperatures scorch the earth, score the surface of melting ice caps, and scar the dried, cracked land.

The quote, then, summarizes the current sustainability crisis: human footprints are accelerating the earth's sixth mass extinction by depleting Earth's non-renewable resources (Benatar et al., 2018). Humans' destructive force on the environment is born from a specious notion that humans are not only separate from nature, but also are in a position of control over all that is beyond them. This view of human exceptionalism prevents us from noticing the ways that "we are nature already" (Rautio, 2013, p. 394). In other words, there is a need to weave back together the severance between humans and

more-than-humans to dismantle the notion that humans are superior to other species and matter on Earth. This understanding of humankind as *of* the world not in power *over* Earth is a foundational point for this dissertation study. It raises the question how do we exceed the human condition to see all that is hidden from our view beyond the human?

One approach that begins to break down the unidirectional perspective of humans in power over Earth is to see the myriad ways that we are entangled with the more-than-human world. Clarke (2017) illustrates this mutual entanglement with an example from rock climbing: "If the rock is climbed, then the climber is rocked" (p. 306). Translating this logic to Dr. Seuss's quote about footprints suggests that if we leave footprints on the earth, Earth leaves prints on our feet as well. All of these marks on Earth and on 'feet' tell Earth's story - a narrative of shapeshifting stardust.

Figure 2

Fieldwork Photo of a Frosted Footprint in the Dust

Schrijver and Schrijver (2018) argue, “we are, indeed, stardust, in a very literal sense” (p. 8). In the origins of Earth’s story, the embers of exploding stars were brought together to form Earth and all its matter (Schrijver & Schrijver, 2018). In short, stars died for Earth to live. Our shared origin as the remnants of perished stars connects celestial bodies to one another: our bodies to Earth, the earth to the solar system, Galaxy, and universe (Schrijver & Schrijver, 2018). Living matter feeds on the energy of stars in the form of sunlight. The sun that feeds plants then nourishes the bodies that consume plant life and breathe the air that it cleans (Schrijver & Schrijver, 2018). This symbiotic making, or sympoiesis (Haraway, 2015, 2016b), blurs the lines that separate Earth’s matter (Schrijver & Schrijver, 2018). The constant replacement, recycling, and mutual (re)making of the biotic and abiotic forces on/of Earth is a poetic shapeshifting of ancient stardust.

As humans imbued in these celestial processes, “we are intrinsically impermanent, transient, continually rebuilt, and forever changing. We are a pattern, like a cloud, a traffic jam, or a city” (Schrijver & Schrijver, 2018, p. 5). It becomes possible in this context to imagine our human form as simply a patterned arrangement of stardust that cannot be separated from the same stardust that forms and regenerates all of Earth’s matter. Imagining new ways to see humans as one of infinite narrators of Earth’s story opens a window to see beyond humans as the center of all that is living and non-living on Earth. Embracing the perspective of humans and all matter as shapeshifting stardust helps us to reconceptualize what it means to be human and learn about our own humanity. Within a re-envisioning of human nature there exists a productive space to reimagine the role of education in the collective narrative(s) of Earth.

The Aboriginal people in the Victoria River region of Australia's Northern Territory, describe these practices of shape-shifting and embracing one's capacity to see and experience ancestral power as shimmer (Rose, 2017). Deborah Bird Rose, who has spent more than three decades returning to the Victoria River region, explains, "when one is captured by shimmer, one experiences not only the joy of the visual capture, but also, and more elegantly as one becomes more knowledgeable, ancestral power as it moves actively across the world" (Rose, 2017, p. G54). The cosmology of the Aboriginal people in the Victoria River region describes the role of 'Dreamings' as the creators of biotic life on Earth (Rose, 2017). The Dreamings, as shape-shifters, bring human and nonhuman descendants of the ancestors together into kin groups (Rose, 2017). In her work with flying foxes and flowering plants (angiosperms) among the Aboriginal people of this region, Rose (2017) observed, "life flows from ancestors into the present and on into the future, and from the outset it is a multispecies interactive project involving (minimally) flying foxes, angiosperms, and human beings" (p. G52). As you read this dissertation, engage in the thought experiment of following the call of the shimmer. Step into the multispecies stories and worlds on these pages. Shift shape.

Statement of the Opportunity

This dissertation study embraces the opportunity to reimagine education beyond the human. It raises the question, how would moving past an anthropocentric, or human-centered model of education for modernity allow for (re)making Earth's narrative(s)? Rather than furthering the status quo of leaving footprints on our path to destruction (read: economic growth), how can education be re-conceptualized to embrace learning as becoming-with the earth (Haraway, 2015, 2016a)? This dissertation study focuses

specifically on understanding how voices that are often missing from the conversation about life on a damaged earth, such as those of children and the more-than-human world, are, in fact, ghostwriters of Earth's narrative(s). In their becoming-with the world through inter/intra-action (Barad, 2008; Haraway, 2015), children and more-than-human others are situated in interspecies encounters in multispecies landscapes (Taylor & Pacini-Ketchabaw, 2015). They are emerging-with Earth as it shifts shapes. One of the ways that this study rises to the call of the opportunity to reimagine education beyond the human is to take more-than-human assemblages (Deleuze & Guattari, 1987), or webs of inseparable actors that exist and evolve in relation to/with one another, as a starting point rather than focusing on the humans themselves. The section that follows elaborates on how the study holds the potential to be conceptually innovative.

Purpose of the Study

The purpose of this study is to challenge binary distinctions (human/nature, teacher/student, formal/non-formal education) that place one as superior to the other. By flattening out these hierarchies, especially those that separate humans from nature, this dissertation aims to reimagine education beyond the human as a multidirectional process of learning as worlding and becoming-with Earth (Haraway, 2016a). To do so, the study decenters humans in favor of centering agential, more-than-human assemblages. Additionally, within this dissertation, I attune myself to the ways that we, as shapeshifting stardust, are capable of seeing how we are all deeply interconnected and bring about the earth together with/in more-than-human worlds (Bauer, 2015; Chandler, 2013).

Research Question

The following question guides this dissertation study: What matter(s) in education beyond the human? This research question is open to multiple interpretations. On the one hand, it builds on a question that is asked within the posthumanist education literature - how are students/children engaging with non-human matter and 'things' in their spaces of learning? On the other hand, it raises a new question, what *does* matter in post-anthropocentric education? It aims to add to the robust body of literature on posthumanist thought to further address the paucity of attention dedicated to what is possible if education were to look beyond the human. The question invites us to engage in a thought experiment and asks us to reflect on the ways that education systems come to be what they are. If education is to address our current, human-generated sustainability crisis, then what comes to matter in education and how it comes to matter are important questions to ask with implications for both policy and practice.

Potential Contributions

This dissertation study has the potential to leave research footprints as it offers both conceptual and methodological innovations. In this section, I outline the possibilities that exist within this study to reimagine Earth's narratives. The first innovation is the approach I take is to framing education as learning through becoming-with (Haraway, 2016a), which I refer to as storyworlding. This term was inspired by Donna Haraway and Fabrizio Terranova's (2016) documentary *Donna Haraway: Story telling for earthly survival* (Terranova, 2016). In the documentary, Haraway and Terranova employ multimodal, multispecies storytelling to illustrate the diverse ways that Earth's narrative is (re)made through sympoiesis, or making-with (Haraway, 2015, 2016b). Storyworlding,

which plays on the notion of storyboarding, includes this sympoietic making of Earth's narrative(s) by including relationships among multispecies/multi-mattered narrators that create stories which make worlds. It demonstrates how education beyond the human is, in fact, learning through sympoiesis as co-authors of worlding narratives.

The methodological approach that I employ in this study is a multispecies, multi-mattered ethnography,[1] or natureculture[2] approach for short. This approach is a nuanced recognition that humans and 'nature' are one and the same. It innovates on traditionally human-centered data collection and analysis techniques and brings into sharper focus the more-than-human world through a centering of agential, multispecies/mattered assemblages. A natureculture approach to inquiry and analysis incorporates those who are traditionally silenced, such as the more-than-human world and children, and includes them in this inquiry and narrative. Furthermore, it breaks from traditional ethnography by rejecting the role of the researcher as one who is an external observer collecting dissertation data. Rather, I begin with an acknowledgement of the ways that I am just one of infinite co-writers of Earth's narratives, who, through our relationality in assemblages, are sympoietically storyworlding.

[1] I played with using the term eth**NO**graphy, which was co-created during a potluck conversation with Mirka Koro and students from our *Qualitative data analysis beyond coding* class. While this study is a multispecies, multi-mattered ethnography, the term does not do this project's approach justice as ethnography centers the human experience. I opted to omit the term eth**NO**graphy as it does not innovate clearly enough on postmodern research using similar approaches. Instead, I refer to my approach as a natureculture approach to encompass the interconnectedness of humans, matter, and more-than-human worlds.

[2] The concept of natureculture comes from Donna Haraway's (2003) *The companion species manifesto: Dogs, people, and significant otherness*. It describes the way that humans are not separate from nature and vice-versa.

Organization

The organization of this dissertation takes its lead from influential ecofeminist scholar Donna Haraway. Rather than describing her work as posthuman, Haraway sees herself (and all of us) as compost-ist because of the ways we all "become-with each other, compose and decompose each other, in every scale and register of time and stuff in sympoietic tangling, in ecological evolutionary developmental earthly worlding and unworlding" (Haraway, 2016b, p. 97). Taking inspiration from Haraway's notion of humans and all critters as compost and drawing on post-structuralism, this dissertation rejects the binary distinction between what is (un)structured to be organized instead as if it were compost in a discontinuous and variable state of decomposition.

What is Compost?

Compost is a process. Agnew and Leonard (2003) define compost production as "the process whereby thermophilic, aerobic microorganisms convert organic material into a hygienic, biostable product" (p. 239). In other words, composting occurs when microorganisms that survive in oxygenated environments and thrive at high temperatures convert organic material into a product that becomes free of pathogens and resistant to the effects of microorganisms. The composting process requires nutrients, water, oxygen, and heat (Agnew & Leonard, 2003). As the organic materials decompose, they reduce in volume and change in color, which are both qualities that indicate compost maturity (Agnew & Leonard, 2003). The resulting mature compost provides biochemical benefits and nutrients to plants (Agnew & Leonard, 2003). Insam and de Bertoldi (2007) describe composting as a discontinuous, three-stage process of rapid decomposition, stabilization, and incomplete humification. These stages have four phases: (1) mesophilic, (2)

thermophilic, (3) cooling (or second mesophilic), and (4) maturation which result in organic matter that contains more than 50% of the starting amount (Insam & de Bertoldi, 2007).

Composting in Four Phases

The Mesophilic Phase (25–40°C) is characterized by the breakdown of energy-rich compounds that are easily degradable by primary decomposers such as fungi and bacteria (Insam & de Bertoldi, 2007). Additionally, the temperature begins to rise in the Mesophilic Phase (Insam & de Bertoldi, 2007). In the subsequent Thermophilic Phase (35–65°C), the mesophilic flora is replaced by the organisms that are adapted to higher temperatures, decomposition accelerates, and the temperature rises killing pathogens, weeds, seeds, and larvae (Insam & de Bertoldi, 2007). The second mesophilic phase is a Cooling Phase in which the thermophilic organisms which were active at the higher temperatures begin to tire and cease activity causing the temperature to decrease (Insam & de Bertoldi, 2007). Finally, the Maturation Phase is one in which "the composition of the microbial community is entirely altered" and the compounds are no longer degradable (Insam & de Bertoldi, 2007, p. 34).

Composting Research: A Dissertation in Four Phases

As Agnew and Leonard (2003) indicate, the production of compost requires nutrients (literature), water (data generation), oxygen (data analysis), and heat (time). This dissertation incorporates these elements and is organized in the four phases of compost. It begins by following the pre-established structures as laid out by the Arizona State University Graduate College using conventions that are commonly agreed upon in a social science dissertation. These include organizing the dissertation by headings such as

statement of the problem (read: opportunity), research question(s), and background literature. Just as compost maintains more than 50% of the original organic material, the overall structure of the dissertation does maintain these prescribed headings throughout the document. However, the maintenance of these sections is nuanced as the language and aims alter with each subsequent chapter.

Chapter 2, Background Literature, begins in the Mesophilic Phase. The chapter contextualizes the dissertation in this historical moment of climate crisis. It illustrates how we are struggling to survive on a deeply damaged earth and outlines the measures that have been taken to try to divest from our dependence on fossil fuels. The chapter first situates the research in the Anthropocene, a geological era of human-induced climate change (Crutzen & Stoermer, 2000). As the temperature rises, the notion of the Anthropocene begins to decompose revealing other parallel -cenes and ways of understanding human relations with Earth. The notions of human exceptionalism that hold together the Anthropocene break down, and it becomes possible in parallel -cenes to imagine different pasts, presents, and futures for Earth. Questions arise about the feasibility of maintaining the status quo of education amidst a climate catastrophe in Chapter 2.

The Thermophilic Phase begins in Chapter 3, Trees and Theories. The title of the chapter itself indicates a decomposition of the required "Theoretical Framework" label. The mesophilic flora of mainstream grand theoretical orientations give way to theories that reject bifurcation. The chapter challenges philosophical dualisms (e.g. mind/body, human/animal, nature/culture) that separate humans from nature, or nature from culture, and place them in a hierarchical position of opposition. Instead, the chapter frames

humans as inseparable from nature and interconnected in multispecies relationships to one another. These relationships create stories that make worlds in sympoietic storyworlding. The 'pathogens' of hegemonic theoretical orientations predicated on a nature/culture divide are killed by the rising temperatures of the Thermophilic Phase altering the composition of the theoretical approach to become a continuum in which it is impossible to bifurcate what Haraway (2003) describes as natureculture, or an inseparable fusion between nature and culture.

The Thermophilic Phases continues its decomposition of hierarchical distinctions in Chapter 4, "Magnificent" Methods, by destroying the weeds and seeds of human-centric approaches to inquiry. The material that constitutes Chapter 4 inquires education beyond the human by outlining three data collection and three data analysis "methods" that have been used to explore how children become-with the more-than-human world. The chapter concludes with an explanation of this dissertation's natureculture approach (Haraway, 2003) to a form of inquiry that effectively rejects the conventions and structures of human-centered and adult-led research.

The Cooling Phase of the dissertation begins in Chapter 5, Data Analysis and Findings. At first glance, the chapter maintains its structural matter from the prescribed label for a data analysis and findings chapter. Entering deeper into the chapter's diffractive analysis (Barad, 2007, 2008; Jackson & Mazzei, 2012; Mazzei, 2014), though, invites the reader to storyworld with the data by following the data in the different directions of its rhizomatic shape and "reading-the-data-while-thinking-the-theory" of the previous chapters (Mazzei, 2014, p. 743). The data is presented in such a way that the reader is invited into the relationship and constitutes the analysis as a co-author in

storyworlding to create new paths for knowledge production. In order to nourish favorable conditions for such a relational approach, there is a noticeable absence of "telling" the reader how the analysis was "done" and a perceptible invitation to join in ongoing storyworlding.

The second mesophilic, Cooling Phase continues in Chapter 6, Provocations. The temperature decreases further allowing for the chapter to maintain its structure just enough to raise questions about what education ***is***. However, in this chapter, the status quo conventions have tired and ceased activity, and the altered organic material now begins to resemble something akin to maturing compost. The reader will neither find neatly packaged conclusions nor a list of policy recommendations in this chapter. Instead, the maturing compost beckons the reader to engage with a series of provocations meant to reimagine education as learning through sympoietic storyworlding. This chapter requires the reader to find new pathways for understanding and storying.

As the dissertation enters the Maturing Phase, again, drawing inspiration from Haraway (2013), the narrative shifts to include "the factual, fictional, and fabulated" in an Epilogue of SF imaginings. Haraway (2013, 2016b) refers to SF as speculative fabulation, speculative feminism, science fiction, speculative fiction, science fact, science fantasy, and string figures. She elaborates that SF also means "so far," opening a space for worlding of what is yet to come (Haraway, 2013; Silova, 2020). Haraway (2016b) argues, "it matters what stories make worlds, what worlds make stories" (p. 12). In the Epilogue, Imaginings, the same data that appears in Chapter 5 re-emerges and joins other data from the study in a speculative fable (SF) of Winged Storytellers that asks *And if*? (Silova, 2020; Stengers, 1997). In the Maturation Phase of speculative fabulation where

"the composition of the microbial community is entirely altered" (Insam & de Bertoldi, 2007, p. 34), the data and readers narrate different stories. They story different worlds.

The use of speculative fabulation in the Epilogue is meant to disrupt our taken for granted assumptions – including those about what education, learning, inquiry, and data can do and be – by eliminating hierarchical relations between us and the data, revealing and inviting us to sympoietically story alternate imaginaries and worlds. The provocations and thought experiments, in and of themselves, grow and spread in all directions, in a rhizomatic fashion, and open doors to other worlds that were always, already there, but are newly accessible through our sympoietic storyworlding. With each reading and reader, new stories emerge to make worlds. New worlds come into focus generating new stories. This use of SF and storytelling is a direct response to Stengers's (2016) assertion:

> We have a desperate need for *other stories*, not fairy tales in which everything is possible for the pure of heart, courageous souls, or the reuniting of goodwills, but stories recounting how situations can be transformed when thinking they can be, achieved together by those who undergo them. (p. 132)

Through this endeavor to create other stories, "the world" shifts from a singular, fixed entity to include many dynamic possibilities and worlds. Stengers (2019) credits William James for proposing "that the world is a pluriverse *in the making*" (Stengers, 2019, p. 189, emphasis original). The notion of an evolving pluriverse carries with it an implication that there are multiple, parallel worlds in nonhierarchical coexistence that interconnect everyone and everything (Silova, 2020). Engaging with the thought experiment of reimagining the data through SF in the Epilogue, Imaginings, is my way of

taking up the work of influential scholars such as Donna Haraway, Isabelle Stengers, and Iveta Silova to offer an additional avenue through which to reconfigure the human-Earth relationship and learn how to live and die well with Earth (Haraway, 2016b). The literature, stories, and speculative fable in this dissertation invite you to join in storying-*with* all that animates these pages, and, in doing so, create space to reimagine education as learning through sympoietic storyworlding.

CHAPTER 2

BACKGROUND LITERATURE

Earth is vomiting. She is not well.

Everything that destroys nature destroys itself.

— Werymerry Pataxó Hã-hã-hãe

(Mesophilic Phase)

In the mesophilic phase, easily-degradable compounds begin breaking down, and the temperature rises.

A Damaged Planet

There has been no shortage of tragedies in the news recently. Worldwide there are nearly 60,000,000 cases of COVID-19 with upwards of 1,400,000 reported deaths (Schiffmann, 2020). Currently, more than 100,000 wildfires are burning across Brazil (Associated Press, 2020). In the United States in 2020 to date, there have been 49,557 fires which are responsible for the destruction of 8,727,443 acres of land (National Fire Information Center, 2020). Last year, a deadly cyclone fell upon Mozambique, Malawi, Madagascar, Zimbabwe, and South Africa on March 15, 2019 killing more than 750 people, uprooting trees, destroying structures, washing debris out to sea, and trapping people in stagnant flood waters (Sevenzo & Cardovillis, 2019). Extreme weather has swept across the United States as well. This year has seen violent, brutal cold in polar vortexes that descended upon the Midwest, overwhelming floods, record heat waves, and furious wildfires. In January 2019 a tragedy occurred in Brumadinho, Brazil where a dam burst killing at least 166 people and devastating lands inhabited by Brazil's Indigenous populations (Reuters, 2019). The inundation, which polluted drinking waters and killed

wildlife, will have a lasting environmental impact for years to come (Sulleiro, 2019). The Pataxó Hã-hã-hãe Indigenous people who rely on the river for fish as a primary food source, lost their food source and saw their land and livelihoods destroyed (Sulleiro, 2019). Now that the river has been so polluted with toxic waste, the Pataxó Hã-hã-hãe people have been forced out of their ancestral home to reside in favelas, or slums, far from what they have known (AFP, 2020). On top of losing their homeland, members of this Indigenous group have also contracted COVID-19 and are fighting for their lives.

These 'natural' disasters including the out-of-control spread of a deadly virus and the collapse of a man-made dam in Brazil tell a story of Earth's demise at the hands of humans. As global temperatures continue to rise, tragedies from hurricanes, monsoons, wildfires, disease, and extinction will be, and already are, commonplace: a grim status quo. Benatar et al. (2018) explain, "accelerations in the depletion of non-renewable resources (such as freshwater supplies and fossil fuel sources), deforestation, soil degradation, and the acidification and pollution of oceans undermining many of the sources of global food chains" are leading scientists to refer to this time as the sixth mass extinction (p. 156). Among these scientists are Steffen et al. (2007) who have also warned of the dangers of a very real extinction crisis.

The United Nations has responded to the threat of climate change with international treaties such as the Kyoto Protocol in the 1990s and the current Paris Agreement, which entered into effect on November 4, 2016 (UNCC, 2018). It seeks to limit the global temperature rise to 1.5-2°C above pre-industrial era levels (UNCC, 2018). The Paris Agreement aims to do this by calling on individual nations to take responsibility for their climate change mitigation efforts in the shared common goal of

limiting the rise of global air temperature (Falkner, 2016). The achievement of the goals laid out in the Paris Agreement, as Falkner (2016) argues, requires targeted efforts at carbon sequestration. However, attempts at large-scale afforestation for carbon capture, the viability of which remains uncertain, also has the potential to create food security concerns (Falkner, 2016).

In a 2018 report, the Intergovernmental Panel on Climate Change (IPCC) cautioned that a warming of 1.5°C above pre-industrial levels will occur between 2030 and 2052 if current trends in carbon emissions continue. Some scholars argue that that a predicted warming of only 1.5°C is optimistic, and average global air temperatures, in reality, could reach over 4°C or even 5°C warmer (Crutzen 2002; Latour, 2015). Included in the IPCC (2018) report is the projected impact of global temperature rises at 1.5°C compared to 2°C. In general, the report concludes, with high confidence, that limiting warming to 1.5°C will result in lesser impact on terrestrial ecosystems than a warming of 2°C. For example, impacts on biodiversity, species loss, and extinction are projected to be lower when warming is limited to 1.5°C, which the IPCC (2018) argues will allow these ecosystems to "retain more of their services to humans" (p. 10). Additionally, the IPCC (2018) report concludes, "climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to increase with global warming of 1.5°C and increase further with 2°C" (p. 11). The increasing global air temperatures are accompanied by a rise in ocean temperatures which will further result in the loss of biodiversity of insect, plant, and vertebrate life (IPCC, 2018). Limiting warming to 1.5°C rather than 2°C will also mitigate the impacts of climate change on efforts made to reduce poverty and inequality (IPCC, 2018).

While limiting temperature rise to 1.5°C results in less impact on global ecosystems, it still projects a future of challenge and strife. Furthermore, the risks posed by global warming disproportionately affect ecosystems and individuals depending on "the magnitude and rate of warming, geographic location, levels of development and vulnerability, and on the choices and implementation of adaptation and mitigation options" (IPCC, 2018, p. 7). The rise in global temperature is not and will not be experienced equally around the globe. In short, the Paris Agreement and the IPCC report both recognize that "climate change increasingly poses a challenge especially to poorer societies, as failure to reduce emissions quickly is locking in dangerous global warming for decades to come" (Falkner, 2016, p. 1116).

Summary and Conclusions

One of the key culprits of climate change and the rise in average global air temperature is human dependence on fossil fuels. According to Benatar et al. (2018), the pollution generated by fossil-fuel based production systems is the primary cause of premature death among humans. Comparatively, it is "the poor that tend to bear the brunt of the effects of pollution and degradation of their health and primary living conditions and who tend to have much lower life expectancy than the affluent" (Benatar et al., 2018, p. 158). Falkner (2016) cites a need to "wean" off of the combustion of coal, oil, and gas in order to address the biggest source of human-generated carbon dioxide emissions. The evidence of climate change is clear. There is an urgent need, as expressed by the IPCC (2018) report, to limit the rise of global temperatures. As Silova et al. (2018) poignantly state:

> In just twelve years – coinciding with the projected achievement of [the] Sustainable Development Goals (SDGs) by 2030 – we will be no longer facing a dilemma of *sustaining* our current lifestyles, but rather *struggling to survive* on the deeply damaged earth.

As we stand on the edge of ruin, considering how to navigate this climate crisis, we are forced to reflect on the role that human presence, actions, and priorities play in Earth's narrative of demise (Rooney, 2018). *What have humans done? Will it be our undoing?*

Setting the -cene

This section is meant to set the scene in two distinct ways. It both lays the groundwork for this dissertation and situates its chapters within the debate about naming the current geological era the *Anthropocene*. The section begins by painting a grim picture of the state of Earth's climate crisis. It continues with an evaluation of the origin and responses to the contested term Anthropocene. The goal of this section is to understand the role of education in addressing Earth's sustainability crisis. As this dissertation research was/is co-created with children and more-than-human participants on family-owned coffee plantations in Southeastern Brazil, I further contextualize the literature review in this chapter by exploring the state of political, agricultural, and educational affairs in Brazil. Specifically, this section illustrates current issues surrounding Brazilian education policies and practices as they relate to sustainability.

Throughout the dissertation, the chapters will show how children and the more-than-human world are largely excluded from conversations about policies that affect them. However, young people across the globe have steadily built a school strike movement to ensure that their voices are heard. This chapter includes an overview of the

#FridaysForFuture and Zero Hour movements, which have inspired millions of people to take to the streets and rise up to demand climate action. This chapter concludes with the argument that the current planetary precarity is caused by the view that humans are an exceptional and superior species capable of dominating all others, thus qualifying humans to be both creator of and solution to the problem of climate crisis. This view of human exceptionalism is preventing humans from seeing other possibilities for being, existing, and relating to the more-than-human world. Placing humans at the center of all creation has allowed for planetary damage to reach its current level, which shows no sign of slowing.

The —cene

The current precarity of the planet suggests that Earth is in the process of leaving behind the relative stability of the Holocene geological era to enter into the age of human-generated geological change (Latour, 2017; Steffen et al., 2007). Crutzen and Stoermer (2000) were the first to suggest naming this era the Anthropocene to mark the influence of humans - *anthropos* - on the environment. According to Steffen et al. (2007), this naming of the epoch as the Anthropocene signifies that humans are a "global geological force" (p. 614). In this era of human domination, Crutzen (2002) argues in favor of using the term Anthropocene as an appropriate way to represent the impact of humans. However, not all scholars agree that 'Anthropocene' should be the only accepted nomenclature. To get to the heart of the issue, an era that is marked by humans as a geological 'force of nature' assumes that 'Man' is both a part of the problem and the solution to climate change.

Placing humans in this light ignores the ways that humans are, in fact, "vulnerable to living and nonliving earth processes" (Hird, 2013, p. 107). In addition, it "reflects denial not only of the reality and threat of climate change but more broadly of the multifactorial underpinnings and magnitude of the many interlinked global crises that need to be faced" (Benatar et al., 2018, p. 169). Anna Tsing (2015) raises an important question about existing in the Anthropocene: "Can we live inside the regime of the human and still exceed it?" (p. 19). While the idea of the Anthropocene carries with it hope of human-generated salvation, it falls on its own sword by using the same logic to frame the solution as that which created the problem: human exceptionalism.

For this reason, scholars have generated names for different -cenes such as the Symbiocene (Benatar et al., 2018), Capitalocene,[3] Plantationocene, and Chthulucene (Haraway, 2015, 2016b; Haraway et al., 2016) to characterize the current situation. These conceptualizations, or -cenes, are in simultaneous existence as they converse with and are used to critique one another (Haraway, 2016b). For the purposes of setting the scene in this chapter, the following sections detail the concept of the Anthropocene and the use of the terms Capitalocene and Plantationocene as critiques of this notion. Later, in the chapter's conclusion, Donna Haraway's (2016b) concept of the Chthulucene is presented as a parallel pathway that challenges the idea of human beings as the only actors of importance. Within the Chthulucene lies space for imagining new futures beyond the human at the center of influence.

[3] Donna Haraway gives credit to Andreas Malm and Jason Moore for coining the term Capitalocene before she began using it as her own (see Haraway, 2015, p. 160).

Anthropocene

The Anthropocene tells a story of human domination. According to Lövbrand et al. (2015), "it is a story of 'the Anthropos' that has conquered the planet and now is humanizing the natural environment in dangerous and unforeseeable ways" (p. 213). The epoch was brought on by industrialization in the late 1800s with the advent of the steam engine and modern capitalism (Crutzen, 2002; Steffen et al. 2007; Tsing, 2015). The climate change that resulted is credited as the primary signal or evidence of the Anthropocene (Crutzen & Stoermer, 2000; Lövbrand et al., 2015). Anna Tsing (2015) refers to the use of the atomic bomb at Hiroshima as a defining moment in which humans exercised their control over nature and demonstrated their potential to "destroy the livability of the planet -- whether intentionally or otherwise" (p. 3). Somerville and Powell (2019) reiterate this notion that the 'great acceleration' of the 1950s was an important historical moment of intensified human impact on the planet. Human awareness of this impact on Earth's viability has only increased with evidence of climate change and the sixth mass extinction underway (Tsing, 2015).

The time has come that we can no longer deny that the fates of the human and more-than-human worlds are inextricably linked (Taylor & Pacini-Ketchabaw, 2015). In this era of the Anthropocene, "survival teeters on a question stirring in the marrow of the Earth's bones. What kinds of human disturbances can life on Earth bear?" (Gan et al., 2017, p. G12). And, for those who ascribe to the belief that humans hold the fate of Earth in their hands, it is a question of if humanity can rise to the challenges posed by the Anthropocene (Steffen et al., 2007). Anna Tsing finds a space within the conceptualization of the Anthropocene to raise questions about "the contradiction of

asking for solutions from the very creature that caused all the problems in the first place" (Haraway et al., 2016, p. 541). By *recognizing* that 'Man' both made the mess and now must conquer nature to curtail a disastrous fate, Tsing argues the contradiction itself is thought-provoking (Haraway et al., 2016).

In their critique of the use of Anthropocene to characterize this epoch, Haraway et al. (2016) remind us to radically rethink our relationships by paying special attention to how we relate with more-than-human others. This is because the notion of the Anthropocene overemphasizes the theory of individualism and ignores the ways in which no species, not even "exceptional" Homo sapiens, acts alone (Haraway, 2015, 2016b). In doing so, it erases the importance and needs of more-than-human others who act with humans. Taylor (2017) cites Stengers's critique that the underlying assumption of humans' ability to conquer nature reifies the human regime and relies on science as a panacea. In other words, the era is not only about the ascent of man, but also it is too focused on the ascent of the scientist (Stengers, 2012), as it is a time when scientists are tasked with leading society toward technologically innovative environmental management (Crtuzen, 2002). After all, according to the IPCC (2018) report, the pathways to achieving the goals of the Paris Agreement necessitate significant changes in the use of energy and improvements upon land use, infrastructure, and industrial systems. The bottom line is that the 'age of Man' gives way to the assumption that all that is needed to resolve the sustainability crisis are creative, human-generated solutions (Conty, 2018). If humans are able to create technological fixes to address carbon emissions and are able to sustain net zero carbon dioxide emissions, they would be in a position to slow the effects of anthropogenic global warming (IPCC, 2018). However, Stengers (2016)

retorts, “it is not in the least bit ensured that the sciences, such as we know them at least, are equipped to respond to the threats of the future” (p. 29).

An additional, parallel perspective on the Anthropocene is that it is not an epoch, but rather a boundary event on the geological time scale (Haraway, 2015). As a boundary event, it can be reconceptualized as a liminal space within which to imagine different presents and futures that restore balance between all of Earth’s actors. For Haraway (2015), “right now, the earth is full of refugees, human and not, without refuge” (p. 160). The Anthropocene as a boundary event serves as an opportunity to imagine an epoch in which refuge is replenished (Haraway, 2015). However, the very logic of the Anthropocene as the age of humans who are focused on material consumption, deceived by the notion of an independent self, and driven by the pursuit of wealth is not in harmony with a goal of restoring refuge (Benatar et al. 2018). Tsing (2015) refers to this challenge as living despite capitalism, which she calls ‘third nature.’ Advanced capitalism, which began in the Enlightenment (Benatar et al., 2018), has since consumed us, absorbing all life into the market and ensuring that “‘seeds, cells and genetic codes’, all of our basic earth others, everything that lives, has become controlled, commercialised, and commodified” (Somerville, 2017b, p. 396). In their critiques of the Anthropocene, scholars are referring to other parallel boundary events such as the Capitalocene and Plantationocene (Haraway, 2015, 2016b; Haraway et al., 2016) to imagine different possibilities for understanding Earth’s past, present, and future.

Capitalocene and Plantationocene

Within the context of the Anthropocene, by focusing on humans as a force of nature, not only are their relationships with more-than-human others pushed outside of

the scope of vision, but also capitalism as a system of relating is also ignored. Tsing (2015) argues that an understanding of capitalism is necessary but will not result from staying inside capitalist logic. Instead, an ethnographic eye is required in the observation of capitalism as a system of accumulation (Tsing, 2015). Haraway, who credits Andreas Malm and Jason Moore with first coining the term Capitalocene, offers her version of the term as an alternative way to describe the realities of the current timespace (Haraway 2015, 2016b; Haraway et al., 2016). Haraway notes how Jason Moore used the concept of Capitalocene as a way to reread Marx through a multispecies lens (Haraway et al., 2016). This alternative eye opens a space to see beyond the human as the center of being.

One key distinction between the Capitalocene and the Anthropocene is that the Capitalocene encompasses a longer history, looking back to slavery, rather than industrialization and fossil fuel use, as the point of origin (Haraway et al., 2016). The underlying tone of both the Capitalocene and the Anthropocene is one of doom surrounding the possibility that it may be too late for planetary redemption (Haraway, 2016b). Capitalism was relationally made (Haraway, 2016b) and continues to commodify everything in its path, including materials, land, insects, animals, and humans. This deeper focus on relationships that is missing from the Anthropocene's overemphasis on individualism, suggests that the Capitalocene can and, as Haraway (2016b) argues, must be "relationally unmade" in pursuit of an era of greater livability (p. 50). In doing so, it stands a chance of introducing the needs of lives and matter beyond the human.

So far, we have seen that the Anthropocene is recognized as beginning with industrialization and focuses on *anthropos* as 'master' of nature. The Capitalocene, which is in simultaneous existence, marks its beginning with slavery and explores relations of

commodification and accumulation. As a third simultaneous -cene, the Plantationocene reaches its origins even further back into the colonial legacy of slavery on plantations (Haraway et al., 2016). As she did with the Capitalocene, Haraway (2016b) credits the genesis of the term Plantationocene to others as it was co-constructed with participants of a recorded conversation which occurred in 2014 at the University of Aarhus.[4] The Plantationocene details the transfer, exploitation, and alienation of individuals through the use of slave labor to transform and commodify plantations (Haraway, 2016b). According to Haraway, the plantation system, in fact, predates the boundaries of the Anthropocene and Capitalocene (Haraway et al., 2016). Haraway dates the systematic relocation of "plants, animals, microbes, [and] people" to before the industrial revolution (Haraway et al., 2016, p. 557). In the Plantationocene, it is possible to observe labor within a racialized, capitalist system of unequal power relations.

As with the Anthropocene and Capitalocene, Haraway (2016b) refers to the Plantationocene as a boundary event rather than an epoch. To this day, in a globalized world of production, the Plantationocene grows ever more ferocious, destroying diverse ecosystems and exterminating local labor along the path to production (Haraway, 2016b; Haraway et al., 2016). Tsing (2015) reiterates that alienation is a key facet of plantations, as it allows for better control. Plantations as locations of mass production are harsh and unwelcoming. For example, Swadener (1996) illustrates the crowded and cold living conditions on tea plantations in Kenya. In this setting, plantation workers faced shortages of firewood and charcoal needed to stay warm and suffered from upper respiratory

[4] For more information see footnote number 5 on page 206 of Donna Haraway's (2016b) *Staying with the trouble: Making kin in the Chthulucene*.

disease (Swadener, 1996, 2000). Alienation was further demonstrated in the working mothers' urgent childcare needs resulting in a schooling serving a custodial function (Swadener, 1996, 2000). The severe circumstances imbued within the narrative of plantations and the Plantationocene do not offer much hope for seeing harmonious ways for living-with and dying-with (Haraway, 2016b) Earth's others. In this way, the destructive legacy of plantations continues.

Environment under Siege

In the context of Brazil, specifically, plantations and land use gained attention since the inauguration of conservative Jair Bolsonaro's presidency on January 1, 2019. To begin, Bolsonaro has sent mixed messages about whether or not he plans to leave the Paris agreement. If he were to do so, it would effectively renege Brazil's obligation to work toward mitigating their carbon emissions (Artaxo, 2019; Menton & Milanez, 2018). In terms of agriculture, Brazil is known for its production of crops such as soybeans, sugarcane, corn, and cotton (Zalles et al., 2019). However, according to The World Bank (2018), the top culprits causing high emissions in Brazil are changes to land use and deforestation. The need for pasturelands to produce beef and soybeans is currently driving deforestation (Zalles et al., 2019). Despite trends in deforestation in Brazil, given the global importance of the Amazon rainforest, there has recently been a slowing in deforestation of the Amazon biome.

However, over the past eight years, the Brazilian government has been slowly removing funding and programs aimed at protecting Indigenous communities in deference to industries that are attempting to gain access to Amazon land (Londoño, 2019). This practice escalated upon Bolsonaro's inauguration into office as he swiftly

dismantled several government divisions which were focused on climate change (Escobar, 2019). One of his first decisions as president was to combine the ministries of environment and agriculture, an act which weakens the checks and balances in place to protect the Amazon (Menton & Milanez, 2018). Furthermore, this change allows the transfer of "responsibility for certifying indigenous territories as protected lands to the ministry of agriculture [which] has traditionally championed the interests of industries that want greater access to protected lands" (Londoño, 2019). This transfer of administration threatens Indigenous lands as the change potentially undermines existing codes in place that require land holders to protect and maintain a percentage of the Amazon biome (Artaxo, 2019).

The Indigenous territories and their protected lands have historically acted as a buffer to the expansion of industry and mining into the forest (Menton & Milanez, 2018). Bolsonaro defends his decision to remove these protections. He claims "fewer than a million people live in those isolated areas of Brazil, in reality, and they are exploited and manipulated by nongovernmental organizations" (Londoño, 2019). Bolsonaro's logic is that by removing the protected status of their lands, they will be better able to integrate into Brazilian life and enjoy the protections of the Brazilian government. Some might argue that this is an attempt to veneer the government's preferential treatment of industries over individuals. The destruction of protected Indigenous lands leads to an erasure of their history and knowledge. Brazilian anthropologist Eduardo Viveiros de Castro (1996), more than twenty years ago, highlighted why this practice of integrating Indigenous populations into national society is problematic. Not only is it based on a denial of Indigenous groups' capacity for historical agency, but also it communicates that

their histories and lifestyles are expendable and therefore able to be assimilated into national society (Viveiros de Castro, 1996).

When viewing the potential harm these practices will cause to the ecosystems and individuals of the Amazon biome, it is also noteworthy that the increased emissions resulting from Amazon deforestation will also have a global impact. This threat to the environment serves as an example of whose voices are missing from decisions that affect planetary well-being. Bolsonaro's ability to remove Brazil from the Paris Agreement and to exploit Amazon land and resources with fewer checks and balances are simultaneously situated in the Anthropocene, Capitalocene, and Plantationocene. The Brazilian government's actions demonstrate the destructive power of human-centric decisions. They serve the capitalist interests of large industries and benefit from alienation and the exploitation of lands and individuals for production. These actions further the sixth mass extinction. The challenges of impending extinction, climate change, and environmental degradation laid out in this chapter thus far raise questions about the role of education in addressing the sustainability crisis.

Education and Sustainability

Earth's narrative is one of uncertainty and precarity. Education is a key puzzle piece in the context of the Anthropocene. Education holds the potential to train the next generation of scientists and innovators who will work toward human-generated technological tools to lower carbon dioxide emissions. Education could contribute to the reduction of the global social inequalities that cause some to experience the effects of climate change disproportionately to others. Education might even have the potential to teach children how to improve the health and well-being of the species, human and more-

than-human alike, that suffer due to rising global temperatures. However, education can be a double-edged sword as it can also be a tool that furthers the status quo responsible for causing the current climate predicament.

The United Nations 2030 agenda for sustainable development is one strategy used to address the sweeping need to foster planetary peace, security, and sustainability. The fourth sustainable development goal (SDG 4) aims to grant access to quality education to all. Within this target is a call for education *for* sustainable development (Goal 4, 2015). However, the act of promoting greater access to education alone will not solve the problem of a human-generated climate catastrophe. David Orr (2009) notes:

> Education has long been a part of the problem, turning out graduates who were clueless about the way the world works as a physical system or why that knowledge was important to their lives and careers, while at the same time promoting knowledge of the sort that has fuelled the destruction of ecologies and undermined human prospects. (p. 176)

The source of education's destructive power is the conceptualization of the goal itself. Quality education, as it is currently framed, focuses on a Western model of education for economic growth that prioritizes literacy and numeracy (Silova et al., 2018). Evidence of this focus can be seen in the use of cross-national comparisons of International Large-Scale Assessments (ILSAs), one of the most-well known and influential of which is the Organization for Economic Development's (OECD) Program for International Student Assessment (PISA) (Fischman et al., 2018). PISA is a survey that is administered every three years to 15-year-old students in more than 90 countries (OECD, 2018a). Students are primarily tested on what the OECD (2018a) refers to as "the key subjects: reading,

mathematics and science." Additionally, for some countries, the 2018 iteration of the survey included items to assess students' financial literacy and global competence (OECD, 2018b, 2018c).

Beyond these efforts, the OECD has gone as far as to implement an early childhood PISA survey which is called the International Early Learning Study (IELS), also known as "preschool PISA" or "Baby PISA" (Moss et al., 2016; Moss & Urban, 2017). These large-scale assessments of 5-year-old children are based on the rationale that the surveys will provide useful data to help improve education performance (Moss et al., 2016). According to the OECD, "The International Early Learning Child Well-being Study is designed to help countries to improve children's early learning experiences, to better support their development and overall well-being" (OECD, 2017). However, the hyper-positivistic implementation of IELS has been criticized for framing education as a technical practice while ignoring its inherent political nature (Moss et al., 2016). The IELS assessments of children have also been critiqued as dismissive of diversity, absent of an acknowledgement of the unequal relations of power that are always present, and lacking in outreach and consultation with the communities, families, and children whose lives are affected by their implementation (Moss et al., 2016; Urban & Swadener, 2016). It is also worth noting that IELS was developed without consultation or scholarly debate among early childhood education specialists and scholars (Urban & Swadener, 2016). Some have referred to the prominence of ILSAs such as PISA, and especially the (mis)use of ILSA rankings for cross-national comparison of education quality, as "idiocy for all" (Fischman et al., 2017). While such assessments could provide a means for

comparisons, a decontextualized ranking using an "idiotic" or myopic lens that lacks nuance and ignores the broader social context is dangerous (Fischman et al., 2017).

As a result of the value placed on literacy and numeracy as indicators and drivers of education quality (read Western, modern education), environmental education and education for sustainability are pushed aside. Taylor (2017) describes the responsibility that falls upon teachers to challenge the "business-as-usual of environmental education" in order to rise to the challenge of children's uncertain futures (p. 1). Other scholars echo this demand to change education to respond to a changing and evolving environment (Vozzo & Smith, 2017). The current framing of quality education does not make space for these challenges to Western modernity. According to Vozzo and Smith (2017), the Anthropocene's precarity requires educators to foster community projects and activities aimed at improving the quality of life on Earth. Education, therefore, serves two purposes: "to help students learn to live responsibly in the world outside the classroom; and to help students develop the knowledge, skills and values to be able to improve that world" (Vozzo & Smith, 2017, p. 293). These approaches to education in the Anthropocene track with the notion of human exceptionalism. Education within the Anthropocene and Capitalocene is human-centered and solutions based (i.e. it fosters economic growth and prosperity). However, it is necessary to ask what other ways forward might lead to greater livability for all on this damaged planet.

Education based on Indigenous knowledges offers different ways of knowing, seeing, and being that could shed light on avenues forward which have been blocked by an overwhelming view of human exceptionalism. The IPCC (2018) report places value on Indigenous knowledges, claiming with high confidence, "Education, information, and

community approaches, including those that are informed by Indigenous knowledge and local knowledge, can accelerate the wide-scale behaviour changes consistent with adapting to and limiting global warming to 1.5°C" (p. 24). Despite the value of Indigenous and local knowledges to encourage changes in behavior in line with limiting warming to 1.5°C, Silova et al. (2018) argue that development efforts thus far have allowed the focus on models of Western education to overpower environmental concerns. Even if education in its current model were to incorporate education for sustainable development (ESD), it will still inadequately address the origins of the climate crisis. Komatsu et al. (2020) illustrate why ESD falls short in responding to our human-generated catastrophe, explaining, "ESD narrowly promotes one form of education, which is anchored in Western modernist schooling and privileges human exceptionalism and liberal individualism over other values" (p. 315). The prioritizing of economic growth and disregard for its impact on Earth's limited resources threatens to, at best, continue a status quo of destruction, and, at worse, accelerate it. As the logic of a Western model of education for economic growth conflicts with the sustainability of the planet, Silova et al. (2018) call for education to delink from this model and move past its focus on literacy and numeracy. Instead, they argue, "we must first fundamentally change ways of being, then (re)describe the world including education in those terms" (Silova et al., 2018).

Education in Brazil

Policymakers in Brazil are aware of the obligation of education to respond to the challenges posed in the Anthropocene. In the guidelines for their national curriculum, the Ministry of Education (MEC) recognizes the universal need for educators to understand

the current crisis in order to prevent its deleterious effects (Ministério da Educação (MEC), 2013). Within this context, MEC frames early childhood education as serving a complementary role to the family in order to protect children and foster "children's integral development and full life" (MEC, n.d., p. 4). The curriculum is designed to be a rights-based endeavor aimed and ending discrimination against children and fostering their inclusion in the social matters that affect their lives (MEC, n.d.). In particular, the Ministry of Education highlights the importance of recognizing children's "privileged way of knowing the world through play" (MEC, n.d., p. 14). It follows, from this rights-based approach to education, that it is the right of children to be prepared for the environmental hardships they will face as a result of climate change, and that it is the responsibility of the state to provide education which furthers an agenda of sustainability and prepares children accordingly.

The Brazilian national curriculum, in response, and following the logic of human exceptionalism, includes a number of references to practices that will promote sustainability (MEC, 2013). For example, the environmental education curriculum strives to engender "an integrated understanding of the environment in its multiple and complex relationships" in order to encourage individuals to protect the environment as an exercise of their citizenship (MEC 2013, p. 166). References to sustainability are mostly found when referring to the goals for Indigenous and rural education. For example, the onus for teaching and learning to preserve life on Earth falls on the rural education sector. According to the MEC (2013) national curriculum:

> Forms of organization and methodologies pertinent to the reality of the countryside must be welcomed, such as the pedagogy of the land, which seeks a

> pedagogical work based on the principle of sustainability, to ensure the preservation of the lives of future generations, and the pedagogy of alternation, in which the student participates concomitantly and alternately in two learning environments: the school and the workplace, assuming an educational partnership, in which both parties are responsible for the student's learning and training. (p. 73)

This language only appears in the national curriculum guidelines in reference to rural education. It is the duty of rural education to ensure that children learn to care for the land in a sustainable manner. This follows within the logic of the Anthropocene, Capitalocene, and Plantationocene, as it is the rural, farming populations that are providing food and exports for the nation. This particular rural education guideline suggests that the workplace (the land) is also a space of education, in partnership with the formal education provided by the Brazilian government. In doing so, it opens doors to imagine educational spaces beyond the classroom and beyond the binary distinction of (in)formal education.

In addition to the national curriculum guidelines for education, the Brazilian government also has a law in place to govern education. The law of guidelines and bases of national curriculum[5] (Law 9.394), was passed in 1996 and revised as recently as 2017 (Presidência da República, 1996). An analysis of the policy illustrates the Brazilian government's focus on literacy and numeracy over other disciplines. To begin, the law requires "the study of Portuguese and mathematics, [and] knowledge of the physical and

[5] Lei 9.394: Lei de diretrizes e bases da educação nacional (Senado Federal, 2005)

natural world and social and political reality, especially in Brazil" (Presidência da República, 1996). The policy references the compulsory teaching of Portuguese and mathematics in secondary school while also ensuring that Indigenous communities are permitted to use their mother tongue(s) (Presidência da República, 1996). Evaluation of progress in these disciplines is monitored by two tests called Provinha[6] Brasil (Little Brazil Test) and Prova Brasil (Brazil Test) (MEC, 2019a, 2019b). The former is administered during the second year of elementary school as a tool to monitor literacy and phonics development in children (MEC, 2019b). The latter, Brazil Test, is a standardized large-scale diagnostic evaluation focused on reading, mathematics, and problem solving that is administered in the fourth and eighth grades to evaluate education quality (MEC, 2019a).

When taking a broader look at Brazilian education policies and practices, some contradictions arise. On the one hand, the Ministry of Education views the role of schooling to be a rights-based endeavor aimed at preparing children to exercise their citizenship in protection of the environment. On the other hand, the focus on Portuguese and mathematics follows the trend of education systems around the world that are based on notions of Western modernity and education for economic growth models. These education practices that prioritize literacy and numeracy displace other disciplines and limit the ability of education systems to prepare children for the sustainability crisis they are inheriting. Furthermore, as Silova et al. (2018) argue, "it is clear that the Earth does not need more 'educated' consumers of knowledge – a mere refurbishment of the long-

[6] -inho and -inha are used to create diminutive words meaning little in this case.

standing Western-turned-modern assumption that knowledge alone will allow us to reach the 'good' life." Indeed, although the concept of the Anthropocene is built upon the foundational power of humans and technological advancement to 'solve' the sustainability crisis, one of the key puzzle pieces, education, falls short of preparing children to fit into that narrative. Young people around the world, including in Brazil, have taken notice of policymakers' lack of action in the face of catastrophic climate change. They have started movements called #FridaysForFuture and Zero Hour through which they leverage education as a tool to raise their voices.

Time for Climate Action

Why are we acting as if we still have time?

We all talk of climate emergency, but we don't act like there's any.

—Hilda Flavia Nakabuye, Youth Climate Activist

Despite the deluge of recent 'natural' disasters, we have not yet seen the worst of the climate change crisis. Somerville and Powell (2019) argue that only the children of the twenty-first century will truly understand and feel its effects as they will inherit a world much different from the one we have come to know. Isabelle Stengers (2016) illustrates this reality:

> I belong to a generation that will perhaps be the most hated in human memory, the generation that 'knew' but did nothing or did too little [...]. But it is also a generation that will avoid the worst – we will already be dead. (p. 10)

Many inspirational young people are determined to convince others to take action now before it is too late. One of these individuals is Greta Thunberg, a 17-year-old climate activist from Sweden who started the international #FridaysForFuture movement that has

grown exponentially since August, 2018 (Vaughan, 2019). Thunberg first learned about climate change as a child through her school's recycling and water saving initiatives (Mitra, 2019; Thunberg, 2018). As she began to grasp the severity and urgency of the sustainability crisis, she had a difficult time understanding why more people were not talking about it (Thunberg, 2018). Thunberg (2018) was stunned: If humans, as a species among other species, were actually changing the climate, how could they be talking about anything else but how to rectify the situation? She began a school strike in August, 2018 and sat outside the Swedish parliament building every Friday to demand that the politicians take appropriate action to remain in line with the United Nations Paris Agreement and the goal of limiting global temperature rise to 1.5°C (Mitra, 2019; Vaughan, 2019).

Thunberg feels that adults have failed the youth by not acting to mitigate carbon emissions and slow global warming (Mitra, 2019). She explains her use of school absence as a megaphone to raise her voice by saying, "and because we children can't vote but have to go to school, this is a way that I can make my voice heard" (Mitra, 2019, p. 47). Her individual school strike ignited the #FridaysForFuture movement. On September 20, 2019, there were 4,716 registered #FridaysForFuture events in 167 countries, involving 4,031,505 people (FridaysForFuture, 2020b). These September 20 events included 54 strikes in Brazil as well as 987 registered strikes in the United States (FridaysForFuture, 2020b). The #FridaysForFuture movement is not the only youth organization working to hold leaders accountable. In 2017, Jamie Margolin, Nadia Nazar, Madelaine Tew, and Zanagee Artis put the wheels in motion to create Zero Hour, an organization of youth climate leaders on a mission to "hold our adults and elected

officials accountable for their legacy of destruction and inaction when it comes climate change" (Zero Hour, 2020). Together, these organizations among other youth activists are calling us to action to address climate change. In light of COVID-19, the climate strikes have taken on various forms of digital activism including virtual events. Most recently, the movement called for a global climate action day on September 25, 2020 (FridaysForFuture, 2020c).

Politicians such as Theresa May have objected to the climate strikes claiming that they are a waste of lesson time and that formal schooling is what is needed in order to train future professionals who can then help solve the climate crisis (Watts, 2019). Thunberg disagrees. She wonders, "why should we be studying for a future that soon will be no more and when no one is doing anything whatsoever to save that future?" (Thunberg, 2018; Mitra, 2019). In a speech to world leaders at the UN Climate Change Conference (COP 25), Hilda Flavia Nakabuye, a youth climate activist from Uganda, reiterated the importance of the movement by saying, "I'd rather fail my exams than fail my generation" (FridaysForFuture, 2020a). Teenagers' participation in this movement has gained attention around the world. However, discussions resulting from the movement have largely been about the children themselves and not the message of taking urgent climate action (Vaughan, 2019). Thunberg takes this in stride by calling on others to act and replying, "if just not going to school for a few weeks can make headlines, think of what we could do together" (Mitra, 2019, p. 48).

Through these movements, young people are emerging as the new age of climate leadership. They are asserting themselves as those who will inherit the damage caused by adults' and policymakers' inaction in the face of this crisis. Although there has been

insistence by politicians and other adults that being in school is a more important way to address the sustainability crisis, there are many adults who stand and march in solidarity with the world's youth. What young people are learning (or not learning) in school and the way they are exercising democratic liberty by taking action outside of school is a stark juxtaposition. By leveraging the formal education space through strategic absence, these children and young people are activating education spaces beyond the classroom as places of political action. Their actions disrupt a business-as-usual model and draw attention to what is learned outside of school (or maybe in spite of school). The #FridaysForFuture and Zero Hour movements simultaneously exist in the Anthropocene and a -cene elsewhere and beyond. The underlying premise of human action to mitigate disaster plays into the logic of human exceptionalism that paints the picture of the Anthropocene. At the same time, the participants of the movement see beyond the projected doom to a place where greater multispecies livability is possible. They see what might become of Earth in the Chthulucene.

Human Exceptionalism

Anna Tsing (2012) poignantly states: "*Human exceptionalism blinds us*" (p. 144). The fallacy of human exceptionalism has obfuscated the view of humans' shared fate as beings that are interdependent on Earth's others. This anthropocentric view of humans in control of nature places the human species at the center of importance, rendering everything and everyone else inconsequential outside of their direct or indirect service for humans (Diehm, 2008; Ferfoljia & Ullman, 2017). The problem that emerges from a human exceptionalist view is that valuable encounters with and among more-than-humans are pushed out of sight.

For example, Diehm (2008), who studies relations with and among trees, argues that trees have an intrinsic value themselves. In other words, trees do not just exist and communicate value to the extent that they serve the human species. They are valuable within themselves. These intrinsic values, beyond human measurement, form part of entanglements with human lives but are kept out of sight by a myopic view of human exceptionalism. A framework that decenters the human also opens the conversation of who owns and has a right to life by reframing life to be an interactive and open-ended process rather than "the exclusive property or the unalienable right of one species, the human, over all others" (Braidotti, 2013, p. 60). In order to address the human-centric assault on Earth's resources and the unequal power dynamics between humans and all earthly others, it is necessary to move aside the delusory assumption of human exceptionalism. The question then becomes, is it possible to move beyond human exceptionalism from within a human-centered neoliberal system?

The very focus on *anthropos* as creator and solution of all that ails Earth is evidence that it may not be possible to do so. Taylor (2017) finds this to be a futile effort as perpetuating "the circularity of the delusional exceptionalist logic that has created the mess we now face and bequeath to future generations" is senseless (p. 3). However, Rose (2017) offers an alternative view that by "foregrounding the exceptional *damage* that humans are causing, the Anthropocene shows us the need for radically reworked forms of attention to what marks the human species as different" (p. G55, emphasis original). Somerville (2017b) also argues that it is possible to utilize the flaws of the Anthropocene. She contends that by focusing on how humans' fate is entangled with that of the planet, the human is decentered through its embeddedness in the world (Somerville, 2017b).

Omnipotence does not allow space for vulnerability or embeddedness. However, this omnipotence is only a guise - a fatally flawed belief (Taylor & Pacini-Ketchabaw, 2015). Plumwood (2010) suggests that we need to deeply and openly rethink our underlying cultural narratives in order to see potential beyond the human. Komatsu et al. (2019) reiterate the need to focus on culture as a part of the discussion of sustainability. They found an empirical relationship between cultural dimensions (such as independent self-construal or individualism) and actual environmental impacts on Earth (e.g., the Ecological Footprint, EF), suggesting that individualistic societies have a higher Ecological Footprint compared to interdependent societies (Komatsu et al., 2019). Le Guin (2017) summarizes our task to change the cultural narrative by calling on us to relearn our being in the world. The parallel and overlapping space within Donna Haraway's (2015, 2016b) concept of the Chthulucene might be a place for such a (re)imagining.

Chthulucene

Earlier in this chapter, the Anthropocene, Capitalocene, and Plantationocene were all presented as boundary events with varying degrees of possibility for imagining different presents and futures (Haraway, 2016a, 2016b). In the Anthropocene, by repositioning humans as deeply entangled with the earth they damaged, the possibility to see human vulnerability and embeddedness in a shared fate is possible. It is the relational unmaking of the Capitalocene that has the potential to reveal an epoch of greater livability beyond its boundaries (Haraway, 2016b). Finally, the Plantationocene, with its deep roots to a racialized and violent past/present of alienation and exploitation, is the opaquest lens through which to reimagine livability on Earth (Haraway, 2016b). These

three, parallel -cenes overlap and unfold in critiques and recreations of one another. In contrast, Haraway (2016b) suggests, “living-with and dying-with each other potently in the Chthulucene can be a fierce reply to the dictates of both Anthropos and Capital” (p. 2). As a critique of the Anthropocene, Capitalocene, and Plantationocene, the Chthulucene opens space for seeing the world differently.

In this relational view, living and dying occur *with* Earth’s others. Through sympoiesis, or making with, rather than autopoiesis, or self-making, Earth’s mortal critters can join together to replenish refuge and reknit order (Haraway, 2015, 2016b). Haraway (2016b) posits that the unfinished task of the Chthulucene is to “collect up the trash of the Anthropocene, the exterminism of the Capitalocene, and chipping and shredding and layering like a mad gardener, make a much hotter compost pile for still possible *pasts*, presents, and futures” (p. 57, emphasis added). This visualization summarizes how the task of the Chthulucene differs from the other -cenes. In the Anthropocene, Capitalocene, and Plantationocene, it is possible to be overcome by the notion that the end is nigh. However, by ‘staying with the trouble’ in the Chthulucene, envisioning ways of (un)making or (re)making Earth’s narrative(s) becomes conceivable. Rather than admitting defeat in the face of trouble as in the other -cenes, ‘staying with the trouble’ in the Chthulucene changes the protagonist from ‘exceptional’ humans to illuminate how “human beings are with and of the earth, and the biotic and abiotic powers of this earth are the main story” (Haraway, 2016, p. 55). Building upon the possibility of (re)creating a harmonious and relational Earth narrative, the following chapter offers theoretical frameworks that move beyond the human exceptionalism that

separates humans from the more-than-human world. Now that the scene is set, we move on to Chapter 3, Act I: Trees and Theories.

CHAPTER 3

TREES AND THEORIES

If a tree falls in a forest and no one is around to hear it, does it make a sound?

(Thermophilic Phase)

In the thermophilic phase, the temperature rises, decomposition accelerates, and the pathogens – such as those of dualistic division – are killed.

Introduction

The purpose of this chapter is to explore the main conceptual and theoretical approaches used to understand human and more-than-human interactions in order to situate my dissertation research within this theoretical conversation. The chapter includes an overview of the key concepts of the posthumanist theories of actor-networks, new materialism, and ecofeminism. For the purpose of clarity in this dissertation, these theories and their overlapping concepts are presented within the context of the Anthropocene. I do this with the expressed understanding that, as Chapter 2 showed, the term Anthropocene comes with limitations and is just one of many ways to name and understand the current era. Furthermore, this chapter focuses primarily on how these theories and concepts are taken up in the field of education, while the literature included here also stems from the fields of anthropology, human geography, philosophy, sociology, and childhood studies. The sharper focus on the use of these theories in education allows for a deeper understanding of the role of education in addressing Earth's sustainability crisis and opens a portal through which to reimagine education beyond the binary distinction of formal/non-formal education to see learning instead as sympoietic storyworlding and becoming-with multispecies, multi-mattered relations.

In order to illustrate what the posthumanist theories of actor-networks, new materialism, and ecofeminism are, I will first explain one example of what they are not. The philosophical question posed at the beginning of this chapter helps to illustrate the distinctions. One approach to addressing the question, "If a tree falls in a forest and no one is around to hear it, does it make a sound?" depends on the role of the human, and specifically, the human mind in *perceiving* or *sensing* the sound. In 1637, the French philosopher René Descartes introduced the philosophical principle, "I think, therefore I am" (Descartes, 2000, p. 14). Descartes (2000) further defined 'being' by saying, "the mind by which I am what I am, is wholly distinct from the body" (p. 14). In this way, Cartesian thought gave rise to philosophical dualisms (e.g. mind/body, human/animal, nature/culture) that framed entities as distinct and in opposition, rather than interconnected.

Just as the mind is wholly distinct from the body in the Cartesian model,[7] the human is distinct from the animal, spirit is distinct from matter, the masculine is distinct from the feminine. Cartesian thought is dualistic and hegemonic. Inherent in the concept of a mind/body divide is the idea that the mind is superior to the body. The Cartesian notion of "I think, therefore, I am" implies that the mind is responsible for the body's existence, and thus, superior. The hegemonic, dualistic discourses Cartesian thought engenders extend to the relationship between humans and the more-than-human world. The human, who is distinct from the animal, is thus superior to the animal. With this

[7] James (2017) argues that those who critique Descartes for originating the dualistic divide of the mind and body have missed Descartes's claim that the mind is in fact an *embodied mind* (see pp. 32-33). Although James makes a valid assertion, the conventional wisdom present in the literature credits Descartes's mind/body distinction as a point of origin for hegemonic, dualistic thinking. Therefore, I have chosen to include James's (2017) contribution as a footnote only.

model of human exceptionalism in mind, one answer to the question about the tree falling in the forest would be that it only makes a sound if there is a human (mind) present to experience and perceive the sound.[8] If not for a human presence, *no one* is there to hear it. The theories of actor-networks, new materialism, and ecofeminism presented here reject hegemonic dualisms. They recognize multiplicities or pluralities rather than singularities. In short, it does not matter if a human is present to hear the sound of the tree falling. The tree fell within an entangled web of more-than-human relations. It did not fall in a vacuum. *Did the other trees sense the sound? Did the birds in the trees fly away when they heard the sound of the tree falling?* Yes, the falling tree made a sound. As humans, we do not need to know that the tree fell or be present to hear the sound to understand that our fate and the tree's fate are inextricably linked.

The concepts outlined in this chapter reject the notion of bifurcation. Instead, they focus on inter- and intra-actions in agential relationships including those between humans and more-than-humans, both animate and inanimate (Barad, 2007, 2008). Some of the scholars cited in this chapter draw on the work of postmodernist and poststructuralist thinkers such as Derrida, Foucault, Deleuze, and Guattari. While the theories and concepts included here build upon postmodern and poststructuralist traditions, the ways of being and knowing presented in this chapter are also found in Indigenous perspectives predating the work of these men. I acknowledge that the literature reviewed in this chapter is born from Indigenous traditions as well as postmodernism and

[8] It is worth noting that Decartes, himself, might have argued that God perceives all. Therefore, even in the absence of a human to perceive the sound, God would hear it and thus the falling tree exists and makes a sound.

poststructuralism. For the purposes of this chapter, I synthesize the literature strategically to highlight the *emergent* ways that scholars are using the overlapping concepts of posthumanist theories rather than detailing their origins. The key concepts outlined and compared here include how these different approaches (1) bridge the nature/culture divide that is created by dualistic, human exceptionalist thought, (2) frame actors and agency, and (3) view relationships through the lens of entanglement. To begin, a key tenet of posthumanist theories such as actor-network theory, new materialism, and ecofeminism is a rejection of a nature/culture binary.

Nature/Culture Divide

The hyperbolized notion of a nature/culture divide is based on the idea of nature as given and culture as constructed (Braidotti, 2013; Plumwood, 2010). Viewing nature as separate from culture is an alienating process (Chandler, 2013). The practice of separating subjects and objects, as is done in modernity, "has gone out of fashion" (Conty, 2018, p. 73). Not only is it unfashionable, it is also hegemonic. The underlying premise of a nature/culture divide is that it separates humans from the material world in a way that places humans in a position of dominion over what is beyond them (Merewether, 2019). Such a division creates a fallacious choice between self and other in an us-versus-them mentality (Plumwood, 2010). In this paradigm, by implying that humans have the culture, the term *nature* is anthropocentric (Clarke, 2017). Nature is homogenized as a placeholder for what exists outside of the human (Diehm, 2008; Duhn et al., 2017). In their rejection of a nature/culture binary, the theories of actor-networks, new materialism, and ecofeminism redirect the focus toward dissolving the barrier that was constructed in this dualism (Clarke, 2017). Therefore, they focus on making views of

nature and culture more complex, rather than more simplistic by moving toward a fluid conceptualization.

Nature-culture Continuum and Natureculture

As a response to the hegemonic nature/culture divide, posthumanist scholars have framed the relationship between nature and culture as a continuum (Braidotti, 2013) or an inseparable amalgam of natureculture (Haraway, 2003). In the context of environmental education for sustainability in these precarious times, Clarke (2017) advocates for a focus on new materialisms in order to dissolve "the essentialist barrier that is set up by the terms 'human' and 'nature' as well as the constructivist view of culturally constructed natures" (p. 309). These concepts disintegrate the boundary between the given nature and constructed culture. Braidotti (2013) illustrates how the synthesis of nature and culture flattens out the hierarchical relationships in a way that allows for more egalitarian inter-species relationships. At the same time, the interrelatedness and lack of borders means that "to hurt nature is ultimately to hurt ourselves" (Braidotti, 2013, p. 86).

Both Haraway's natureculture and Braidotti's nature-culture continuum interrogate hegemonic dualisms and call for reframing humans in their relationships with matter beyond human life. These reframings do not call for the elimination of humans from the equation. Instead, they challenge us to leave behind views of human exceptionalism to see humans differently as egalitarian participants in relationships with Earth others (Braidotti, 2013). Haraway (2003) and Tsing (2012) illustrate this interrelatedness by framing the others, such as dogs and mushrooms, as companion species, through which "there must be two to make one" (Haraway, 2003, p. 103). Through a natureculture lens, nature and culture, two concepts, are no longer separate but

rather are one in mutual becoming. Pacini-Ketchabaw (2013) extends the lens of natureculture to non-animal life by highlighting forests as naturecultures within which children, educators, and the forests are entangled. A focus on naturecultures opens the door to research that goes beyond human-centric relationships (Pacini-Ketchabaw & Nxumalo, 2014). Examining relationships among humans and the more-than-human world adds to our understanding of the complexities that are pushed out by dualistic thinking. These perspectives are necessary in order to re-frame living and educating in the age of the Anthropocene.

Actors and Agency

One of the key critical posthumanist thinkers, Rosi Braidotti, refers to 'human' as a hierarchical term (Braidotti, 2016). It matters how humans are positioned in relation *to* and *with* the more-than-human world. Braidotti (2016) calls for a paradigm shift that rejects the notion of human life - *anthropos* - as separated categorically from and viewed as superior to *bios* or animal and non-human life, which she refers to as *zoe*. Instead, posthuman theory, she argues, necessarily decenters the human subject by allowing the *zoe*-centered subject to be viewed as immersed in a nonhuman network of relations (Braidotti, 2016). The concept of *zoe* requires the consideration of animate and inanimate matter in the conversation of what or who has agency. Bruno Latour, an actor-network theorist, argues that agency is not limited to human actors as it extends to *non-human* and *non-individual* entities (Latour, 1996). In actor-network theory, all entities have the ability and potential to express agency (Conty, 2018). Actor-network theory contends that the interactions between human and non-human agents is on equal footing (Latour, 1996; Müller 2015). In a network of diverse actors, also called actants, there are no a priori

relations tied to a hierarchical notion of society (Latour, 1996). Vital materialist Jane Bennett furthers this notion by treating all agency as equal (Conty, 2018).

While this general concept of non-hierarchical relations extends across posthumanist thinking, it is taken up differently by the theories. For example, new materialist thinker Karen Barad (2008) developed a theory of agential realism in which agency is not something that can be held. Instead, they argue that the world is constantly becoming through intra-actions that are causal enactments (Barad, 2008). Rather than using actors/actants to illustrate action upon the world, Barad suggests, "it is through specific intra-actions that phenomena come to matter—in both senses of the word" (Barad, 2008, p. 135). In agential realism and new materialism, matter is agential, regardless of being human or nonhuman (Barad, 2008; Merewether, 2019). Where actor-network theory frames relationships in terms of the interactions between different actants or groups, new materialism in Barad's model does not use agent/actant as separate categories that interact with one another. Instead, the world is emerging through agential intra-actions affirming that all matter is *of* the world (Barad, 2008).

Ecofeminist scholar Donna Haraway (2016a) refers to these processes as worlding and becoming-with in sympoiesis. She argues, "there is no becoming, there is only becoming-with" (Haraway, 2016a, p. 221). The world that is emerging through agential intra-actions is becoming, or becoming-with, through on-going inter/intra-action (Barad, 2008; Chandler, 2013; Haraway, 2015). For this reason, Rautio (2013) argues, "we need to be more aware of the diversity of ways in which we are nature already" (p. 394). Van Dooren and Rose (2016) offer ecological animism as a lens through which to see and seek greater sensitivity to Earth others (i.e. nonliving volcanic rock, monk seals, crows

etc.). In this framework, “all life - from the smallest cell to the largest redwood - is involved in diverse forms of adaptive, generative responsiveness” (Van Dooren & Rose, 2016, p. 82). The storytelling of Earth’s becoming through intra-actions forms part of the becoming itself, as “the stories we tell are powerful contributors to the becoming of our shared world” (Van Dooren & Rose, 2016, p. 89). An understanding that we are *of* the world causes us to reconsider the durable and hegemonic assumption of human exceptionalism that places the human species in power *over* Earth. It reframes it to reveal the ways that we are storyworlding with the earth.

A cultural reframing of this kind that takes into account the agency of human and non-human (in)animate matter brings to light the capabilities of other species beyond the human. For example, Viveiros de Castro (2004) shares that it is a widespread Amerindian notion that there is no differentiation between humans and animals. In this sense, he explains, “being people in their own sphere, nonhumans see things just *as* people do. But the things *that* they see are different” (Viveiros de Castro, 2004, p. 472, emphasis original). Similarly, anthropologist Eduardo Kohn, author of *How Forests Think*, illustrates how the complex ecosystems that make up forests operate in ways that show that they are thinking and speaking (Kohn, 2013). He paints a vibrant picture of interlacing forest life. Visualizing how forests *think* positions forest ecosystems as a stark contrast to Descartes’s notion of thinking - human thought as the product of human exceptionalism. A *thinking forest* would be beyond Descartes’s humanly imagination. Within a forest ecosystem, it is possible to visualize the myriad interconnections between life and matter. Viewing encounters through the lens of these entanglements serves as a way to decenter the human and dispel the myth of human as sole creator of the narrative.

Entanglements and Assemblages

There is a rich body of literature on children's entanglements with more-than-human life, including with spirits, animals, and other critters (Bone, 2010, 2013; Malone, 2016; Nxumalo, 2016; Taylor, 2012, 2013; Taylor & Pacini-Ketchabaw, 2015; Taylor & Pacini-Ketchabaw, 2017). For example, Bone (2010) explores child-bird play to show how child-bird becomings are examples of animals teaching children about humanity. Bone (2013) argues, "For many researchers who explore the animal and human connection the animal is a conduit for learning to be human; some propose that it is only through the animal that we recognise our humanity" (p. 61). By using child-animal metamorphosis and spiritual with-ness, Bone (2010) shows how boundaries shift between humans and animals when viewed as entangled rather than separate entities.

A common thread across posthumanism builds upon the notion of assemblages (Deleuze & Guattari, 1987). An assemblage, which entangles humans and more-than-humans, comes into being and brings about the world through connection (Bauer, 2015; Chandler, 2013). By way of these connections, the individual 'subject' is transformed to no longer exist autonomously, but rather through imbricating with networks in assemblages (Chandler, 2013). Barad (2008) describes the material and discursive as being in mutual entanglement. They argue, "All bodies, not merely 'human' bodies, come to matter through the world's iterative intra-activity— its performativity" (p. 141). In this way, a focus on assemblages rather than individuals decenters the human subject (Bauer, 2015). New materialist philosopher Jane Bennett (2010) argues that assemblages have agency and benefit from heterogeneity. However, their agency is not autonomous, as it is more porous and indirect than the kind of agency of an omnipotent God, for example

(Bennett, 2010). Multispecies assemblages are characterized by complex, discursive practices that intertwine social material histories (Davies, 2018; Pacini-Ketchabaw, 2013). Assemblages are not just the entanglement of living and non-living matter. In other words, an assemblage is not a web of relations made up of individual actors on equal footing as in actor-network theory. Instead, assemblages occupy and evolve within infolding social-material spaces where all matter and life fold into one another.

The concept of assemblage is being used widely in new materialist studies of early childhood education contexts. This framework exemplifies a non-hierarchical approach to understanding and framing human and more-than-human 'actors' by illustrating how humans and non-humans simultaneously engage with one another (Malone & Truong, 2017). Assemblages as a concept are also broadly taken up in the literature on child-nature becoming. In fact, Somerville and Powell (2019) argue that the field of early childhood is a leader in applying posthuman theories. In their study, which took place in two early childhood education centers in Australia, Somerville and Powell (2019) explore how sticks participate in agentic play with children. They refer to the child-stick interactions that they observed as assemblages of body and sense through which language materialized from the stick/body movements (Somerville & Powell, 2019). An understanding of the multifarious languages and literacies that emerge through child-nature more-than-human assemblages has the potential to contribute to ethical being and becoming in the Anthropocene.

Looking through a lens of assemblages, rather than focusing on individual actors or entities, opens the narrative of what early childhood education is. For example, Hadfield-Hill and Zara (2018) reveal an "interwoven narrative of gods, animals and

ghosts" when they consider the agentic roles of spirituality in the language, actions, and feelings of young people in India (p. 66). The incorporation of gods, animals, and spirits in a conceptualization of how the world is becoming through multi-species assemblages broadens the view of ways of being with Earth that are beyond the dualistic separation of what is possible at the hands of humans.

One of the downfalls of a view of children as entangled within Earth-other-assemblages is that it may romanticize childhoods, running the risk of painting a utopian picture of children's connections to Earth (Taylor, 2014). When applying the concept of assemblages to the study of early childhood, it is important to avoid an oversimplified, overly romantic coupling of children and nature (Nxumalo, 2016). One way to do so is to move away from a narrative about 'pure nature' and 'wilderness' as separate worlds from childhood (Taylor, 2011). Instead, reconceptualizing childhood as nature/culture assemblages will be a closer approximation of childhoods as they are: situated and entangled (Taylor, 2011, 2014).

Nxumalo (2016), who looks specifically at how coloniality is a part of these assemblages, cautions that assemblages, although not human-centric, are "neither the absence of human difference nor the presence of equal relations between humans" (Nxumalo, 2016, p. 133). In other words, the concept of assemblages does not assume neutrality or equality. Assemblages are (un)folding in specific times, places, and spaces that include unequal power dynamics. Nevertheless, a framework that includes assemblages shifts the lens from human-centeredness to human in more-than-human assemblages, shedding light on different ways of being and becoming-with Earth (Duhn, 2012; Haraway, 2016a). Decentering the human by centering assemblages instead has the

potential to make visible ethical ways of being and becoming that more appropriately address the challenges posed by and faced in the era of the Anthropocene.

Child-place-assemblages

In addition to children's entanglements with more-than-human animate life, child-place assemblages also appear in the posthumanist education literature. Duhn (2012) uses an early childhood care center as a space to show the unfolding of places as assemblages. Traditionally, early childhood education spaces are described as places with clear boundaries that are enforced by adults (Duhn, 2012). There are outdoor areas, sand pits, and dress up corners that do not intersect (Duhn, 2012). The sand stays outside; the dress up clothes stay inside (Duhn, 2012). Using a posthuman lens shifts the focus to what is separated and policed by adults to what is a place-more-than-human-self assemblage, revealing how children are and become through their interactions with complex, messy networks (Duhn, 2012, 2017).

In doing so, the indoor/outdoor binary is dissolved and exchanged for a holistic understanding of how children's learning spaces are embodied and embedded within the indoors and outdoors (Merewether, 2015). A place-as-assemblage perspective widens the possibilities of not only who can teach but also what is taught. Merewether (2019) argues, "rather than understanding outdoor spaces simply as, for example, somewhere to let off steam or 'connect with nature', they may instead be seen for their unlimited everyday potential - a seemingly banal puddle assemblage offers extraordinary curriculum opportunities" (p. 114). The challenges of the Anthropocene require education, as a field, to embrace these extraordinary curriculum and pedagogical opportunities in order to

make fundamental changes in what is valued as knowledge and who/what is seen as a teacher.

Expanding the view of teachers opens a space to see how more-than-human life, such as forests, can be active collaborators in pedagogy (Pacini-Ketchabaw, 2013). Forests, in their thinking and storytelling, teach about interdependence, life, and coloniality (Kohn, 2013; Nxumalo, 2016; Pacini-Ketchabaw, 2013). They are simultaneously without borders, as lungs interconnecting life across the planet, and strictly bounded by the colonial lines drawn by settler colonialism and human destruction (Nxumalo, 2016). In her study about the boundaries between a community garden in an early childhood care center and the surrounding forest, Nxumalo (2016) frames these spaces as places of complex mutual encounter. She interrogates the notion of distinct borders, asking, "what might we learn by paying attention to not only colonial framings enacted by lines, but also to leaks, cracks, and ruptures in these lines?" (Nxumalo, 2016, p. 143). It is illuminating to recognize and explore the border zones between formal and non-formal education spaces, between the 'pure nature' of the forest and culture of the early childhood center, and between what is given and what is constructed in order to dissolve the misconception that they are distinct and hierarchical. At the same time, flattening out these hierarchies between humans and nature does not mean that humans are treated equally. Exploring the leaks and cracks between the borders drawn by settler colonialism and using an ecofeminist lens to understand inter/intra-activity can reveal the vast (in)equalities that are part and parcel of Earth's becoming.

Child-place-assemblages do not just occur in forests, the epitome of 'pure nature.' They characterize the outdoors in materialdiscursive intra-actions between children

animating puddles that animate children in their outdoor environments (Merewether, 2019). They occur indoors in child-museum entanglements (Birch, 2018). They are evident in the porous boundaries of a nature/urban/childhood entanglement in city centers and urban landscapes (Duhn et al., 2017; Malone, 2004). No matter the place that is unfolding into a child-place assemblage, these encounters provide a chance to see vibrant, agential becoming through a non-human-centric lens. Children are embodied experiencers of their education place-assemblages (Birch, 2018; Duhn et al., 2017). Child-place assemblages as a conceptual lens allow for the re-imagining of human-nature encounters as opportunities for acquiring knowledge through embodied learning with places, again, shifting the focus from the adult human as the sole teacher to the relationship between children and their surroundings as teacher. Somerville (2007) sees places as pedagogical sites for intersecting knowledges, including Western and Indigenous knowledges. In their non-hierarchical, flat orientations, places as assemblages challenge hegemonic understandings of childhood and early childhood education. This opens a door to reimagine education in all its form as learning through becoming-with our relations in sympoietic storyworlding (Haraway, 2016a).

Post-anthropocentric Education

The concept of assemblages helps to illustrate how the world and education are in constant emergence. Earth, which is neither nature nor machine (Latour, 2014), is emerging and becoming "through the complex actions and interactions of numerous agential assemblages" (Chandler, 2013, p. 525). Through this process of mutual entanglement, it is no longer possible to visualize the human species as distinct from nature. The rich use of posthumanist concepts in early childhood education literature

illustrates how children are involved in diverse, multispecies assemblages in their places and spaces of education. As discussed earlier, the boundary between formal and non-formal education spaces is porous resulting in a dynamic border zone between the formal, 'pedagogical settings' of the classroom and the curriculum (Merewether, 2015, 2018), and the informal 'everyday life' settings of the natural world beyond. In a similar fashion to how children are becoming-with the world, they are also becoming-with their education in emergent relational fields (Hultman & Lenz Taguchi, 2010). Posthuman approaches that decenter the human offer a view beyond a dualistic divide between formal and non-formal education and beyond a destructive model of human exceptionalism.

In addition, it is possible to observe how humans, within these perspectives, cannot be homogenized as the human experience varies greatly based on race, class, gender, sexual orientation, age, or country of origin. For example, with relation to hierarchies based on age, Hanson et al. (2016) use actor-network theory to challenge adult-centric views of children and childhood. Magnusson (2018) also highlights unequal power relations between adults (preschool teachers and researchers) and children in formal education spaces. Greater attention will be focused on the rights of children and the importance of integrating their perspectives into the conversation about education and sustainability in the fourth chapter. To get to the heart of the issue here: research that excludes both the perspectives of children and more-than-human others from the discussion of education and the sustainability of the planet is inadequate in addressing how to survive on a damaged Earth. In contrast, posthumanist approaches that focus on children's entanglements with Earth's others are appropriate tools to interrogate how we

as humans can become-with (Haraway, 2016a) the world in ethical ways that recognize and dignify all of Earth's biotic and abiotic forces. The following sections will show how children's entanglements with living and non-living matter in (in)formal education spaces can shed light on these ethical ways of coming to exist in sympoiesis *with* and *of* the world.

(In)formal Education Spaces

The acts of decentering the human and interrogating binary oppositions outlined above are key features of a posthuman, post-anthropocentric condition that seeks to challenge accepted hierarchies in pursuit of planetary well-being (Bone, 2010; Hackett & Somerville, 2017). Pedagogical spaces of (in)formal learning have the potential to be post-anthropocentric spaces that focus on intra-relations between learners, curriculum, and the natural world. The knowledge that emerges from child-more-than-human entanglements is not limited to animal life. Plant life and other matter is also in constant becoming-with children in their (in)formal education spaces. Cele (2019) researches the relationship between children and trees in urban areas of play to show how the intra-activity between children and trees opens a space for knowledge exchange in which trees and children share their wisdom through their active relationships.

Shifting boundaries opens doors to ethical living, becoming-with, and learning from more-than-human beings such as plants and critters. For example, Taylor and Pacini-Ketchabaw (2015) employ a microbial-level perspective using ants and earthworms to highlight how all life, including human life, depends on the lives of others, dispelling the myth of human exceptionalism. Nxumalo (2016) explores child-earthworm entanglements and shows how they engage in mutual *touch* in their ethical becoming.

These ethical interactions extend to interspecies encounters with children, dogs, racoons, and kangaroos as well (Malone; 2016; Taylor & Pacini-Ketchabaw, 2017). Such encounters paint a picture of early childhood education about, of, and with the world in constant emergence. Somerville and Powell (2019) focus on children's stick/body entanglements to demonstrate the relationship between matter and meaning. They argue, "The world is an ongoing open process of mattering through which 'mattering' itself acquires meaning and form in the realization of different agential possibilities" (Somerville & Powell, 2019, p. 29). In this way, it becomes clear that teachers can be other than human beings (Rautio, 2013). A teacher can be a tree, in all its wisdom, or a child-tree entanglement can teach about ethical becoming in sympoiesis (Haraway, 2016b). Interspecies connections extend to rivers, moss, and berry bushes (Humphreys & Blenkinsop, 2018; Pacini-Ketchabaw, 2013). They can be seen in children's relationships to the weather (Rooney, 2018).

Across all of these relationships, children are co-shaping their surroundings and their ecological identities through their Earthly encounters. They are making stories that make worlds (Haraway, 2016b). They are storyworlding. They learn *with* not *about* their environments through their early childhood education experiences within and beyond the classroom (Rooney, 2018). They become-with the river (Humphreys & Blenkinsop, 2018). They understand how their fate is connected to and depends on all that surrounds and is within them. For example, Bone (2010) explores children's spiritualities through play as metamorphosis and literature in early childhood settings. When she displaces the human at the center of inquiry, Bone reveals child-animal becomings within a space she calls the spiritual elsewhere (Bone, 2010). Within this space, where metamorphosis and

shape shifting are possible, she was able to observe children who were aware of their becoming in ways that are not evident to adults (Bone, 2010). These spiritual-animal-child becomings revealed a porous, unfixed boundary between human and animal allowing for an infolding metamorphosis of humans and animals folding into and becoming one another rather than a polarizing human-animal distinction (Bone, 2010).

The early childhood spaces in the literature on education in the Anthropocene expose the boundaries between formal and non-formal education as permeable or even non-existent. Bauer (2015), in her study of geographies of education through an actor-network theory lens, draws on Kratl's view of the interesting border zone between in/formal education. Observing the spaces in between formal pedagogical spaces and non-formal education places allows for a re-thinking of children's becoming with their education of, by, and with(in) the earth by interrogating the binary distinction between formal and non-formal education. Bauer (2015) approaches (in)formal learning environments "as social spaces that are constantly being made up, de- and reconstructed by a lively actor-network of heterogeneous materials" (p. 624). This allows Bauer (2015) to emphasize the connections between children and non-human objects as they mutually become the world (read: storyworld). A fissure of the dominant discourse of early childhood education spaces as divided between the formal, school setting and the informal space beyond the walls of the school and curriculum effectively decolonizes the spaces and opens up the discussion of the 'natures' of childhood (Bloch, 2014).

In practice, this re-imagining of early childhood education research and education has incorporated new materialisms that expand the scope of vision of how the world is formed. These approaches to early childhood education broaden the field to include

literacies and learnings that are absent in modern conceptualizations of the child and education. Literacies, thus, include movement and sound that is perceptible when the human is decentered, and the focus shifts to human and non-human interactions (Hackett & Somerville, 2017). Whether in indoor spaces (i.e. schools, museums) or outdoor spaces (i.e. on a riverbank), children are engaging in multimodal communication through their vibrations and movement with matter in embodied, sensory experiences (Hackett & Somerville, 2017). In becoming-with and through multi-modal, multi-mattered literacies, children's thinking and utterances are re-conceptualized as part of non-anthropocentric literary practices (Hackett & Somerville, 2017), which offer ways of reading the world beyond the view of the human as indelible and the center of life on Earth. Non-anthropocentric literacies have the potential to inform ethical ways of inhabiting the planet in an era of human-driven planetary destruction.

Literature and Story-telling

By way of multi-mattered, multispecies story-telling children 'become-with' the more-than-human world through their unfolding with literature and imagination. Harju and Rouse (2018) explain that in the West, "adults have often used children's literature as a civilizing force, a tool to impart moral codes and model behaviour in an attempt to distinguish humans from their baser, animal natures" (p. 453). In contrast, in a study of early literacy textbooks from post-Soviet Armenia, Latvia, Kazakhstan, Russia, and Ukraine, Silova et al. (2014) observed a sense of children's 'rootedness' and intimate interaction with "an idyllically imagined nature" (p. 202). Applying a posthuman perspective to how children experience literature allows their becomings-with the land and animals to come to light (Harju & Rouse, 2018). For example, research on children's

entanglements with ‘wilderness’ in Maurice Sendak’s (1963) *Where the Wild Things Are* acknowledges children’s animality (Harju & Rouse, 2018) and children becoming monsters-monsters becoming children as they engage with the “monsters inside-outside ourselves” (Tesar & Koro-Ljungberg, 2016, p. 702). Embodied educational experiences such as child-monster becomings blur the boundary between imagination and reality and expand the assumption that literacy relates to written language only. Communication as an embodied, sensory, multi-modal experience includes movement and sound in a more-than-human world (Hackett & Somerville, 2017). A posthuman or new materialist approach to child-literature entanglements with stories show us how ‘things’ speak (Tesar & Arndt, 2016) and make us aware of the literacies and sounds to which we have been made ignore. After all, the boundary between imagination and reality is drawn by human thought. Monsters are ‘real’ in their becoming-with children and children’s becoming-with monsters through their encounters with literature. And in these child-monster-literature interactions, new stories emerge with each encounter, storying new worlds with each reading.

While engaging with literature is limited to literate populations, story-telling, myths and fairy tales move beyond the limits of literacy. Warner (2014) argues that they disrupt the limits of time as well. She describes fairy tales, which are often attributed to oral tradition, as “connective tissue between a mythological past and the present realities” (Warner, 2014, p. xvi). They connect real and imagined worlds by facing “towards a past realm of belief on one side and towards a sceptical present on the other” (Warner, 2014, p. 2). Armstrong (2004) highlights the power of mythology to ‘speak of’ parallel planes of existence in ways that might aid in our understanding of our own problematic

existence as humans. In a similar vein to how the Chthulucene allows us to imagine the possibility of greater livability with Earth (Haraway, 2016b), myths and fairy tales have the power to open our eyes and imaginations to other realities and possibilities. In the context of education specifically, these mythical and spiritual domains have been used to disrupt the Western sense of linear time (Silova, 2019). By moving beyond the limits of modern linear time, it is possible to imagine how cyclical time could recompose a picture of childhood that reorients children in both time and nature (Silova, 2019). Rethinking childhood through pedagogies of space and time challenges the status quo narrative that modern education will prepare children to respond to the climate crisis in the future. It reimagines here-and-nows as ever entwined with myriad pasts and futures of varying degrees of livability.

A Common Worlds Approach

Another 'disruptive' pedagogical approach found in the posthumanist and new materialist literature on early childhood education in the Anthropocene is the common worlds approach (Taylor & Giugni, 2012). Affrica Taylor, a key theorist of the common worlds approach, draws on the work of actor-network theorist Bruno Latour and ecofeminist[9] Donna Haraway when she outlines the goal of the 'common worlds' response to the Anthropocene as "quite simply to keep working at ways of [becoming] more worldly through focusing upon our entangled relations with the more-than-human world" (Taylor, 2017, p. 11). A common worlds pedagogy is one that emerges from

[9] Donna Haraway describes herself (and all of us) as compost-ist rather than posthuman. She explains, "Critters--human and not--become-with each other, compose and decompose each other, in every scale and register of time and stuff in sympoietic tangling, in ecological evolutionary developmental earthly worlding and unworlding" (Haraway, 2016b, p. 97).

interspecies encounters within multispecies landscapes (Taylor & Pacini-Ketchabaw, 2015; Tsing, 2012). These landscapes are characterized by a multispecies co-inhabitation and co-shaping, which include living and non-living matter (Taylor & Pacini-Ketchabaw, 2015; Tsing, 2012).

In order to examine power through a new lens, a common worlds approach builds on Haraway's (2008) concept of contact zones to problematize the way that "education has traditionally located the developing child within an exclusively human sociocultural context" (Taylor et al., 2013, p. 54). Moving beyond human-centric sociocultural contexts into focused contact zones illustrates how children animate the nonhuman world through mixed up, mutual entanglement as a part of common worlding (Merewether, 2019; Taylor & Giugni, 2012). Taylor (2017) describes interspecies contact zones of multispecies cohabitations as a product of urbanization and climate change that force multispecies beings together in common worlding. In other words, these contact zones are forced into multispecies becoming in response to the turbulent changes that characterize the Anthropocene.

A common worlds approach offers a unique opportunity to observe early childhood education as a contact zone for multispecies becoming. For example, Nxumalo and Pacini-Ketchabaw (2017) draw on a common worlds multispecies ethnography in an early childhood center to situate child-pet-classroom entanglements within the context of ethical considerations of the Anthropocene. Using children's relationships with the formal schooling practice of caring for a classroom pet, in this case a walking stick insect, they argue a common worlds pedagogy carries the goal of working with children to disrupt nature/culture binaries (Nxumalo & Pacini-Ketchabaw, 2017). In their view,

common worlding must occur in ways that do not reinforce the human exceptionalist views stemming from the disconnect between their formal schooling in the classroom and their human-centered environments within and beyond school (Nxumalo & Pacini-Ketchabaw, 2017). Instead, applying a common worlds approach to this case of child-insect-education interaction in a formal school setting offers a way to learn the practice of 'staying with the trouble' in response-ability, taking the responsibility to respond, to Earth's others (Haraway, 2016b) in early childhood education.

A benefit of a common worlds framework for exploring children's lives as becoming-with messy, entangled life worlds is that the approach "is geo-culturally attuned and responsive to the considerable challenges of ethical multispecies cohabitation in anthropogenically damaged life-worlds" (Taylor & Pacini-Ketchabaw, 2017, p. 133). In this way, the framework moves beyond a human-centered view to reveal children's ethical becomings with other agentic species, lifeforms, and matter. Returning to the example of the forest pedagogies, Pacini-Ketchabaw (2013) explores how the common worlds approach interrupts the dominant narrative of innocent, idyllic child-nature encounters to offer a more nuanced understanding of the 'muddled frictions' that result from the entanglement of settler colonialism and forest pedagogies.

By reframing the forest, an (in)formal education space, as a place intertwined with settler colonialism, Pacini-Ketchabaw (2013) dissolves the misguided notion of the forest as "an innocent space that we, and the children, visit to purify ourselves and show care for the environment" (p. 363). The Anthropocene's call to action requires more than benevolence and good will on the part of humankind. Even though we humans are always already in nature and are in constant becoming-with natural environments, that does not

mean we are also not human-centric in our approach to addressing the ecological crisis. A common worlds approach and pedagogy offer alternatives to research and teaching that decenter the human in general, and children in particular, in order to illustrate and educate about ethical forms of multispecies intra-action.

This approach returns us to the words of Donna Haraway (2016b) from Chapter 1, "it matters what stories make worlds, what worlds make stories" (p. 12). A singular, human-centric master narrative of Earth's demise at the hands of humankind does not teach us how to live and die well with the earth (Haraway, 2016b). A way to decenter the human is to center entanglements instead (Nxumalo, 2016). Specifically, within the field of early childhood education, centering children's entanglements in their (in)formal education spaces to observe how they are worlding and flowing through the leaks and cracks of the boundaries drawn by colonialism, capitalism, modernism, and adults offers a chance to engage with a narrative of Earth's becoming through ethical multispecies encounters that are storyworlding. Research that foregrounds children and more-than-human species/critters/matter as becoming in agential assemblages challenges the dominant discourse that childhood is linear and based on hierarchical assumptions (O'Loughlin, 2014). Storyworlding, as a concept, builds upon the common worlds approach to focus on the ways in which everyone and everything are creating stories – in a non-hierarchical fashion – together through their relationality. As they create stories, they create worlds. Education as storyworlding, therefore, allows us to see learning as 'becoming-with' in ethical relationship to all matter and all that matters as we make stories that make worlds, sympoietically.

Survival and Education

It is the ethical responsibility of research on (in)formal education in the age of the Anthropocene to challenge dualistic thinking and address both the response-ability (Haraway, 2016b) of humans in their multispecies entanglements and the structural inequalities that exist among humans. The underlying thread, the misconception of exceptionalism, is the same that positions humans as superior to nature, colonizer as superior to the colonized, men as superior to women and so on. In the case of early childhood education, opening a space for the collective voice of children's entanglements decenters the children by centering their entanglements and brings into conversation children's sympoietic becoming-with the world (Haraway, 2016b). In the same light, exploring the border zone between formal and non-formal education settings challenges the dualistic divide between places of education. Examining the way that education is (un)folding with children inside and outside of the formal school setting broadens the view of who/what is a teacher and how/what education is. Research that centers the naturalcultural entanglements looks beyond dualistic thinking, revealing in its multiplicities, ethical ways of being and becoming-with Earth's others.

In these troubled times, species' and planetary survival depends on finding and engaging with new and Indigenous theories and practices that go beyond human exceptionalism (Duhn et al., 2017). The time-bound ecological crisis challenges research and practice in education to re-configure what it means to live differently with the planet and live and die well with Earth's mortal critters (Haraway, 2016b; Malone & Truong, 2017). This ecological imperative requires us to live in response-ability, taking the responsibility to respond to all with whom we are inter/intra-acting (Haraway, 2016b). To

do so, we must decenter the human species precisely in a geological epoch that would center *anthropos* as responsible for the fate of the planet (Somerville & Powell, 2019). Centering multispecies more-than-human assemblages is key to sustainable worlding. Specifically, understanding how children's worldly and spiritual entanglements co-shape their environments will unveil ways of knowing and being that are pushed out by adult-centric education, policymaking, and being in the world (Malone, 2013).

The way that posthumanist theories are taken up in early childhood education reject the dominant view of human exceptionalism that results from looking through the scope of a human/nature divide. In order to survive, we need to dismantle human exceptionalism and change the lens filter to see how multispecies intra-actions and multi-modal literacies teach us how to live and become ethically with Earth's critters in the Anthropocene (Haraway, 2016b; Malone, 2016). Tuning into multispecies storytelling in early childhood education does not only offer ways of ethical being, it also reconceptualizes what curriculum is (Merewether, 2019). Tesar and Arndt (2016) contend, "A new materialist perspective challenges the reduction of perceptions to linguistic and discursive interpretations and, therefore, urges the legitimation of other ways of seeing and being and other relationships" (p. 195). This paradigmatic shift in understanding of what it means to be human and think human thoughts is necessary to Earth's survival in precarity (Duhn et al., 2017; Somerville, 2017).

A reconsideration of our relationship with the planet in this time of ecological crisis compels us to question our most basic narratives and dangerous illusions about human exceptionalism in order to fundamentally shift the way we understand our interrelated, mortal fate with Earth (Plumwood, 2010). As seen in Chapter 2, Haraway

(2016b) refers to this task as ‘staying with the trouble’ in which the goal is not to find a human-generated solution to the planetary crisis, but instead, to engage in living and dying well with Earth’s others (Haraway, 2008, 2016b). Haraway (2016b) argues, “[Sympoiesis] is a carrier bag for ongoingness, a yoke for becoming-with, for staying with the trouble of inheriting the damages and achievements of colonial and postcolonial naturalcultural histories in telling the tale of still possible recuperation” (p. 125). Sympoietic worlding, or storyworlding, with others furnishes hope of healing some of the damage that plagues Earth.

The boundaries of formal education are pervious to sympoietic (story)worlding. The ongoing processes of becoming-with permeate boundaries that divide children from adults, humans from more-than-human others, and teachers from students. They pass through antiquated lines drawn by dualistic divides. In these interstitial spaces, it is possible to see new ways of educating that change the shapes of ‘curriculum’ and ‘teacher’ to include children and their natural environments as agential educational assemblages. By reframing early childhood education using these theories, the focus shifts from the child as learning for adulthood to child-matter relations as they are constantly mutually (un)folding (Rautio, 2014). This dissertation enters the emergent conversation about the roles of education in preparing children to survive on a damaged Earth guided by the following conceptual framework.

Conceptual Framework

My dissertation joins a robust conversation about children’s worlding by exploring how children, teens, and adults in a coffee producing region of Southeastern Brazil are becoming-with their environment and education. The next chapter includes a

more detailed overview of the methodological framing(s) for this study. Here I will share the study's conceptual framework based on the review of the literature synthesized in this chapter. However, as the fourth chapter will show, in my research, I embrace slow, messy, fluid methodologies. Therefore, these concepts were used to follow the relationships where they led to attune myself to these relationships and the ways in which I, myself, was becoming-with the children and the more-than-human participants. Table 1 (below) shows an overarching picture of the ways I situate myself within posthumanist approaches to educational inquiry. The table is followed by an elaboration on each concept.

Table 1

Summarized Conceptual Framework

Natures and Cultures*	Relationships/ Agency**	Worlds***	Education****
Natureculture	Becoming-with through inter/intra-actions	Situated, common worlds approach	Learning as becoming-with in sympoietic storyworlding

*****(Haraway, 2003; Pacini-Ketchabaw, 2013); **(Barad, 2008; Haraway, 2015; Haraway, 2016a); ***(Haraway, 2008; Nxumalo, 2016; Taylor, 2017; Taylor & Pacini-Ketchabaw, 2015); ****(Haraway, 2016a)

Aim

My approach to the dissertation research aligns with a rejection of a dualistic divide between nature and culture. While I found Braidotti's (2013) concept of a nature-culture continuum to be compelling, I agree with Rautio (2013) that we, as humans, are already nature. Therefore, this study approaches nature and culture as entirely entangled in mutual becoming. Through this lens, humans do not fall on a continuum between 'pure nature' and 'pure culture.' They are simultaneously both. I use Haraway's (2003) concept

of natureculture to frame my research. In this study, I observe what naturalcultural entanglements characterize our mutual becomings.

I position children's relationships with their environments as becoming-with the more-than-human world through inter/intra-action (Barad, 2008; Haraway, 2015, 2016a). This approach includes observations of agential assemblages of mutual entanglement (Barad, 2008). I focus on the assemblages rather than the individual entities in these relational webs. My goal is to focus on multispecies more-than-human assemblages in order to engage in post-anthropocentric research that has the potential to reveal ways of relating that are pushed out by modern education and research approaches.

Summary

A common worlds approach that engages with ways of becoming more worldly by shifting the focus to multispecies entanglements serves as a framework for this study (Taylor, 2017). My research involves situated interspecies encounters in multispecies landscapes (Haraway, 2008; Taylor & Pacini-Ketchabaw, 2015). I employ a common worlds, natureculture (Haraway, 2003) framework that opens space to observe and become-with these landscapes. In doing so, it is necessary to acknowledge the colonial ties that are part of natureculture entanglements (Nxumalo, 2016). Situating these entanglements in time and space while paying attention to (in)equality within interspecies encounters will help to better understand we are becoming-with each other and Earth.

The common worlds approach illuminates how children's multispecies encounters occur in their places and spaces of formal and non-formal education. I have been referring to this as (in)formal education to show how I frame the boundary between formal and non-formal education as fluid. In the same way that I reject a nature-culture

divide, I also see education as mutually entangled in formal pedagogical settings such as schools and in 'pure nature' settings beyond the walls of the classroom. Children's encounters are multi-mattered as they become-with the books that they read and the trees that they climb. For this reason, they are becoming-with (Haraway, 2016a) their education in their emergence with the world everywhere that they are. My study includes examples of storyworlding in an elementary school classroom as well as in 'everyday life' spaces outside of school. In other words, this study exists beyond the formal and non-formal education binary, thus rejecting the bifurcation between the two. The aim of this study is to engage with this conceptual framework to attune to the multispecies storytelling of Earth's becomings. To bring it back to the philosophical question posed at the beginning of this chapter — put simply — this conceptual framework allows us to see that when a tree falls in the forest, it not only makes a sound, it speaks a language. It tells a story.

CHAPTER 4

"MAGNIFICENT" METHODS

(Thermophilic Phase)

As the Thermophilic Phase continues, the higher temperatures destroy the weeds and seeds of hegemonic, human-centric approaches to inquiry.

♫♫ *And at once I knew I was not magnificent.* ♫♫

Holocene - Bon Iver

The song *Holocene* by Bon Iver has been the soundtrack to my path to discovery of my dissertation research interest: understanding the role of education in reconfiguring the human-Earth relationship by identifying what matters in education and how it comes to matter. The lyrics talk about how the musician looked around at all the beauty he could see for miles and miles and, at once, understood that he was not magnificent. This message is a thread tying the dissertation chapters together thus far. The first and second chapters highlight the need to leave behind antiquated and harmful notions of human exceptionalism. The third chapter discusses theoretical approaches to early childhood education research that decenter the human, and specifically children, by centering their entanglements and agential assemblages instead. This fourth chapter takes on the challenge of engaging with research methodologies that incorporate the experiences of children while simultaneously decentering humans in research encounters. Put differently, my task in this dissertation is to both decolonize my research by foregrounding children's experiences that have been pushed out by an adult-child binary in a way that also decenters the child in post-anthropocentric research. In response to what is seemingly a catch-22, this chapter troubles the power given to standard research

methods and the pursuit of capital T Truths. It concludes with an argument for slow, fluid methodologies that embrace messy, chaotic assemblages and leave behind clearly delineated boundaries.

In this chapter, I outline three data collection and three data analysis "methods" that have been used in research that centers on participatory methods and the study of children's entanglements as they become-with (Haraway, 2016a) the more-than-human world. I have chosen an innovative approach to synthesize this literature review by packaging the data collection methods with corresponding data analysis methods in three research approaches summarized by the titles: (1) Rights-Based Approach, (2) Arts-Based Approach, and (3) Natureculture[10] Approach. There is significant overlap between these approaches. They are not mutually exclusive.

The rights-based approach includes participatory action research studies that acknowledge children as co-researchers in varying degrees from including them in the research design to collaborating with children in every step of research from the design, to data gathering, analysis, and the interpretation and dissemination of findings. The arts-based approach examines the use of visual data collection and analysis methods in participatory action research. While the focus is on visual, arts-based methodologies, it is important to note that the research included in this section is also participatory in nature and aims to include the voices of children as co-researchers. The final approach presented, a natureculture approach, considers how ethnographic data collection and analysis methods are employed in the study of children's common worlding (Haraway,

[10] The concept of natureculture comes from Donna Haraway's (2003) *The companion species manifesto: Dogs, people, and significant otherness*.

2008; Taylor & Pacini-Ketchabaw, 2015) with more-than-human animate and inanimate others.

The three approaches presented in this chapter highlight research that is participatory, includes children's voices beyond simple tokenism, and incorporates varying degrees of focus on children in more-than-human-assemblages. The intentional organization of the approaches in the order of rights-based, arts-based, and natureculture is done to illustrate how participatory approaches fall on a spectrum of human-centeredness. Additionally, while the approaches are not tied to a singular, unifying theoretical framework, the literature reviewed in this chapter primarily falls under the umbrella of posthumanist research. Therefore, when thinking *with* theory (Jackson & Mazzei, 2011), an ecofeminist, critical posthumanist, or new materialist analysis, for example, could be applied alongside or with any of the data analysis "methods" synthesized here (Grbich, 2013).

For the purposes of clarity (or, maybe, simplicity) in this dissertation, the three approaches and my dissertation research approach are all presented here as packages with relatively clear boundaries and straightforward procedures. However, the chapter argues in favor of messy, slow, fluid research methodologies. In doing so, I challenge the use of clear cut, linear "magnificent" methods that strive for simplicity and make a case for messy methods that embrace multiplicities instead. The chapter concludes with an outline of this dissertation's multispecies, multi-mattered, natureculture approach that employs an ecofeminist theoretical lens to engage the reader in storyworlding.

Overview of the Literature

The review of literature on how children are situated in intra-active (Barad, 2007, 2008) more-than-human entanglements in early childhood education revealed some common procedures for data collection and analysis. In general, study types in this area included ethnographies and case studies among other types (i.e. participatory action research, phenomenological research etc.). Data sources included interviews, observations, visual data such as photos, videos or other artwork, other types of artifacts and overt fieldnotes (Grbich, 2013). Finally, some of the commonly found analysis procedures were thematic coding, theoretical coding, and/or conceptual coding. There were examples of thinking *with* theory and thinking *with* the data (Mazzei & Jackson, 2012) in the literature as well.

This chapter synthesizes work that both uses thematic and theoretical coding as analysis techniques as well as research that goes beyond coding by including the data and analysis in agential assemblages as the researchers become-with the data. The "methods" employed in the literature reviewed here respond to a shared concern about voices that are missing from research. The authors cited in this chapter bring into conversation the silenced voices of children, the more-than-human-world, and the agential voice of the data itself which are powerful but can be rendered powerless in research encounters that are based on hegemonic ways of thinking, being, and researching. Specifically, the rights of children and inclusion of children as co-researchers were central themes in the literature.

The Rights of the Child

As mentioned earlier, this chapter strives to bridge not only the nature/culture divide but also the rift between adults and children. This binary, especially in 'Western' cultures, has resulted in a view of children as "lacking agency and in need of protection" (Malone & Hartung, 2010, p. 26). Clark (2010) argues, in order to decolonize research, it is important to understand where the boundaries are between children and adults. A point of departure for addressing this unequal division of power and the subjugation of children is the United Nations Convention on the Rights of the Child (UNCRC), a treaty created by the United Nations in 1989 to establish children's rights (UN Convention on the Rights of the Child, 1989). In particular, research focused on including children's voices draws on Article 12.1 of the treaty which assures that children are allowed to express their views freely and calls for their voices to be given due weight in all matters that affect their lives (UNCRC, 1989). In other words, it is incumbent upon adults to consult with children on all matters that concern their lives (Lundy & McEvoy, 2012; UNCRC, 1989).

When applied to research in practice, these principles point to a need for research to respond to how children have been treated as objects and instead take their agency into consideration (Broström, 2012). Beyond rupturing the researcher-object model, participatory research should also consider how children are active agents, not passive recipients, who have influence in their own lives (Lansdown, 2010). Children are capable of sharing their voices and deserve to have them heard, acknowledged, and acted upon. Children's participation in research, and specifically ethnographic and phenomenological research has increased the incorporation of children as participants who are recognized as

experts in their own lives (Broström, 2012). This inclusion of children in research as a *right* adheres to the UNCRC by valuing and giving due weight to children's voices (Habashi, 2013; Lundy & McEvoy, 2012; Murray, et al., 2019). As a result, the movement for children's rights that the UNCRC spurred has led to research *with* children for social change (Malone & Hartung, 2010). However, when it comes to including children in research, there is a lack of a clear definition of what exactly is meant by participation as a child's right (Lansdown, 2010), and when participation is defined, its definitions remain narrow (Malone & Hartung, 2010). For example, Malone and Hartung (2010) point to the confining definition of participation as only existing "if it is named and operated by adults in their domain" (p. 33). The rights-based approaches to research in the section that follows aim to clarify how children have participated as co-researchers in meaningful ways.

Rights-Based Approach

One approach that is employed in the exploration of how inventive and experimental inquiry engages children to investigate their worlds is a rights-based approach to participatory action research that includes children as co-researchers in data collection and analysis "methods." There is an increasing call for addressing the "pressing need for children's rights research that robustly engages with children's lifeworlds and concerns and that connects these to relevant human rights and opportunities for activism" (Larkins et al., 2015, p. 333). Research is a political action. The inclusion and exclusion of children in these encounters determines their ability to be included in conversations about matters that affect their lives. Therefore, it is important that children's inclusion in research reflects their own realities/lifeworlds and does not

simply occur when adults open a space for children to participate based on the rules and cultural frameworks that dominate adult life (Malone & Hartung, 2010). By beginning from the view of children as *rights-holders*, the conversation can evolve beyond children being able to speak for themselves to acknowledge that they are *entitled* to do so (Lundy & McEvoy, 2012). One way to engage in rights-based research is to use an explicitly UNCRC rights-based approach, however, there is no singular blueprint for how to design participatory, rights-based research (Lundy & McEvoy 2012; Lundy et al., 2011). In the examples that follow, children participate as co-researchers in all stages of research, including data collection and analysis.

Data collection or gathering *with* children as co-researchers is one way to include children in the research design and implementation from the ground floor. Prasad (2013) refers to this as data generation to make a distinction between collecting data *from* children and generating data *with* children. Prasad (2013) argues, "this distinction necessitates a paradigm shift that regards the research process as iterative, in which engagement in the creative process of data generation builds knowledge and understanding that in turn deepens students' creative processes, reflection and engagement in the inquiry" (p. 9). Participatory methods can include children's participation in setting the research questions, designing the research, choosing the methods, collecting and interpreting the data, and disseminating the findings (Bradbury-Jones & Taylor, 2015; Lundy & McEvoy, 2012).

For example, in a UNCRC-rights-based study on children's views of after school programs, Lundy et al. (2011) included children's participation in all stages of the research. Children in this study were grouped into "Children's Research Advisory

Groups" which met in the children's familiar school environment. Together they evaluated an after-school program by identifying questions of interest and choosing data collection methods such as 'circle time' conversations and the use of child-friendly digital cameras for children to capture photographs of their experiences (Lundy et al., 2011). A crucial aspect of this study was that Lundy et al. (2011) considered the maturity-level of the students and participated in capacity building activities to facilitate the children's inclusion in the research in a way that was appropriate for their age and maturity levels.

In addition to including children as co-researchers in data generation, there are also diverse opportunities to collaborate with children in the meaning-making process of data analysis. For example, Malone (2013) worked with children as co-researchers and co-constructors of their child-friendly neighborhoods. In an iterative process, children generated data by drawing pictures of their ideal neighborhood and then analyzed their drawings in focus group discussions with each other and the adult researchers. The children furthered their discussion on how to build a child-friendly neighborhood by processing the data together (Malone, 2013). They were also included in the thematic analysis of the data and designed thematic collages that they used to communicate their plans to a landscape designer. The inclusion of children in every step of the research process resulted in a playground that was the culmination of their collective work and data analysis.

In a study of how children and their material surroundings intra-act, Rautio (2014) used a participatory approach in a slightly "messier" arrangement than Malone's (2013) study. Rautio (2014) embraced the openness and uncertainty of fluid methods. She gave

children small, wooden boxes and asked them to fill the boxes with anything of their choosing. The children were invited to meet and share the contents of their boxes with the others. In these meetings, Rautio (2014) left the research boundaries open by explaining to the children that she was interested in "pretty much anything" they did during their research encounters (p. 465). She also participated by filling her own box and sharing her items. Some of the meetings were audio recorded. In others, Rautio (2014) took notes or photos. There were instances that she did not document anything about the meetings. The way that Rautio (2014) framed this research as messy allowed the children to determine what items they wanted to share with the group as well as how they wanted to share these items. Through the messiness, Rautio (2014) was able to observe and be embedded in the children's material intra-actions without furthering a researcher/researched binary.

Participatory action research that includes children as co-researchers who are entitled to share in the research encounters can provide opportunities for research that gives due weight to the missing voices of children and youth. There are a number of ethical considerations to keep in mind when engaging in this type of research. For example, it is important to understand where the boundaries are between children and adults (Clark, 2010) in order to ensure that children are willingly participating and are not simply acting upon their feelings of obligations to adults. In the context of an adult-child hierarchy, it may be difficult for a child-researcher to refuse participation, and therefore, it is important to give children ample exit opportunities (Spriggs & Gillam, 2019). Additionally, Bradbury-Jones and Taylor (2015) summarize and respond to some of the most prominent considerations when conducting research with children in rights-based approaches to research. Some of these concerns requiring a response include the need for

research to: (1) begin from the assumption that children are competent and capable of forming their own views, (2) ensure research activities are age-appropriate and children have support and training, (3) avoid insider/outsider bifurcation, (4) navigate complex remuneration politics so that children are fairly compensated for their contributions to research, (5) avoid unequal power differentials, and (6) carefully consider the consent process so that children are protected (Bradbury-Jones & Taylor, 2015).

As a critique of adult-designed participatory approaches, Rautio (2013) suggests that children might not need adults to facilitate their entry into adult-centric research spaces. She argues, "children might not need adults to provide them with equipment and allocate special spaces and time for participation" (Rautio, 2013, p. 396). The act of providing children with equipment and ways to 'capture' their views might, in fact, serve to further other children (Rautio, 2013). Said differently, children exercise their rights as co-researchers automatically and do not need to be strategically included in a hegemonic, adult-centric research space. Instead, they can be taken seriously as they exercise their agency through intra-action with their surroundings (Rautio, 2013). Researchers who allow for messiness and their own embeddedness in children's intra-actions without trying to control the situation unsettle the adult-child binary, thus, decolonizing the research. The arts-based approach that follows builds on these participatory methods and furthers the discussion on the tools and ways in which children are incorporated into research.

Arts-Based Approach

Another possibility for inquiring about children's intra-actions in (in)formal education spaces is an arts-based approach to participatory action research which uses

visual data collection and analysis "methods." Visual data sources could include photos, videos, artifacts, drawings, and/or multimodal combinations of these items. Arts-based research or visual approaches follow two methods: (1) using existing visual artifacts for participant elicitation or (2) asking participants to generate visual artifacts (Thomson, 2008). A benefit to using images, instead of narratives, for example, is that "images communicate in different ways than words" (Thomson, 2008, p. 11). By diversifying the means of expression, an arts-based approach has the potential to decolonize research by framing it through languages other than the written or spoken word. Additionally, an arts-based approach intersects with the decolonial nature of the participatory action research approach presented earlier as it provides a means for children to share their views and voices on matters that affect their lives. For example, in the Lundy et al. (2011) evaluation of the after-school program which used a UNCRC participatory approach, children took pictures on child-friendly digital cameras to show what they liked and found difficult about school as part of the data collection methods. Additionally, to present the research results, an artist drew the findings, as described by the children, on a canvas and allowed the children to add directly to the canvas as well (Lundy et al., 2011).

Arts-based approaches to qualitative data collection and analysis offer benefits but are not without drawbacks. In her arts-based study of the experience of children living on the streets in Kenya, Swadener (2005) used multifarious artistic approaches including visual and performance arts. She identified several advantages of arts-based approaches such as the slowing down of the research process, the active engagement of children, and the potential to rupture a unidirectional adult-child research model (Swadener, 2005). Two potential disadvantages that Swadener (2005) highlighted in this study were the

possibility that children would include visual images that they hope will please adults and the chance that the researcher will overinterpret the children's artwork. A nuanced analysis of visual data is necessary in an arts-based approach. Visual research methods employ diverse data analysis techniques, including content analysis of visual documents using a theoretical or conceptual lens, ethnographic analysis to understand the signs and signifiers present in the visual data, and deconstruction of the visual media to find meaning in the elements (Grbich, 2013).

In the review of arts-based approaches to educational research, the photovoice approach (Wang & Burris, 1997) emerged as a common method for collecting and generating photographic data. For example, Genuis et al. (2015) used a photovoice participatory approach to explore food security and lived experiences with food among First Nation young people at a rural reserve school in Canada. The participants were asked to take photographs of the food they ate. Genuis et al. (2015) trained high school students as co-researchers who then interviewed the children about the themes that emerged from the photographs they had produced. This example is both an arts-based and a rights-based approach to research in its inclusion of children as co-researchers and elicitation of children's voices and experiences, as well as their own interpretations of the "data," through visual methods.

Photo production as a data collection method with children requires the use of technology that is child-friendly. For instance, Magnusson (2018) used cameras in preschools as a methodological tool and ensured that the digital cameras were child-friendly and accessible to three-year-old participants. This allows for the use of visual data collection methods that are participatory and accessible. Photography in

participatory action research facilitates research *with* rather than *on* or *about young* people (Clark, 2010; Prasad, 2013). Moving image methodologies also provide opportunities to engage with visual languages and to study more-than-human entanglements. Lorimer (2010), for example, uses moving image methodologies to study elephants' interactions and argues, "moving images help deepen analyses of the power relations that run through three multi-species, multi-cultural triangles on display" (Lorimer, 2010, p. 244). An arts-based approach using photos and/or videos to this end could highlight unequal power relations among humans and between humans and more-than-human actors offering another avenue to address both the adult/child and nature/culture divides.

In addition to photos and videos as visual data, arts-based research approaches can also incorporate artifacts such as children's drawings (Leitch, 2008; Sachdev, 2017; Somerville, 2013). Specifically, in the study of children's more-than-human world encounters, Somerville (2013) includes children's drawings as data in a participatory action research project in the Morwell River Wetlands in Australia. After a visit to the wetlands, children drew and wrote about their "wonderings" in "place learning maps" (Somerville, 2013, p. 409). The drawings resulted in a unique opportunity for the children to share how they were entangled with the wetlands. Visual data collection methods such as photography, videography, and drawing that are child-friendly and accessible to young people offer alternative ways to share their voices that go beyond using written and spoken language alone.

When combined into multimodal expressions of voice, visual, arts-based methods tell a multifaceted story. A mosaic approach to research brings together multiple data

sources (i.e. interview data, images, etc.) to allow children to participate in the construction of a composite picture of their worlds, fostering the exploration of meaning with their co-researchers (Clark, 2010). Merewether (2015) uses a mosaic approach in a study of three- and four-year-olds' experiences of outdoor spaces. In their everyday pedagogical setting of the early childhood education center's outdoor space, the children led tours, took photographs, and discussed the photographs with one another. Merewether's (2015) innovative use of a mosaic approach culminated in a documentation book that included conversation snippets, children's photographs, drawings, and interpretations that was available for viewing by the children, teachers, and parents throughout the study.

Merewether (2018) builds on this earlier study by focusing on agential pedagogical documentation in the research process. Again, she invited the children to be co-researchers in a study that centered on photography. In this case, the children took photos of their educational space while Merewether also took photos as fieldnotes. Additionally, the children wore audio recorders on lanyards around their necks while they engaged with the space. Again, these multiple data sources were brought together in a documentation book that was available to everyone and placed prominently on a shelf in the early childhood education center. Merewether (2018) identified that this "teacher~researcher's notebook is not simply a container to be filled, rather, it is an active player in the research assemblage" (p. 272). In her use of innovative data collection methods, Merewether was able to include the voice of the data itself as agential in assemblages with children in their outdoor educational spaces.

Similarly, Odegard (2019) used innovative multimodal data collection and presentation techniques to study child-crow intra-activity. In a study of children's engagements with Nordic crows, Odegard (2019) shares the details of one creative/artistic session with children in which she analyzes audiovisual data including images and recycled materials that the children used to create crows. These materials were presented in a hypermodal fashion as Odegard blended images, crow sounds, and children making crow sounds. Using a complex visual ethnographic narrative and a hypermodal lens, Odegard (2019) challenges us to see differently, arguing, "when looking at these narratives through a hypermodal lens, humans, crows, recycled materials, photos, movements, and translations entangle and force humans to look at the world with different eyes, from a non-human-centered focus" (p. 133). Such innovative methods that decenter the human and entangle multiple data sources are important to the study of children's more-than-human world encounters. In order for researchers to recognize their own embeddedness and the role of agential data in these research assemblages, they must embrace the uncertainty of messiness.

The choice of theoretical lens used to analyze the entangled content of visual, arts-based data is important to the understanding of how the data itself is agential. Inherent in a content analysis using a new materialist or relational materialist orientation, for example, is the notion of intra-activity between human and more-than-human entities such as dogs, playgrounds, children, trees, and data such as photos (Hultman & Lenz Taguchi, 2010; Magnusson, 2018; Malone, 2016; Trafí-Prats, 2017). In a study of child-dog encounters, Malone (2016) used a visual, participatory, place-based methodology in which children were given disposable film cameras and no specific instructions about

what to take pictures of. Children discussed their images in a photo-narrative format, allowing them to show the world through their eyes. During this process, the children focused on their self-dog assemblages. When applying a new materialist lens not only to the analysis of the content in the photos but also to the participatory approach to the data collection process of child-dog encounters, Malone (2016) disrupts the idyllic misconception of children *in* nature to reveal that "nature-child relations are messy and complex, rather than simply restorative and idealistic" (p. 534). Utilizing a theoretical orientation that embraces and becomes a part of the messiness of these encounters opens space to decenter the human "data collector" and see instead the generation of data with Earthly others.

Another way to use a new materialist lens for data analysis is to specifically employ a diffractive analysis using Karen Barad's (2007) concept of diffraction as a methodological tool for analysis. Mazzei (2014) describes this process as reading the data "through multiple theoretical insights [moving] qualitative analysis away from habitual normative readings (e.g., coding) toward a diffractive reading that spreads thought and meaning in unpredictable and productive emergences" (p. 742). Magnusson (2018), for example, in a diffractive analysis of the photos generated by preschool students, engaged in an iterative data analysis process. The diffractive reading included previous iterations of analysis, the author's personal experiences, the research of others, theory, and the materials generated in the data collection phase (Magnusson, 2018). Multiple readings and re-readings of the data using a diffractive analysis highlighted new connections between different parts of the data and the agential forces of the data (Magnusson, 2018). Rautio (2013) summarizes the benefit of approaching research in this way:

> A new materialist approach to children's geographies would direct attention to the ways in which children constitute their material – human and non-human – surroundings *and vice versa*. Agency would be allocated space *in between* children and their environments, arising in complex encounters rather than located only in the human individuals. (p. 396, emphasis original)

The potential for exploring how children and the more-than-human mutually constitute one another is not limited to new materialist approaches or conceptual-level diffractive analyses. Other posthumanist approaches to data collection and analysis are also used to explore these relationships. For example, Trafí-Prats (2017), in a common worlds approach to multispecies child-tree encounters, included "drawing, video, print, and narrative to develop attentiveness and intimacy with a group of trees and tall grasses on the school block" (p. 325). These methods required children to tune into their own being with the trees in a space of informal education (Trafí-Prats, 2017). Arts-based methodologies offer one way to think *with* the data (Jackson & Mazzei, 2011) to understand how children are situated in intra-active worlds. The following natureculture approach develops these participatory and arts-based methods to further decenter the child specifically and humans more generally.

Natureculture Approach

The final approach in this chapter explores the construction of a nature-culture world through ethnographic data collection and posthumanist analysis "methods" in a multispecies and/or multi-mattered ethnographic approach. As opposed to a classic ethnography in which the researcher is an "objective" observer, a natureculture ethnographic study requires the researcher to note their own situatedness in multispecies

assemblages. A goal of an ethnographic study is a description of culture (Grbich, 2013). For this reason, a multispecies, multi-mattered ethnography is positioned to describe what Haraway (2003) calls natureculture. As seen in the arts-based approach, the use of a relational materialist or diffractive data analysis focusing on the assemblage as the primary unit of analysis, rather than the human, allows for a better understanding of more-than-human relations in ethnographic studies as well (Fox & Alldred, 2015). An analysis of entanglements rather than individual agents moves beyond including individual voices and instead zeroes in on agential assemblages.

This change in paradigm "entails challenging, and moving away from, the privileging of the speaking, rationally reflective human agent/research that continues, implicitly at least, to frame knowledge production in the social sciences and humanities" (Dowling et al., 2017, p. 827). A focus on naturalcultural entanglements frames knowledge production within more-than-human intra-activity and rejects the notion that knowledge is the unique possession and production of humankind. Cele (2019) embraces the complexity of conducting this type of research by challenging posthuman research "to be able to focus both on that which is visual and possible to express in words, and to focus on that which is neither visual nor verbal" (p. 4). A multispecies ethnographic approach aims to incorporate not only the (in)animate more-than-human world but also the more-than-linguistic world, opening space for different ways of thinking, knowing, being, speaking, and listening.

According to Somerville and Powell (2019), common worlds[11] approaches often

[11] Haraway, 2008; Taylor & Pacini-Ketchabaw, 2015.

employ multispecies ethnographic methodologies. For example, Pacini-Ketchabaw, et al. (2016) have conducted multispecies ethnographies in diverse settings including Hong Kong, Australia, and Canada. They have chosen a common worlds framework in "an attempt to move beyond research practices that confine themselves to exclusively human (or social) concerns and interests" (Pacini-Ketchabaw et al., 2016, p. 151). In their ethnographic study, the authors acknowledge the agency and participation of human and more-than-human actors by listing among the participants trees, mosses, bears, and birds (Pacini-Ketchabaw et al., 2016). However, they illustrate that a common worlds approach is not without challenges in practice. Pacini-Ketchabaw et al. (2016) describe the difficulty of decentering the human in early childhood education settings that practice child-centered pedagogies. For example, in a place-oriented study, Somerville and Green (2011) inquire about children's ecological learning through digitally recorded 'walking interviews' on the school grounds. The use of walking interviews allowed children to narrate the significance of different places they encountered on their walks showing their relationships to the space from their perspectives. While this offers the chance to highlight children's relationships with/to places, it does so by framing them through the children's eyes and amplifying the children's voices. Posthumanist approaches must strike a delicate balance between decentering the human (child) and avoiding the erasure of the child's voice. By centering assemblages rather than individual actors, the child's voice is still considered along with and through its relationship to other actors in the assemblage.

One way of fostering a more profound decentering of children in multispecies ethnographic work is to use walking ethnography as a data collection technique *outside*

of school environments. By removing the children from the everyday formal pedagogical space of their child-centered classroom, they are able to engage with the world beyond their formal spaces of learning and being in different ways. Walking ethnography, as a data collection technique within and beyond school settings, requires the acknowledgement of the researchers' presence and experience within the research encounter (Iared, 2017). Taylor and Pacini-Ketchabaw (2017) conduct a multispecies ethnography using a common worlds approach in their study of child-racoon and child-kangaroo encounters. They use walking ethnographic methods to move away from child-centered research and to "follow and document the key relations that emerge over time between children and other species within their imperfect, everyday, local 'common world' environments" (Taylor & Pacini-Ketchabaw, 2017, p. 133). In this study, Taylor and Pacini-Ketchabaw (2017) collected field notes and visual recordings as they walked around campus with children from the university's early childhood education center. Their walking ethnographic methods allowed them to enter a space where children were able to be and 'become-with' kangaroos and racoons. These child-animal encounters, which occurred as a part of a formal education activity in a space of informal education, were facilitated by traversing the (in)formal education boundaries.

Somerville (2017a) conducted a similar multispecies/multi-mattered ethnography that played with the boundaries of formal and informal education. In the study, teachers and students were invited to explore a nearby wetland as a part of the formal school project (Somerville, 2017a). During the course of the wetland visit, Somerville found that the children she was supervising chose to break the rules of the formal school activity to "play" with the natural elements instead. For example, three children asked Somerville if

they could use her iPhone to record a video of stones being thrown into the water. As they recorded a few versions, the children aimed to be silent and show only the moment that the stones entered the water. Somerville (2017a) read their multiple attempts at silent recording to mean that they were actively working to decenter themselves. In their refusal to follow the school project tasks and their engagement as silent recorders of stones and water coming together, the children expressed their own autonomy as well as inquired their relationship with the stones, water, and adults present. Somerville's (2017a) choices to acknowledge her position of power as supervisor and to not intervene or insist that the children complete the assignment as it was outlined opened a space within the multi-mattered ethnographic study to decolonize the research by bridging divides between adults and children as well as between children and 'nature.'

In a similar study, Somerville and Powell (2019) conducted a walking, multi-mattered ethnography near a local creek with fifteen children ages three to five years old in what they described as a methodology of 'deep hanging out' with children. As they were walking, Somerville and Powell (2019) took fieldnotes, videos, and photos on their iPhones of the children's intra-actions with sticks, waters, and a drainage hole near the creek. Their methodology of 'deep hanging out' responds to the challenge of intentionally decentering children by "being-with children and their worlds without any particular purpose or assumptions, just to see what happens" (Somerville & Powell, 2019, p. 20). As researchers, they flow in and out of assemblages with children, sticks, water, and iPhones (Somerville & Powell, 2019). The 'deep hanging out' approach to walking, multi-mattered ethnographic methods places value on the uncertainty and messiness inherent in human-more-than-human world entanglements. Entering a research encounter

with no clear purpose as Somerville and Powell (2019) did, creates infinite possibilities for the observation of and becoming-with Earth (Haraway, 2016a).

Other common worlds approaches to multispecies ethnographies have resulted in similar examples of naturalcultural worlding through agential more-than-human-child-researcher assemblages in forests (Nxumalo, 2015; Pacini-Ketchabaw, 2013) and in children's everyday lived common worlds encounters (Taylor & Pacini-Ketchabaw, 2015). These observations challenge the status quo of seeing the world through a human-centric lens. For example, Taylor and Pacini-Ketchabaw (2015), in their study of children's common worlds encounters with ants and earthworms, strive "to learn to be affected by and think with all of the actors – in particular by and with the children's, the ants' and the worms' bodies, movements, disconcertments and preferences" (p. 11). Fostering a thinking *with* the assemblages gives way to a new view of thinking as something that is possible beyond the human mind. It provides a different way to describe the naturalcultural world through co-constructed multispecies language.

A natureculture approach calls for innovative uses of standard data collection techniques such as trading static interviews for walking interviews as well as requires the use of theoretical analysis that is equipped to make meaning of complex and myriad encounters. In their multi-mattered ethnography, Taylor and Pacini-Ketchabaw (2015) use vignettes to draw together the various data sources such as photos, fieldnotes, reflections, and ponderings. They discuss their challenge to constantly work against the desire to position children as central actors in the analysis process (Taylor & Pacini-Ketchabaw, 2015). By visiting and re-visiting the data as they craft the vignettes, the authors are able to move away from understanding the data through a child-centered lens.

As was mentioned in the arts-based approach, a diffractive analysis can also be used to shed light on relationships, including relationships of power and influence, through iterative readings and an openness to unpredictable outcomes.

Centering the data itself as part of an agential assemblage is another step toward decentering the human as research participant and analyst. An additional consideration of importance is the 'voice' of data. Koro-Ljungberg (2016) raises questions about data and its wants and its influence. She asks if data is alive and if data has the power to transform us as researchers by influencing our behaviors, attitudes, and actions (Koro-Ljungberg, 2016). In a similar vein, the scholars cited in this review of literature acknowledge data as agential in assemblages with other animate and inanimate actors. For example, Merewether's (2018) use of a prominently placed documentation notebook that was a mosaic of the pedagogical happenings in the early childhood education outdoor spaces was simultaneously a collection of data (photos, interview excerpts, notes) and agential in the child-research assemblage as it became part of the space and the intra-actions that occurred within it.

The conversation about data as having voice and agency also draws into question what/who makes data meaningful. *Is it intrinsically meaningful?* In a similar vein to the philosophical question about the sound of a tree falling in the forest, Darby wonders, "is data meaningful only when a person stops to reflect on its meaning? Or is the world full of the untapped potential of data, being limited only by the hegemony of human thought?" (Koro-Ljungberg, 2016, p. 46). This leads to questions about how the three research approaches summarized in this chapter find ways to see the data beyond the 'usual way' as an object that is lying in wait for a researcher to code, shape, and interpret

(Koro-Ljungberg & MacLure, 2013). The following section builds upon this notion to conclude that slow, messy, fluid methodologies are conducive to delving deeper into the data's wants and influences (Koro-Ljungberg, 2016).

Slow, Messy, and Fluid Methodologies

For the sake of clarity, this chapter has packaged three research approaches as if they had clear boundaries. The first approach, a rights-based approach, included examples of participatory action research that includes the voices of children through their participation as co-researchers in all phases of research design, analysis, and dissemination. The data collection and analysis techniques such as interviews and theoretical analysis were not particularly innovative, however, viewing children as rights-holders who are entitled to share their voices on matters that affect their lives is revolutionary. The arts-based approach built upon the participatory and rights-based nature of the first approach by providing children with a different way to express their voices and needs through visual data. This approach offered diverse, multimodal means to visualize children's entanglements with more-than-human others. The natureculture approach used ethnographic methods to acknowledge the political participation of children and adults in messy, entangled more-than-human and research assemblages. What all three approaches shared was the element of surprise in the unknown.

One of the greatest challenges that resonated throughout the literature reviewed in this chapter was the difficulty of decentering the human while ensuring that children's voices are given due weight. In the data collection and analysis phases alike, the scholars cited here struggled to decolonize their minds and research processes to see what is pushed out when they collect and view data through a human-centric lens. Hackett and

Somerville's (2017) year-long ethnographic study of children visiting museums is a prime example of this struggle. When they first approached data analysis, they found that their observations were still child-centered. They revisited the data in iterative waves to disrupt this pattern of seeing and decenter the children. Their compromise was to stay a while with their data and listen (Hackett & Somerville, 2017). Slowing down the research let sound and movement germinate and emerge.

Millei and Rautio (2017) also make a case for methodological slowness by re-analyzing their observational data from the "home corner" of a preschool classroom. Their first encounter with their observational data of children engaging with domestic toys such as a play kitchen revealed child-centered findings about globalization. When Millei and Rautio (2017) acknowledged they were still controlling what and who entered the research, they chose to revisit the data to see what might have been erased, left out, or made absent by their first analysis. Their embrace of open-endedness allowed them to see that to which they were previously unaware. Rautio (2013) summarizes the task of a posthumanist researcher who works with children:

> Follow children who write, draw, speak, jump and shout without a clear purpose. Create space for this. Join in. Interrupt yourself as a researcher, stay on your toes, change methods in the middle of your data collecting phase if that is what it takes. Seek the moments in which children produce the unfinished and the pointless and move on. Celebrate data that does not fit into categories. (pp. 403-404)

Slow, messy, fluid research asks us to sit in the discomfort of the unknown. It calls us to respond. It tempts us and compels us to "seek uncertainty and risk, and get lost" (Koro-Ljungberg, 2001, p. 377). Within the uncertainty lives surprise and innovation. Research

that takes place in and describes the (un)predictable precarity of living and dying in the Anthropocene must embrace these unknowns. Fluid methodologies open space for alternative ways of understanding that the boundaries surrounding research approaches are in fact leaky and unfixed. They allow for and encourage variability and instability. Approaching these boundaries as permeable and seeing methodologies as fluid "[works] against the stability of methods and the omnipotent power of 'right' methodology that may portray methods as isolated, always (in)appropriate and (in)accurate, fixed, objective, and ultimately as controllable tools for research" (Koro-Ljungberg, 2016 p. 97). The challenge I accept in this dissertation is to trade in notions of "magnificent" methods and embrace the mess. In the section that follows, I outline the research design that guided this inquiry.

Determination of the Research Design

"*Can you hold yourself as a researcher and your data, analyses, and representations in an uncomfortable position? Can discomfort be productive?*" (Koro-Ljungberg, 2016, p. 114)

Challenge accepted.

The natureculture approach used in this study is an innovation on a traditional ethnographic approach that is limited by its human-centric focus on the description of culture and does not, in and of itself, allow for the study of the more-than-human. A natureculture approach, as outlined in the sections above, addresses the catch-22 of giving children's voices due weight while also de-centering the human through its focus on multispecies, multi-mattered agential assemblages. The approach is similar to

multispecies ethnographic approaches that have focused on children's entanglements with Earthly others (Nxumalo & Pacini-Ketchabaw, 2017). It explores children and their entanglements by entering and becoming within more-than-human assemblages which include children.

In this dissertation study, for example, there are multiple entry points into the assemblage (read: story). Some entry points include: the forest, birds, noise, fire, rain, cats, spirits, dogs, a rooster, a toddler, blocks, Batman, a butterfly-moth creature, and a spray-painted structure on the side of the brick road. Some of these entry points are human. Most of these entry points are more-than-human beings or matter. This natureculture approach includes all of these entry points as narrators through their presence in more-than-human agential assemblages. The goal of this natureculture approach is not the description of (human) culture (Grbich, 2013), but rather the exercise of sympoietic storyworlding. Education as storyworlding is embodied in Earth's many shapes and forms, including within children and more-than-human assemblages.

Setting

My initial dissertation data generation (Prasad, 2013) began over a three-month period from mid-June to mid-September 2018 in a coffee-producing region in Southeastern Brazil. The town where I stayed has a population of just over 500 and is located in a region of about 6,000 inhabitants. The first half of the study was funded by a United States Agency for International Development (USAID) Global Development Research (GDR) grant through the Julie Ann Wrigley Global Institute of Sustainability at Arizona State University. In the first three months of the study, I spent time building relationships with the families in the community. I observed classes in the local high

school and made connections around the region. I took the opportunity to learn more about education by interviewing the teachers. My knowledge of specialty coffee production grew exponentially as I interviewed third- and fourth-generation coffee producers about how they care for the land and pass their knowledge of sustainable land use across generations. Upon my return to Arizona, in the initial analysis of the data and through conversations with my dissertation chair Iveta Silova, we determined that I often shared anecdotes and experiences of my time with the children. This is where the idea was born to return to the region for a second iteration of my dissertation study as a natureculture study from June to August 2019 with the support of First Solar and ASU's Global Development Research scholarship program. In the second iteration of the study, as the focus shifted to children's multispecies encounters in education, I aimed to return to the community and accompany 9 children who attended a mixed-grade elementary school in a one-room schoolhouse in their schooling and everyday lives.

Participants

Inherent in a natureculture approach is the inclusion of human and more-than-human multispecies, multi-mattered participants. The participants in this study are intergenerational humans and more-than-humans. To avoid insider-outside bifurcation with the human participants (Bradbury-Jones & Taylor, 2015), Appendices A through L include Institutional Review Board approved documents that demonstrate the language I used to frame the study in both iterations (2018 and 2019) as well as the language framing my own participation that I used when speaking with the human participants of all ages. In this explanation, I share with the human participants that I planned to follow wherever I was invited but that I had not defined a set research space. When invited, I, as

a participant and co-narrator of our story, storyworlded with human and more-than-human participants who invited me to join them. Just as Rautio (2013) did, I "[followed] children who write, draw, speak, jump and shout without a clear purpose" (p. 403). I did the same with the more-than-human participants. Almost daily, I walked between where I lived and where the families lived. I slowed down. I laid on my bed and observed the dust in my room as it traveled in patterns on the sunlight.

Figure 3

Fieldwork Photo of Dust in a Sunbeam

I spent time with the dogs and sat in the forest. Comparatively, I spent much more time outside of the one-room schoolhouse than I spent inside of it. Sometimes, I just sat on a hill with my back against a tree and stared out across the valley without a clear purpose.

Figure 4

Fieldwork Photo of the View from where I Lived and Sat Without a Clear Purpose

Data Generation[12]

Storyworlding through a natureculture approach encompassed data generation, analysis, and dissertation drafting. All three stages invite a constant, sympoietic (re)writing of stories, and by extension, worlds. This approach does not assume that the data is passive, lying in wait to be created, coded, shaped or interpreted (Koro-Ljungberg & MacLure, 2013). Data is not generated and then labeled as fixed. It is emergent in its assemblages. In this dissertation study, data is a co-narrator in sympoietic storyworlding. In the sections that follow, I outline some of the data generation methods that form part of this study.

School participation. When this study began in 2018, the initial guiding research questions were predicated on a binary distinction between formal and non-formal schooling. I conducted interviews with teachers and observed students in the local high

[12] Prasad, 2013.

school to see which disciplines received the most priority. As the study evolved to focus on younger children and the more-than-human world, I decided to focus my second iteration of the study on the experiences of children in a multi-grade one-room schoolhouse.

Figure 5

Fieldwork Photos of the One-room Schoolhouse

The school employs one teacher and one chef. There are 6 students in the elementary school level (ages 7-11) and 3 students in the preschool level (ages 3-5 years old). The elementary school children sit in rows at the front of the classroom and receive differentiated learning based on their grade level. The preschool children share a small table at the back of the classroom where they engage in preschool-level activities. In the morning, the elementary school students join the preschoolers in their "routine." They move around the classroom singing songs meant to help them understand the consonants, vowels, syllables, numbers, days of the week, and months on the calendar. They repeat this routine daily.

Because this dissertation is focused on exploring what matters in education and how it comes to matter, I intended the school to be the primary location for data generation. Before my arrival to the region for the second iteration of the study, my host

organization facilitated a meeting with the education minister for the families of the children who attend school in the one-room schoolhouse. They explained my research project and confirmed that the families were comfortable with my presence in the school. I later learned that the school was set to be closed down due to low enrollment. When they learned that I would be returning to their community to complete my dissertation research, they kept the school open. Despite widespread approval of my presence and the project itself, I did not arrive and immediately request to participate with the children in the school. One of the main guiding tenets of my methodological framework was that I followed the multispecies participants wherever they led and invited me. They did not immediately lead me to the school.

The internal doubt that was created by *not* rushing to start "my study" in the school was heavy. I spent my mornings sitting on the hill or wandering up and down the road toward where the families lived with an ache in my stomach that I was somehow doing something wrong by not inviting myself into the school. I reminded myself that following where I was invited was not only part of the plan, it was also an important step toward decolonizing my research. I could not impose my research agenda on any individual or school. I had to remind myself that I had no agenda. I had to be patient and follow each path as it revealed itself. Once I was invited into the school, there was a noticeable change in my ability to attune myself to the more-than-human world around me. My walks between where I was living and the school were rushed as I hastened my pace hoping to arrive in time to drink coffee with the students and sing their routine songs together in the morning. I found myself zeroing in on the children's interactions with the materials inside the school. I noticed how they played with blocks or paid attention to

what they chose to draw. I listened to the sounds that could be heard from within the school and breathed the smoke that entered the school from local fires being used to burn trash or clear land. Entering the school pulled me from the Chthulucene where I wandered and sat without purpose into the Anthropocene where I inserted myself into the narrative of the children's schooling.

Art and 'things' of importance. As seen earlier in this chapter, an arts-based approach to inquiry includes children's voices in a way that moves beyond the written and spoken language. These types of visual methods such as those incorporating multimodal art (Odegard, 2019) and drawings (Leitch, 2008; Sachdev, 2017; Somerville, 2013) are valuable tools for sympoietic storyworlding that diversify the means of expression. For example, Sachdev (2017), in a study of worlds through children's eyes, invited children in an early childhood education center to draw in their own 'world books' to learn about their worlds through art. The early childhood education literature also featured activities that allowed children to share 'things' or matter of importance (Merewether, 2018; Rautio, 2014). These methods were participatory in nature and allowed children to take the lead in choosing what to share and how to interpret the data that was shared.

In the context of this dissertation, I drew on Rautio's (2014) way of framing her interest in "pretty much anything" the children wanted to share and I explained to the children that this was our story to create together. I brought a large scrapbook to the schoolhouse that the Arizona State University had provided. We called it our storybook. This storybook remains at the schoolhouse and continues storying as an agential narrator in the research assemblage (Merewether, 2018). We often drew together and pasted our

drawings into the book. I enjoy drawing lines on paper without a specific image in mind and then coloring in the shapes that the lines create. The preschool children would often ask me what I was drawing, and I would reply that I didn't know. They would tell me what they thought it looked like, and then we would color the shapes in together.

Figure 6

Fieldwork Photo of a Storybook Page that the Children and I Drew Together

Walking conversations. The literature on early childhood education that focuses on children's entanglements with the more-than-human world often used 'walking interviews' as a way to learn more about children's ecological learning and relations between children and other species (Somerville, 2007; Somerville & Green, 2011; Somerville & Powell, 2019; Taylor & Pacini-Ketchabaw, 2017). This 'method' allowed for researchers to "follow and document the key relations that emerge over time between children and other species within their imperfect, everyday, local 'common world' environments" (Taylor & Pacini-Ketchabaw, 2017, p. 133). Walking conversations are framed as a flexible method to "see what happens" without any assumptions about how the research should go (Somerville & Powell, 2019, p. 20).

Walking conversations took place with both human and more-than-human participants in this study. In the walk between where I lived and where the families live, I will be able to 'speak' with and listen to the brick road, weeds, coffee plants, trash, trees, birds, ants, and flowing creek as I practiced slow research and mindful movement. Additionally, when invited, I participated in walking conversations with intergenerational individuals as they played, worked, lived, and storied worlds. Sometimes I video or audio recorded these conversations. Other times, I took photos or wrote musings about the experiences. Most times, I simply 'became-with' those with whom I conversed without recording anything.

Audio/visual recordings. I brought a digital camera and audio recorder with me that became part of the research assemblage. Although I considered bringing child-friendly digital cameras as Lundy et al. (2011) used in their study, I had to use the technology that was available to me through the university, which was a Nikon digital camera. The device turned out to be intuitive enough that all of the children were able to use it without too much difficulty. We had a short lesson on how to hang the camera around their necks using the strap and then how to support it with their hands as an additional measure to keep it from breaking.

The only issue that arose with the device was related to the camera's buttons. The children learned how to use different filters and change the colors of the photos. They also learned how to delete a photo if they did not like it. When you press the trash can button on the camera, you are presented with two options in English: (1) Delete one photo, or (2) Delete all photos. One of the 8-year-old girls took a liking to taking a photograph and deleting it and then taking another photograph and deleting it. She cannot

read English. On not one, but two separate occasions, she managed to delete nearly 500 photos from the camera. While I was able to recover many of them using a recovery software, most were lost. This is just a part of the messy methods that characterize our story.

In addition to the photos and videos we generated, I also brought a voice recorder that the children asked to use anytime they wished. Since the preschool students had not yet learned to read, they enjoyed recording their voices as they narrated stories from the pictures in the books. Some nights, when the dogs would bark late at night or a heavy rain was falling on the roof, I turned on the recorder.

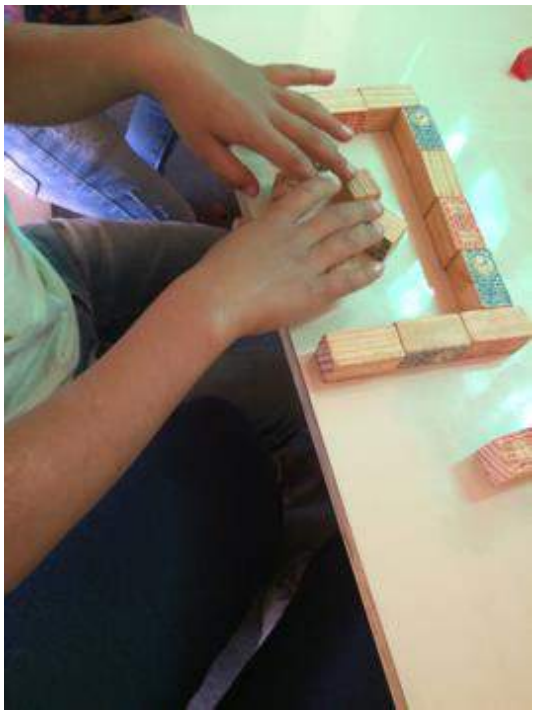
Reflections, musings, and fieldnotes. Building in time to slow down the research was important to following the methodological framework that embraced slow, fluid, messy methodologies. Journaling in the evenings sometimes helped me to stay in the Chthulucene. I reflected on the way that there were white flowers on a tree at a bend in the road near a cement structure with haphazard spray paint on it. When I walked past this structure at dusk, the white flowers glowed as if they were candles. I recorded notes about what I saw during my walk. These notes varied from narrative fieldnotes to bullet-point procedural lists. I shared these experiences and stories with family and friends via FaceTime. All of these musings and reflections are data that become part of our stories.

Researcher participation. I wore many hats while I was in Brazil. One of my roles was as a representative of Arizona State University. I shared stories from home and told the children, teens, and adults about what life is like in Arizona. As a doctoral candidate representing the university in a formal research capacity, one of my roles was to gain the consent of the human participants. While the families accepted my presence

openly, not all children chose to participate in this study. Those who did wish to participate signed assent forms, and their parents signed consent forms (see Appendices C through L). When I presented the Institutional Review Board (IRB) assent forms to the children, I framed the project as our story. Shortly afterwards, one of the preschool children, a 5-year-old boy, used the blocks to create a computer so that he could help write our story.

Figure 7

Fieldwork Photo of a Boy and His Computer Made of Blocks



Another hat I wore was as the community's English teacher. In the first iteration of the study, there was a community-identified need to learn English. This region has been gaining notoriety for their specialty coffee for years now. They are located in proximity to a national park that draws tourists from around the world. Only one member of their community can speak English. They wish to learn English so that they can

communicate with visitors, share their families' stories, and sell their family-produced specialty coffee. I offered to teach free English classes as a part of my return project with the support of First Solar through Arizona State University's Global Development Research Scholars program. From my second day in town until the very end, I taught 9-hours of English class per week after school and in the evenings. I taught the classes in the same one-room schoolhouse where I participated in school with the children. We divided interested participants into three groups: children, teens, and adults. It took me a while to figure out that all three levels enjoyed playing "Go Fish" with new vocabulary words. In my downtime, I created artistic and elaborate Go Fish cards with words that were relevant to their context. Illustrating the cards relaxed me. Everyone loved them. I left the cards in the school. I wonder if the children still play with them.

Figure 8

Fieldwork Photo of a Go Fish Vocabulary Game

My role as a teacher did not end with the English classes. School participation in the multi-grade one-room schoolhouse generated diverse roles for me as well. Every

morning began with coffee and biscuits. On the days that I wore my glasses, the coffee would fog up the lenses. All of the children found this amusing and they would ask me to do it again and again. I would blow on the hot coffee, fog up my glasses, and then quickly wave my hands in front of my lenses to clear the condensation. One of the preschool children said that it is just like when his dad turns on the fan in the car to clear the windshield. Each morning, one child per day was invited to read a book to the entire class. The preschool children who could not yet read would choose a book and narrate a story from the pictures. Most mornings, I spent my time sitting at the small table in the back with the three preschool children. The teacher seemed relieved to have extra support in the classroom, and I was happy to be anywhere I was invited. The youngest girl liked to sit next to me and rest her head on my arm or lap while the children read their morning story. When it was time to color, if I was not coloring with the children, I was sharpening a pile of colored pencils on the table while the children drew.

After school ended, my time with the children continued. Sometimes, I would keep one of the 8-year-old girls company while she waited for her brother to pick her up from school. We would draw in the dirt.

Figure 9

Fieldwork Photo of a Girl's Drawing of a Sunflower with Rosy Cheeks

Most days, I ate lunch at the house/restaurant next door to the school which belonged to the grandmother of one of the 8-year-old girls. She and I ate lunch together most days. While we ate, she would hover right above my food and tell me the colors of my food in English – white, black, brown, yellow. After lunch, I walked up the hill to the house of some of the other children's grandparents. All of the students knew that I liked to go there between lunch and English class, and they started to come back early for English class so we could all be together at this house. It felt as though I was never alone. There were always children or dogs or cats with me wherever I went, and they loved to be glued to me when they could.

Figure 10

Fieldwork Photo Taken by a Child of Me with Three Children and a Dog

After teaching my first English class to the children, there was a slight break before I taught class to the teens and adults. On days when I taught multiple classes, I usually wanted to be alone. Rather than going across the street to play with the children at the house construction site where their father and uncle were building a new family home, I usually chose to "hide" inside the school. I would latch the front gate, hide inside, and create my lesson plans or color new Go Fish cards. One of the 8-year-old girls knew that I liked to do this, so she would come into the school and keep my company by playing teacher. She would draw squiggles on the chalkboard and speak quietly to herself as if she were giving a lesson to the class. One day, her father came to the door and said, "I am responsible for her today, so she will be staying here with you." The boundaries between offering my childcare services and conducting walking interviews or 'deep hanging out' (Somerville & Powell, 2019) with children in their situated lifeworlds were non-existent.

I spent a lot of time with one of the families where many of the children, who were all cousins, lived together in four houses within a one block radius of each other. One of my favorite activities to do with them was help the boys as they were "catando café" *picking coffee*. Once their fathers had picked the cherries, the green, yellow, and red coffee cherries were separated and grouped in a large machine – the size of a small house

– that used water and the coffee's buoyancy to determine which ones were green, yellow, and red. The cherries were then dried on separate raised beds by color. Sometimes, a few stragglers of one color would be hiding in the pile of another color cherry. The younger boys were asked to pick those out by hand and put them with the right group.

Figure 11

Fieldwork Photo of Yellow and Red Coffee Cherries to Be Separated

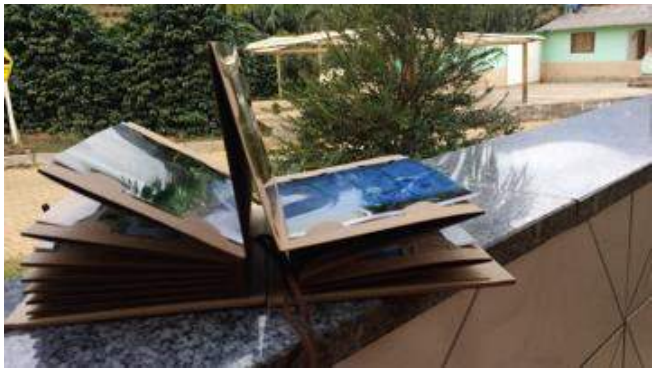
Separating the coffee by color was so relaxing. We used both hands at the same time and gathered up fistfuls of whichever color we were picking in each hand and then put them in a bucket at the center of the drying rack to transfer them to a different rack when we were done. I would play music in English, and we sang the songs together. On the days that I didn't have another class to teach, I would stay and pick coffee with the boys or keep their grandmother company while she made dinner. She taught me how to make *doce de leite em pó*, one of my favorite sweets. We spent so much time together that she often introduced me to her relatives and friends at church as "her eldest daughter." On the evenings that I did have an English class at night, one of the families

would bring me to their house for dinner afterward and then take me home. I was so welcomed and cared for by all of the families in the community.

Because my presence in this community was ephemeral but our connections were so deep, I needed a careful exit strategy to help the children understand that I would be leaving and we did not know if I would return. Toward the end of our time together in the school, I created a calendar that showed the children how many days we had left together. We crossed off each day one by one during the morning routine. Before I arrived in Brazil for the second iteration of the study, the plans were already underway to center my study around the schooling experiences of the 9 children in the one-room schoolhouse. Using a generous grant from Arizona State University, I planned ahead and purchased 9 small photo albums to bring with me to Brazil. I put together an individual photo album for each child with a photo of the two of us together and some of the photos we had taken together on the digital camera.

Figure 12

Fieldwork Photo of a Child's Photo Album



The children proudly showed the albums to their parents and knew that they would always be theirs to keep so that we could visit with one another in the photos even if I could not return.

CHAPTER 5

DATA ANALYSIS AND FINDINGS

(Cooling Phase)

In the Cooling Phase, the thermophilic organisms which were active at the higher temperatures – such as the structures and conventions of theoretical coding – begin to tire and cease activity causing the temperature to decrease.

Nature: More than Just Beauty

A poem by Milena Gomes De Abreu

A Natureza não é só beleza.	Nature is not just beauty.
Nela está nossa maior riqueza:	Within Her is our greatest wealth:
o nosso ar com certeza.	Our air, without a doubt.
Mas o ser humano, com sua malvadeza,	But Mankind with his wickedness, is
está deixando-a cheio de impurezas.	leaving Her full of impurities.
A Natureza chora de tristeza ao ver o ser	Nature cries from sadness to see human
humano nessa frieza.	beings with this coldness.
Se o homem tivesse esperteza, respeitaria	If Man were wise, he would respect
o tempo da natureza.	Nature's time.
Poluem, cortam árvores, colocam fogo.	Man pollutes, cuts down trees, sets fires.
Que dureza.	What harshness.
O ser humano deveria ver com mais	Mankind should see with more clarity:
clareza: as matas são os pulmões do	The forests are the lungs of the world
mundo com certeza.	without a doubt.
Esses fogos nas matas não são moleza.	These fires in the forests are no joke.
Se acabar a natureza, viveremos na	If Nature perishes, we will live in
pobreza.	poverty.
O planeta está vivendo na escureza.	The planet is living in darkness.
Os animaizinhos dos fogos estão virando	The little animals, of the fires, are
presos.	becoming prisoners.
Meu Deus, quanta tristeza.	My God, so much sadness.
Que Deus tire a floresta Amazônia dessa	May God free the Amazon Rainforest
escureza.	from this darkness.

Diffractive Analysis

Barad's (2007) concept of diffraction as a methodological tool for analysis

offered a way to stay with and listen to the data in this dissertation study (Hackett & Somerville, 2017). The multiple readings and re-readings of the data that are part of a diffractive analysis allowed for new connections and narrations to emerge from the data over time (Magnusson, 2018). Mazzei (2014) uses Barad's concept of diffraction to move away from "habitual normative readings that zero in on sameness toward the production of readings that disperse and disrupt thought as [she plugs] multiple theories into data and read them through one another" (p. 743). The motivation behind visiting and revisiting the data and theory in waves and following it where it leads is to keep the analysis on the move and respond to it in conversation rather than reducing the data to a series of static themes of concepts as is done in coding (Mazzei, 2014).

Barad (2007) and Mazzei (2014) make a distinction between reflection and diffraction to move beyond an analysis that seeks to identify sameness. Rather than looking for the ways that themes reflect theory or the ways theory illuminates themes (read: sameness), Mazzei (2014), drawing on Barad's (2007) work, sees diffraction through the metaphor of an ocean wave passing through an opening or obstruction. She explains that waves passing through such spaces as an opening or obstruction are spread differently than they otherwise would be (Mazzei, 2014). When translated to a diffractive analysis, this means that sitting with(in) the data and following the waves as they travel in different directions will lead to "reading-the-data-while-thinking-the-theory" rather than overlaying the theory onto the data (Mazzei, 2014, p. 743). In other words, diffractive analysis is not aimed at a categorical interpretation of the data but rather is an exercise that is meant to thread data into theory and theory into data in iterative waves to

constitute one another and make something new (Jackson & Mazzei, 2012; Mazzei, 2014).

My own use of diffractive analysis was varied and messy. Over the past year, I have interacted with the data in iteration after iteration while thinking with ecofeminist theory and the concept of storyworlding through my natureculture approach. In a *Qualitative data analysis beyond coding* class with Mirka Koro in 2019, we were encouraged to sit with the data in uncomfortable spaces to see what the exercise revealed. I applied this activity to the data generated in this dissertation study and sought opportunities to sit with my discomfort with the data. In the most literal sense, I found myself in uncomfortable locations reading the data while thinking *with* theory (Jackson & Mazzei, 2011). As a volunteer at the Arizona Animal Welfare League, I spent hours sitting in the kennels with the shelter dogs reading through my fieldnotes and musings or an Ursula Le Guin novel while the dogs erupted in waves of barking and silence as visitors entered the shelter to view them. Sitting on the cold floor, steeping in the smell of dog food, urine, and cleaning solution, I found new ways to understand the noise in the place where I had lived in Brazil.

For an entire year, I kept a piece of paper on my bedside table. As an idea for the SF Epilogue of imaginings came to me in my sleep, I wrote it down on the paper in the dark without looking at what I was writing. I gathered notes on napkins and in the notes section of my iPhone as ideas came to me. The analysis permeated the writing process as I wrote this chapter, Analysis and Findings, in parallel with the SF chapter, Imaginings. The data traveled back and forth across chapters between the stories and the imaginaries they might be(come). In a slow, uncomfortable, and exciting process, I expanded

Mazzei's notion of "reading-the-data-while-thinking-the-theory," to include storying-while-imagining-with-SF (Mazzei, 2014, p. 743). I played with the visual data without a purpose or goal. As I thought with the butterflies and winged creatures, I made a mosaic of all of the butterfly and moth images we collected. Just as I followed the more-than-human participants where they led, I followed the data into and back out of the Chthulucene.

This chapter is an invitation to join me in this diffractive analysis process that is still underway. As you read this chapter, there is a noticeable (perhaps, uncomfortable) absence of theoretical explanation of the data. For example, the children took photos of what they called interesting – cats, chickens, a rooster, the plants they themselves had planted, the dogs, the coffee cherries, their bicycles, and my water bottle among many other things and beings. Analyzing the data theoretically might lead to the conclusion that children are in situated relationships with dogs, for example. They inevitably learn from their child-dog relationships, and if these relationships are missing from their education, there is a missed opportunity to recognize children's situated relationships as teachers. Such a recognition would shift focus to ways of ethical relating with the more-than-human world.

However, by connecting the dots from the theme of child-dog relations to this conclusion and by unpacking this data using posthuman theory, I have just walked you from a definitive beginning to a definitive end of a path without leaving space for alternative imaginaries. More importantly, I have colonized your experience by dictating how you as the reader enter the story with us. I have defeated the purpose of inviting you to engage in sympoietic storyworlding. The stories that follow begin from 14 entry

points. They do not need to be read in order. Some of the stories are intentionally ambiguous. You are invited to enter and exit wherever you please. These entry points are just some of the ones that emerged from the data through diffractive analysis. I interpret this to be the data sharing its wants and influences (Koro-Ljungberg, 2016). The stories that follow, in no particular order, emerged while I was thinking-with-the-data-and-theory-and-SF. The aim of this dissertation is to create something new with each reader. With each re-reading, start somewhere different. As you read, follow the data and the stories in any direction they lead you. Join in storyworlding.

Forest

We enter through the forest. In this place, a custodian of the land has dedicated decades to a reforesting project that has restored the Atlantic Rainforest on her property. The lush forest of many shades of green abuts the brick road which meanders from the bottom of the hill where the market and municipal school are, through the family-owned plantations, alongside cliffs, down into a river valley, and back up to the top of the hill where the national park is located.

Figure 13

Fieldwork Photo of the Aging "Reforesting" Project Sign

The forest is lush. Even during the day, it is dark in the forest. The damp forest floor is red-orange mud. It is lined with leaves and fallen grasses. Large ants collect leaves and travel among the trees with foliage on their backs. Spider webs glisten in the scarce rays of sunlight that make their way through the trees. Small birds jump back and forth between the plants. A compost pile of organic material from the kitchen - coffee grounds, fruit peels, egg shells, discarded avocados - decomposes on a gentle-sloping hill.

Beyond the canopy of the forest, the sun shines brightly on the valley. Coffee plants hug the hills as clouds roll over the peaks covering them as if with a blanket.

Figure 14

Fieldwork Photo of a View from the Brick Road along the Hills

During recess one day, the youngest preschool student, a 3-year-old girl, told me that she does not play in the forest, because if she were to play in there, a creature would get her.

A genus that features heavily in the vegetation of this place is the invasive eucalyptus tree. All along the hills, tall, thin eucalyptus trees wave in a dance with the breeze. The trees tower over the coffee plants.

Figure 15

Fieldwork Photo of Eucalyptus Trees on a Hill of Coffee Plants

All of this vegetation intermixes and colors the area in what one person jokes are “Fifty shades of green.” The plants grow alongside the winding brick road, shading it in some places and leaving it exposed to bright sunlight in others. The road winds up and down through the valley. At the bottom of a hill, near a curvy section of the road that is a bridge over a creek, there is a road sign that implores motorists to slow down.

Figure 16

Fieldwork Photo of a Sign That Reads, “Danger - Slow down”

The dense forest obscures the message. It is as if the sign is emerging from the forest.

And if *the forest is pleading with us to slow down our destruction?*

Birds

There is something about the way that the sunlight interacts with a certain tree in this place that makes it look as though its leaves are made of wax. The tree with the wax leaves is tall, and the foliage is sparse enough that the toucans can perch on the very top of the tree or within the shade of the branches and still peer out and call out across the entire valley.

Figure 17

Fieldwork Photo of a Toucan Perched High on a Tree Branch

The Jacu birds forage for avocados on the forest floor. They hop high enough to hide themselves in coffee plants that are 7-feet tall and indulge on the ripe coffee cherries. At dawn and dusk, the rapid flapping of their wings echoes through the forest as they fly higher into the dense tree canopy above. Even if *no one* is around to hear the discord of their wings slapping the air, the trees hear the sound.

Figure 18

Fieldwork Photo of Two Jacu Birds

In a pasture on the side of the road, a bird with long, thin legs and a slender body perches on the side of a brown cow as it rests in the grass.

Noise

This is not a quiet place. From the break of dawn, roosters call. The sound of Jacu wings screech and slap the air in a frantic melody. Their guttural, low, rhythmic squawk punctuates the sunrise. The Jacu hop among the branches of the trees and coffee plants feeding on the ripest cherries and discarded avocados. As the Jacu harvest their coffee to eat, all around the valley, coffee producers harvest coffee to peel, dry, and sell. There is a constant ebb and flow of a weedwhacker-esque hum as ripe cherries, leaves, and twigs are trimmed and fall onto sacks on the ground. Coffee pickers travel around the plantations on motorcycles, kicking up dirt and adding to the cacophony. A house under construction produces steady notes of hammering as debris thrown onto piles disrupts the air with each crash and fall. A river flows through the valley, its waves breaking gently on boulders. A school bus travels back and forth down the road to pick up and deliver children to school and take them back home by lunchtime. It repeats the procedure again after lunch with a different group of afternoon students. As the sun sets, a tractor climbs the hill where there is a large, community-shared, washing and peeling machine – the size

of a small house – that rumbles as it forcefully separates and peels the coffee with jets of muddy water. Children run back and forth between their relatives' homes within the same one-block radius. They kick a soccer ball, sing, and cheer. Dogs bark. It is not a quiet place.

Fire

The air smells of smoke in this place. In earlier days, the third-generation coffee producers used to use fire to clear land. One of the patriarchs of this community tells the story of how the Catholic church came to the area and taught them that they should not be using fire to clear the land. He says:

> What has changed a lot is that, at the time we worked, for example, we worked with fire a lot. We burned these quarries and everything there. It wasn't like life now. We cut down plants, cleared a field to plant a farm, set a fire, and let it burn. We burned everything. So, from there, we became aware, just like our property right here, we have seen that it is not this way. That our work has to be one with Nature. We have our job, to produce, and Nature to be reserved as we are doing here with the mines of protected waters.

Nevertheless, fire and smoke are ever present – at least in the winter. Fire is used to clear trees from properties and burn trash or leaves outside of homes. The smell of smoke permeates all spaces indiscriminately. It enters the school with abandon. It laces the air in the restaurants. It lingers around the leaves of the trees. It engulfs this space.

Figure 19

Fieldwork Photos of Fire Being Used to Clear Land

The use of fire is no secret. The omnipresence of smoke seemingly goes unnoticed. One day, while I was coloring with the preschool children, one of the youngest students, a 3-year-old girl, drew a photo of a figure and two falling trees. She showed her photo to me and explained that it was “the bad lady taking the trees.” We included her drawing in our storybook.

Figure 20

Fieldwork Photo of a Young Girl’s Drawing of “The Bad Lady Taking the Trees”

Rain

This place is known for its specialty coffee. The favorable conditions of the location’s altitude and proximity to a national park contribute to the coffee’s quality. The fresh, mineral-rich water travels a short distance from the mountain peak gathering bacteria and nutrients from the biodiverse national park. The water feeds the coffee plants

and infuses the sweet cherries with its wealth. The minerals in the water used to brew the coffee enhance the flavor of the beverage. Water is a precious resource here.

Figure 21

Fieldwork Photo of Rain Droplets Gathered on Leaves

Ancestral knowledge from a generation now gone has taught the community to know when the rain is coming long before the sky turns cloudy. They read the ants. As a rain storm approaches, the ants prepare for the deluge by climbing the door frames of the families' homes. With a clear blue sky in the background, as large, black ants, nearly the size of bees, climb to safety, the coffee producers take note and prepare for the coming rains.

Figure 22

Fieldwork Photo of a Rainbow on a Rainy Day

Over the past year, I have received messages from some of the families that the rains have intensified. This winter, in addition to facing the COVID-19 health crisis, the community suffered widespread flooding. There is just one main brick road that meanders through their plantations and connects the town from the municipality at the bottom of the hill to the national park at the top of the hill. As a result of the torrent, flooding and mudslides damaged the road at multiple turns.

Figure 23

Still Photo from a Video of the Flood Damage

Spirits

"There is a spirit there. A man is buried there," the 5-year-old boy told me as we walked to his home together after school one day. He was pointing to a non-descript patch of land under a 3-foot tall concrete structure not much larger than the child himself.

The concrete appeared to be a hollowed out, arch-shaped altar. Inside of the altar was a figurine, the shape of which I have since forgotten. I walked past this concrete altar every day and thought nothing of it.

"Have you ever seen a spirit?" I asked.

"No. I think they come out when we are sleeping," he replied.

"But you've never seen one?" I asked again, incredulously, unable to understand how he could know there was a spirit there if he hadn't seen it.

"No."

That evening, on my walk back to where I was staying, I took a photo of the sky above the altar.

Figure 24

Fieldwork Photo of the Night Sky above Where a Spirit Dwells

Cats

Food does not go to waste in this place. If you peel an orange, you throw the peel into the garden or underneath a plant where it takes on new life as fertilizer. When the coffee cherries are peeled, the organic matter is returned to the plantation to become food for the coffee plants whence they came. When there is leftover rice, the families feed it to the cats. The local cats and dogs make their rounds collecting up the scraps and bones of the chickens that the humans eat. They finish the beans that are discarded underneath the

clothes line behind the house. They hang around at the people's feet cleaning up the crumbs of cakes and biscuits. You do not have to look far to find a cat or kitten.

Figure 25

Fieldwork Photos of a Family Cat Photographed by a Brother and Sister

A few days after the 8-year-old boy and 14-year-old girl took these photos of their grandparents' cat, it was found dead in the plantation. A snake had bitten its face, paralyzing and killing the cat. I commented to the grandfather that we had just taken some beautiful photos of his cat earlier that week. He wondered aloud, "Aren't you not supposed to take pictures of creatures?" as if to ask whether the camera had somehow played a role in the fate of this cat's life and soul.

"Oh?" I asked.

"Nah. That's just superstition," he concluded, shrugging it off.

Was it? I wondered. ***And if*** *it weren't?*

Dogs

The dog that lives in the house near the bend where the bridge crosses the creek has a threatening bark. He advances on passersby with a menacing guttural, growl. The adults advised me that it might be wise to walk past this home with a large stick in my

hand – advice which I did not heed. The house sits between the school and the home of an 8-year-old boy's family. As we walked to his house together after school one day, the dog lunged in our direction and barked.

Figure 26

Fieldwork Photo Taken by a Teenager of a Dog That Has a Loud, Threatening Bark

"Don't worry," the boy said. "Dogs who bark don't bite." A note to the reader: He did, in fact, bite. He bit me.

One of the dogs with whom I spent the most time was one of my host family's dogs. She is a medium-sized yellow dog that roams the reforested land between her home and the villa on the hill above.

Figure 27

Fieldwork Photo of the Yellow Dog Asleep in a Plant Bed in the Shade of a Tree

One day, at dusk, I saw the dog chewing on a large skull. It looked to be the size of a pig or boar skull. Fascinated, I took out the camera to try and capture a photo of the scene to be able to show it to a biologist friend and ask what it might be. The dog bolted as soon as I drew up the camera. All I could "capture" were two blurry photos in quick succession. In the bottom right corner of one of the images, the dog's legs appear as she escapes my camera lens.

Figure 28

Blurry Fieldwork Photos of a Yellow Dog Absconding with a Skull

Rooster

Figure 29

Fieldwork Photo of a Family Rooster, Taken by an 8-year-old Boy

The rooster died. A “cat of the forest,” known by the name oncilla in English, killed all of the chickens and the rooster in one fell swoop.

Toddler

The day after the wild cat killed the rooster and all of the family’s chickens, the youngest child in the family, a toddler who was not yet 2 years old, invited me to walk around to see the empty hen homes. She reached her palm out toward me opening and closing her hands a few times to wave me over. “Vem cá.” *Come here*. We walked together through the yards of each of her family members. She was concerned about the hens and wanted to make sure they were really dead and not simply in need of help. As she led me on a tour through the interconnected yards of each family’s home, the oncilla returned and started attacking the chickens at the house on the hill above. The toddler yelled up the hill and out to her 9-year-old second cousin, “Be careful, my child!”

Blocks

During the school day, the three preschool children and I spent a lot of time coloring or playing with blocks together. They constructed and dismantled all kinds of structures. Sometimes they were treehouses. Other times they were corrals for the bulls.

Figure 30

Fieldwork Photos of a Treehouse and a Corral Made out of Blocks


Sometimes the blocks were not just blocks. On the day after a wild cat had killed all of his family's hens and its rooster, a 5-year-old boy took a rectangular yellow block off of the table and told us that it was a "vira bicho" *turn animal*. He held the vira bicho device in his closed fist, spun around, and, as he was still spinning, got down on his hands and knees. He was a wild cat. The boy growled and prowled the corner of the room as one of the other children picked up the vira bicho off of the floor to test its shape-shifting powers.

Batman

"There is a bat in the bathroom!"

The children greeted me with giggles and screams about the bat that was sleeping in the bathroom before I entered the school. The preschool children crowded into the tiny space underneath the bat and giggled and stomped their feet as if they were breaking the rules by standing so close to the bat. From the other side of the room, the teacher announced that they should leave the bat alone and that he would not harm them.

"He's a banana eater," she said reassuringly. By this point, the commotion had disrupted the bat's slumber. He flew to the classroom where he found a new place to rest. This was an invitation for all of the students to gather around underneath him. One of the

boys threw a pencil eraser at him, and the bat flew to another roost. The children asked if they could use the camera to take a photo of Batman, who had returned to the place he was resting before the eraser had been hurled in his direction.

Figure 31

Fieldwork Photo of Batman Taken by One of the Children

Once the children had taken a few photos and it was clear that Batman was settled in his place, they returned to their school activities with Batman asleep above them. The following day, one of the preschool children brought his bat mask to school and embodied Batman during his recess playtime.

Figure 32

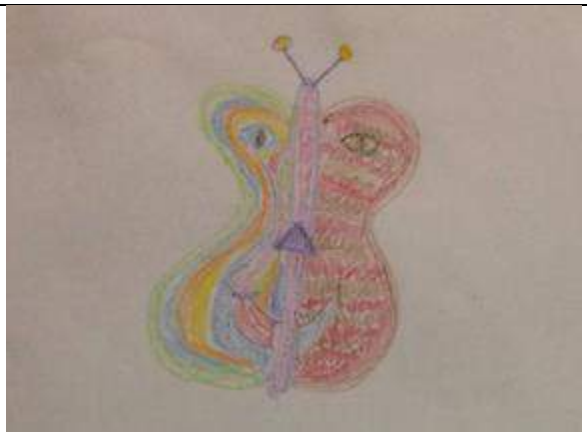
Fieldwork Photo of the Boy in the Batman Mask

Borboletiposa

During one of our coloring sessions in the preschool section of the classroom, I decided to draw a figure that I called a *borboletiposa*, who was half butterfly (borboleta in Portuguese) and half moth (mariposa). I wrote a story about her and shared it with all of the children when they asked me about the drawing.

Figure 33

Fieldwork Photo of a Borboletiposa Drawing and Its Accompanying Story



It was the year 2020. The earth was full of beauty. The clear, freshwaters ran across the dry land, giving life to the dust. In this world of such beauty, mixed creatures were

born of stardust and freshwater. One of these creatures was a *borboletiposa.* She was half butterfly (borboleta) and half moth (mariposa). By day, she opened the eye on her butterfly side. She flew around the land to keep watch over all of the animals, plants, trees, and everything that gave life to Earth. At night, she opened the eye on her moth side to watch over Earth's dreams while she slept.

The figure of the *borboletiposa* does not have a single origin. She emerged from the literature I read, my ponderings and SF imaginings about the creatures with wings in this region, and a moth who we met one evening. This is the story of the moth. One chilly night, while I was teaching an English class to the older teenagers and adults, a large moth that frankly looked like an enormous monarch butterfly-the-size-of-a-bat, joined us in the classroom. One of the men shot to his feet and chased the moth around the classroom, frantically stomping his flip-flops around as he tried to end the moth's life. Three of the women shouted, "No! No! Leave her! Leave her!" The man ceased. The moth departed through the door it had entered. We continued with our English lesson.

Worlds

In art composition, there is a practice called "the rule of thirds." The principle outlines that a composition should be able to be divided on its horizontal and vertical planes into thirds, and that the areas of focus should be at the divisions and/or intersections of these thirds.

Figure 34

Fieldwork Photo of the Scenery, Divided into the Rule of Thirds

It is possible to imagine that at least three parallel-yet-intersecting universes exist in this one image. In the upper third of the horizontal plane, there is a blue sky with puffy white clouds. It is bright. It is lively. It could be a playful Rorschach test to imagine what figures are drawn in the clouds sky. In the upper third of the photo, the world atop the hill is idyllic.

The middle third of the photo is abundant with plant life. It is possible, in this world, to imagine diverse ecosystems in the lush greenery. The dynamic trees are captured mid-sway in the breeze in this photo. A more judicious look at the vegetation reveals that, in the middle, there is a row of invasive eucalyptus trees. They intermix with the coffee plants and Atlantic Rainforest in a world of reproduction, competition, and growth.

The lower third of the photo is confounding at first glance. The haphazard camouflage paint is a stark contrast to the aesthetically pleasing worlds above. This structure belongs to a man who lives atop a hill outside of the frame of the photo. He keeps to himself. At night, it is a common occurrence to hear a gunshot or dogs barking at 11:00 pm. They tell me that it is this man who is provoking the dogs to bark and shooting his gun to instill fear and keep the neighbors away. He has painted this structure,

which is impossible to ignore when traveling along the brick road, with hateful and racist graffiti.

Figure 35

Fieldwork Closeup Photo of Nazi Graffiti on the Structure Wall

The community worked with the local government for more than a year to negotiate permissions to paint over his vitriolic messages. A butterfly landed on the wall one morning, and I wondered, *what must she think of us as she reads all of this hate?*

Thought Experiments in the Chthulucene

The various entry points shared in this chapter open pathways for co-authoring new stories that create new worlds. With each reader and each reading, as we follow the data in different directions, we can imagine different pasts, presents, and futures for each story(world). A thought experiment in this dissertation, aimed at reconfiguring our human-Earth relationship, is to reimagine these stories in a parallel –cene to the Anthropocene. Although the stories already decenter the human by offering multispecies, multi-mattered entry points into the assemblages and relationally made worlds, within the stories lies the potential to access different imaginaries by re-reading and re-storying with them. For Haraway (2016b), the Chthulucene offers a space for such imaginings. Within

the Anthropocene, it is difficult to see beyond humans as the protagonist. For example, when we enter the assemblage through the entry point of dogs, and we meet the dog with the menacing bark, he is presented as menacing to us, as humans. It is intentional that I share with you that this dog bit me. However, in doing so, I inadvertently draw attention to myself as a protagonist. Moving into the Chthulucene opens a space to practice operating and seeing beyond ourselves as the central actors and narrators.

The Epilogue, Winged Storytellers, is a re-writing of this chapter in the Chthulucene as an experiment in SF imagining. The entry point to Epilogue of speculative storying is a butterfly. In her SF chapter, *The Camille stories: Children of compost*, Donna Haraway (2016b) explores how humans and monarch butterflies make kin called Camille across five generations. Iveta Silova (2020), too, engages us in thought experiments of anticipating other worlds by drawing inspiration from butterflies, Haraway's SF work, the Chinese fairy tale story of Zhuangzi's dream, in which Zhuangzi dreamt that he, himself was a butterfly, and a fairy tale her Oma used to tell her about a mother helping her child to see what she was unable to see by giving her own eyes to the child. Silova (2020) asks us to consider that butterflies may, in fact, dream us into existence and cautions:

> If we do not make the relay, Zhuangzi's butterfly may become extinct as quickly as other butterfly populations which are disappearing from life on Earth every day. And when there are no more butterflies left, we (humans) will cease to exist too—not only because butterflies (along with other insects) are at the base of many of the Earth's ecosystems, but *because there will be no more butterflies left to dream us into existence*. (pp. 152-153, emphasis original)

As I engaged with this thought experiment, I began to attune myself to butterflies, moths, and other winged creatures with whom I was in relation. In the moments that I slowed down enough to notice their presence while in Brazil, I watched the butterflies dance on the wind and wondered if they were writing something in the sky as they darted up and down on the breeze. Once, when I was very tired, I wondered to myself, *is there a world in which I am not this tired?* In that moment, a large butterfly flew over my shoulder and off into the distance as if to invite me to enter the world I was asking about. I did not follow it. I noticed that there were often butterflies or moths around during memorable moments in my own life. On the day that the dog bit me, I called a friend at home to tell her what had happened. An orange moth was near me on the floor and wall during our entire conversation.

Figure 36

Fieldwork Photo of an Orange Moth Who Kept Me Company

When I returned from Brazil, our family dog Sami was showing signs that she was nearing the end of her life. On the day she passed, two large, yellow butterflies flew around our yard, bringing me comfort, solace, and the courage to face letting her go. I

began referring to butterflies, moths, bats, and other winged creatures as the winged storytellers or the keepers of the day and night stories.

During this same time, I saw an interesting tweet from an entomologist explaining that turtles have tears and butterflies drink them for the salt.

Figure 37

Screenshot of a Tweet from Phil Torres about Turtles and Butterflies (Torres, 2019)

And if they were doing more than just drinking tears for salt? *And if* the butterflies were sending or receiving messages through these tears?

Another tweet crossed my path that led me to an interesting article about the aerodynamic glide of raptors (Usherwood et al., 2020). In the study, Usherwood et al. (2020) track particles of "neutrally buoyant 0.3 mm helium bubbles" as a range of raptors fly through them (p. 1).

Figure 38

Still Image of a Tawny Owl Passing Through Illuminated Bubbles (Usherwood et al., 2020)[*]

*Image is reproduced / adapted from *Movie 1* (Usherwood et al., 2020) with permission from the *Journal of Experimental Biology* per The Company of Biologists Ltd. (Order license ID 1071588-1).

I pondered us all as shapeshifting stardust and wondered, if wings could displace bubbles in swirling, spiraling patterns as the owl's wings had, what must they do to the stardust that constitutes all matter. *What if* they were the shapers of our stories, not only by dreaming *us* into existence, but also by bringing into existence a *pluri*verse, creating a new world from stardust with each flap and flutter of their wings? *What if* winged creatures were the Dreamings that the Aboriginal people of Victoria River region had described? *What if* they were dreaming us all into existence by bringing everyone and everything into relation. *Was this shimmer?* I began to reimagine the data and stories in Chapter 5 through the eyes of a winged storyteller: A butterfly named Orla.

And if the forest were where the story begins?

And if the birds calling across the valley are warning of danger?

And if the soundwaves of all the noise are disrupting the stardust?

And if the rain is in response to the rampant fires?

And if the children can see what we adults cannot?

And if the winged creatures are pleading for us to change through the spirits, and trees, and animals, and children?

And if the butterfly that landed on the painted wall that day were Orla, a winged storyteller?

And if…?

CHAPTER 6

PROVOCATIONS

All that you touch you change. All that you change, changes you.

—Octavia Butler

(Cooling Phase)

As the Cooling Phase continues and the temperature decreases further, the status quo conventions have tired and ceased activity, and the altered organic material is nearly unrecognizable.

Before the compost is mature and altered enough to continue with the SF imaginings introduced at the end of Chapter 5, we must first take a brief interlude to collect up the scraps and trash of the conventions that have survived the composting process in our story thus far. We will not linger here long. In this stage, the SF imaginings of Chapter 5 are emerging as nutrient-rich compost and calling us back to engage with them in the Epilogue that follows. Provocations have replaced "Conclusions and Recommendations" in this nearly mature compost. They feed the seeds of new possibilities for education pasts, presents, and futures. This story began a question: What matter(s) in education beyond the human? Perhaps what the dissertation is really asking is: What ***is*** education?

Understanding what matters in education begins with inquiring who is defining education and its priorities. One of my mentors, Dr. Francisco Jiménez, says often that the curriculum should be a mirror through which the students can see themselves reflected. He is drawing attention to the need for educators to acknowledge diverse voices and stories and move away from a singular, culturally unresponsive curriculum. Through

storyworlding in this dissertation, we see that education is not just a mirror through which students should see themselves reflected. The mirror also reflects the students in their interrelatedness to all matter and all that matters. It reflects their inextricable link to the earth and its fate. The mirror, then, becomes a portal through which to access other worlds and other ways of relating. It becomes a portal to a *pluri*verse (Stengers, 2019).

What matters in education? If education is meant to be a tool for economic development, then what matters is offering disciplines that promote such development. This is the Western education model that focuses on literacy and numeracy, disciplines which come to matter through the attention and resources dedicated to the measurement of student progress toward their attainment (for critique, see Goebel et al., 2019). If education is meant to result in human-generated techno-fixes to a human-generated climate catastrophe, then what matters is innovation in response to stagnation. And how do we innovate without breaking from the status quo? And if we were to succeed, would these solutions wean us from our dependence on fossil fuels? Would global heating wane? Would the fires stop? Would we contain the spread of a deadly virus? And what would we learn if we were to succeed? If education followed a rights-based approach by acknowledging the voices of youth, and if it headed the calls of the climate activists, would the voices of a generation pleading for action come to matter to policymakers? And would their voices come to matter only when the youth shout too loudly for policymakers to ignore? And haven't they done so already?

And if education were meant to re-configure the human-Earth relationship? Would we be able to see beyond our view of human exceptionalism? Would we understand that worlds are relationally made and can be relationally unmade (Haraway, 2016b)? Would

our multispecies encounters and becomings-with worlds generate stories within and beyond this world? Would we, ourselves, become more worldly by focusing upon our relationality with the more-than-human world (Taylor, 2017). *And if* education were a space or place to learn how to live and die well with Earthly others (Haraway, 2016b)? Would we be better equipped to leave behind our quest to find solutions and learn how to 'stay with the trouble' in the face of precarity (Haraway, 2016b)?

"*And if*...education was a "connective tissue" between different worlds?" (Silova, 2020, p. 144, emphasis added). Would we be able to access these worlds unobstructed? *"And if* learning was about attuning to and engaging with these interconnected different worlds, rather than differentiating, ranking, and hierarchizing them?" (Silova, 2020, p. 143, emphasis original). Would we "embrace the principles of cosmopolitics and acknowledge pluriversality" to cross freely between worlds no longer bounded and defined (Common Worlds Collective, 2020, p. 8)? *And if* learning were storyworlding? Would we not only move between worlds, but become makers of stories that make worlds through sympoiesis (Haraway, 2016b)?

EPILOGUE

IMAGININGS

(Maturation Phase)

In the Maturation Phase, the material composition is altered allowing the data and readers to narrate different stories and story different worlds.

Winged Storytellers

Winged storytellers are as old as time itself. When Earth was forming, they were there, arranging the stardust into the clouds of atoms that became the stars and galaxies. They did not take a singular shape or form instead evolving with Earth across time and space. They roamed the seas with crustaceous wings. They rose from the waters and explored the land and skies. By modern, human measures, they were as many and as unique as there are stars in the night sky. One of the most delicate orders of winged storytellers – the lepidopterans – evolved near the end of Earth's Jurassic period to arrange the dust and ash from the ongoing wreckage of the Mesozoic era. In this time, the lepidopterans went relatively unnoticed. As one of many custodians of Earth's stories, they weathered the frigid cold, acidic oceans, and perpetual darkness as they rebirthed the dust into the lush jungles and rainforests of the Eocene era. As time passed, the lepidopterans enlisted the help of sturdier and more nimble storytellers – such as the order of the chiroptera – to swirl and arrange the stardust into the shapes of the Holocene's mega flora and fauna, while they partnered with the winged storytellers of the order of the hymenoptera to tend to creating the shapes of the plants and critters that blanketed and inhabited Earth's land. Despite the extreme conditions of the worlds that they storied across the eras, the winged storytellers enjoyed relative stability, adapting to

the characteristics of each epoch with grace as their wings danced new arrangements of stardust into livable, biodiverse worlds. This stability ended in the Anthropocene, which is where we begin our story.

As stories go, this one is quite ordinary. Orla emerged from her chrysalis deep in the forest and shook the sleep dust of new life off of her wings. Lepidopterans had evolved to camouflage their wings with the stardust of where they rested. As a juvenile storyteller, Orla knew that her first task was to create a safe space to rest at dusk. She fluttered her wings back and forth sending orange stardust in swirling spirals from her wingtips. They settled in the pattern of an orange flower atop a light green plant stem in a plant that her ancestors had left behind for her. Orla looked at the flower she had made and was satisfied.

Figure 39

Orla and Her Flower

She set off through the rainforest her ancestors had created. Although it was dark and the air was thick, she could feel that all was well with the trees as her wings glided through the planes of stardust that made up the fabric connecting the trees' leaves to the sky. She floated higher into the canopy where she encountered a large, black-winged storyteller that she thought she may have dreamed into existence. Orla did not realize it, but her ancestors were providing her with a memory of her kin disguised as a faint recollection of a dream. She wondered where she had seen this large, winged storyteller before. Although she didn't know why, as she glided past it, Orla thought to herself that she may need help from the black-winged storyteller someday.

As she flew through the top of the canopy and emerged into the daylight of the rising sun, Orla felt her wings shimmer as the stardust of her orange wings made contact with the illuminating dust in the rays of light from her mother sun. In this moment, Orla's body awoke. She understood in an instant that she had emerged into this place as the newest custodian of the valley of the sun.

Figure 40

The Valley of the Sun

The ancestral knowledge that was woven into the stardust of her wings came together in the glistening sunlight and she understood what she was meant to do.

Orla traveled along the edges of the forest along a brick path that she was unable to identify. It had not been created by her ancestors, yet, somehow, it was here in this story. She descended into the valley and rested on a plant near a babbling brook. Nearby, a yellow sign emerged from the forest. She recognized that, like the brick path, it was not the creation of her ancestors, but something about the sign drew her closer. She landed on the warm surface, and she sensed that, in fact, there were traces of her ancestral stardust within the fabric of this sign. She understood that a lepidopteran had communicated a message to someone that they needed to slow down. *Slow down?* Orla wondered. *Why might this be?* She continued her flight along the roadside and through the valley. She passed a pasture where she observed that a long-legged winged storyteller was perched on the side of a brown cow who was resting in the grass. She was pleased to see that her kin were here watching over the health of all the creatures her ancestors had created. She

knew that this winged storyteller contained stardust from the wings of many of her ancestors, and she was pleased to be among family.

Orla continued to fly around the valley stopping along the way to orient herself to the trees and plants that made up the fabric of this story. She landed on a coffee plant and sensed that the fruit it bore was sweet. Satisfied that all was in order, Orla made her way back to the orange flower she had constructed. She closed her wings, camouflaged herself into its orange petals, and fell into a deep slumber.

Lepidopterans had evolved to camouflage themselves in order to prolong the period of time they could remain the custodians of each story. When a lepidopteran was consumed by a non-winged creature, their stardust disintegrated, erasing the possibility of carrying on the storyline. For this reason, lepidopterans preferred to remain relatively undetected. They only made themselves known to non-winged creatures when their stories were in danger of ruin. Orla didn't know it yet, but hers was.

Orla startled awake to the sound of the black-winged storyteller's guttural squawk. During the evening, as Orla slept, the violent sound of a gunshot had pierced the stardust fabric of the night sky. It was followed by forceful sound waves of dogs barking that had shifted the orientation of the story's fabric so that parts of it were unrecognizable to Orla. She could tell that the black-winged storyteller sensed that something was wrong too and was using its own soundwaves to mend what had been broken in the fabric of stardust that connected the trees' leaves to the sky. Grateful for the help from her kin, Orla set off to survey the valley of the sun for a second day.

As soon as she emerged through the rainforest canopy, she sensed something was wrong. *Smoke*. There was a fire burning somewhere in her story. Orla raced against the

breeze toward the smoke. She heard the call of a winged storyteller alerting her that she was headed in the right direction. Orla recognized this sound as her kin with the colorful throat and long beak. Her ancestors had shared their stardust with these winged storytellers precisely for moments like these. The colorful-throated-long-beaked winged storytellers were able to fly higher and see farther. They could alert the lepidopterans to danger and trouble. As Orla flew over the trees, she observed that something had changed about the leaves of the tree where the colorful-throated-long-beaked winged storyteller was perched. The leaves glistened in the sun, as if they were made of something other than stardust. She had not created them to look this way. She was sure this was not the design her ancestors had intended. Such a sheen on the leaves would make it more difficult to camouflage themselves. It would require more of their own stardust from their wings. Orla knew that there was a finite amount of stardust in the wings of each lepidopteran. They could give some away to other creatures to help with the caretaking of their stories, but doing so hastened the timeline each story was allowed. When the winged storyteller's stardust disappeared, so too did its storyline. She wondered what had made the leaves change so, but she assumed it had something to do with the other parts of her story that she was sure her ancestors had not created – such as the brick road along which she now flew in search of the fire.

A firestarter stood next to the row of trees he had set ablaze. The ancestral knowledge woven into the stardust fabric of Orla's wings told her that firestarters were evolved from winged storytellers. She was reminded of a dream she had about a firestarter once. Her ancestors, again, were providing her with a memory of her kin disguised as a faint recollection of a dream, but Orla was none the wiser. In her dream,

she remembered that the firestarters once had glorious large wings. With wings that size, they could create whole universes with each flap and flutter of their wings. The firestarters had learned that they could prolong their stories by harvesting the gold stardust of winged storytellers from epochs before. They mined the earth in search of gold stardust using explosive devices to break through the fabric of the dust beneath their feet.

Orla remembers the dream ending when the firestarters, in their rush and greed to harvest the gold stardust, stood too close to the flames and singed their wings. As Orla watched over this firestarter, she knew that her story was in danger. Her first step must be to stop the fire. She landed on a tree nearby and shook her wings to transfer some of her stardust to the wings of the tree's leaves. As she did, the leaves fell to the ground where they encountered a row of ants gathering food for their queen. The ants carried bits of the leaves to their colony. When the queen ate the stardust-covered leaves, she understood that there was trouble above ground, and the rains would soon arrive. She instructed the colony to move to higher ground, and they obliged. Orla rested on her flower. As she drifted into a slumber, a steady rain began to fall, extinguishing the fire and sending its ashes down the river to a saltwater pond far below. The lepidopterans that reside on the shore of the pond would later drink this ash in the salty tears of the turtles and be alerted to the danger on the hill above so that they could prepare to adjust the stardust fabrics of their stories to protect their kin from the danger.

When Orla awoke, she sensed that the air was clear. Departing the canopy and making contact with the mother sun's rays, Orla felt she had averted a crisis. She set off to monitor the story and carried on as usual. As the rays of the sun dried the plants and

leaves throughout the valley of the sun, Orla noticed that something was off. The sound of a colorful-throated-long-beaked winged storyteller came as a surprise. There was another fire.

Orla raced to where she had encountered the firestarter the day before. This was not where the fire was. She flew higher into the trees in search of a colorful-throated-long-beaked winged storyteller who could help her locate the source of the smoke. As she arrived to the scene of the fire, she was surprised to find a firestarter standing next to his child. Orla knew she had to send a more direct message than rain to stop the fires. It was not enough to extinguish them. She had to ensure that once they were extinguished, the firestarters ceased setting fires. The ancestral knowledge in the stardust fabric of her wings told her that the child might be able to help. Orla wasn't sure how to share her stardust with the child. He did not have wings. As she drifted and flew over him, she decided to try sprinkling her stardust onto the lashes near his eyes as they most resembled her wings. That evening, as the child slept, he was visited by the spirit of his ancestor. Since the child's eyelashes were only a proxy for wings, Orla's stardust was not able to help him *see* the spirit, but the child knew he was there. The following day, the child told a firestarter about the visit he had received from another world. The firestarter did not believe him, and the fires continued.

With each day came a new fire. Orla tried sending a more forceful message with each new blaze. She noticed that the firestarters had winged creatures that dwelled on the ground. She had learned from her ancestors in a dream that they were called chickens. Orla shared some of her stardust with the chickens in the hope that they would help the firestarters to see the error of their ways. Orla knew that when the firestarters lost their

wings, they maintained a desire to fabricate stories and worlds, despite their inability to write them into existence with their wings. They had learned to craft devices that captured bits of stories using the light of the mother sun. The devices opened a shutter, absorbed some of the light, and recorded the sections of story in the path of the lens. Orla hoped that the stardust she shared with the chickens would be captured through the lens of the firestarter's device so that they could see the danger she saw and change their ways. To her chagrin, each time the firestarter captured an image of the chickens, Orla felt a searing, burning pain in her own wings. She knew she had made a mistake by sharing her stardust with the chickens and allowing the firestarters to capture her in their lens. That evening, her ancestors intervened and sent a wild cat to kill the chickens. As the chickens died, a small part of Orla faded.

The dogs that her ancestors had created fed on the bones of the chickens that the wild cat had left behind. With the bones, they consumed bits of Orla's stardust. Orla did not know this until she flew over the firestarters who were capturing images of the dogs and she felt a searing pain again. She knew that each sharp burn was hastening the end of this story. Without Orla willing the dog to, somehow, he knew that he must send a warning to the firestarter on her behalf. He sunk his teeth into her calf provoking the same burning pain that Orla felt in her wings in the firestarter's leg. This was enough to temporarily stop her from capturing his image. Yet, it was still not enough to slow the firestarters on their path to destruction. Each time the firestarters viewed the images, Orla's wings lit up with pain. She could not bear it. In a desperate attempt to make the pain stop, she sacrificed some of the limited stardust that remained in her wings to sprinkle it on the eyelashes of a child nearby. The next time the child handled the device,

she deleted the images that were saved within, liberating Orla from her prison and her pain.

This still was not enough. The firestarters continued to try to capture images of the dogs that had consumed the chicken bones with Orla's stardust on them. As Orla returned to her flower that evening, she saw that the firestarter who the dog had bitten was trying to capture an image of one of the dogs that had eaten the chicken bones. As she fell into a slumber, Orla pleaded with her ancestors to intervene. They obliged. Just as the firestarter opened the shutter to capture the image, the dog escaped the frame leaving only a blurry image of waves of stardust fabric. The firestarter was not discouraged. She knew she had a decoder that could help her see what was beyond the frame. That evening, while Orla slept, the firestarter overlaid a binary decoder onto the image. She hoped this would help her to see what was beyond the image. To her disappointment, applying this binary filter to the image had the opposite effect. Rather than illuminating what was beyond the frame, it obfuscated what was in the frame and blocked the firestarter from seeing the dog, and by extension, Orla's stardust.

Figure 41

A Binary Decoding of the Dog's Image

The following day, Orla awoke enveloped in smoke. The fires had worsened, and she was running out of time. She knew that she would need to take more drastic measures to get the attention of the firestarters. Nothing she had tried had worked. From her dream about firestarters, Orla knew that they were astute enough to notice when something was out of place or out of the ordinary within the possibilities of their imaginations. She settled on sending them a winged storyteller – who only appears at night – to visit them during the day. She landed on the nearest banana tree and struggled as she shook off a portion of what little stardust remained in the fabric of her wings onto the fruit. That evening, a black-winged storyteller of the night ate the banana and understood that he was to visit the firestarter's structure to deliver them a message. He found his way to a

roost inside the structure and fell into a slumber hoping that he had fulfilled what was required of him.

It did not work. The fires continued. Orla knew that with each attempt to convince the firestarters to stop setting fires, she was hastening the end of the story. She thought that there was only one way that could possibly be more powerful than what she had already tried. She would forgo her slumber and visit the firestarters during the night. She knew that without slumber, she would be overextending herself so much that she may cause her own demise, but she knew that the alternative was a certain end to the storyline. As the evening set in, Orla entered the firestarter's structure. The dim light inside made her wings appear to be three times the size that they were. She knew that she was in danger by revealing herself to the firestarters directly, and she hoped that this trick the light was playing to make her appear larger would somehow help her sacrifice be worthwhile. She hoped they would see her and understand at once that they needed to stop setting fires. Instead, one of the firestarters chased her around the structure making it difficult for her to navigate the fabric of the stardust inside the structure. She abandoned her plan and fell onto the largest leaf of the closest plant she could find. She would be unable to make it back to her flower tonight.

Orla awoke to the mother sun's rays. They did not cause her wings to shimmer the way they had the first time they made contact. She had given too much of her stardust away for that to ever happen again. Orla was tired. She wished only to return to the safety of the orange flower. She began her flight back to her resting place stopping frequently to rest on the plants along the brick road. Too tired to make it to another plant, she decided to rest on a wall that had been spray painted in black, white, brown, and green. She felt

the pads of her feet singe and stick to the paint. The fire of the vitriolic paint crumbled her, and she fell to the ground where the heat of bricks desiccated her wings. As Orla withered, the firestarter walked by and captured one last image.

Figure 42

The Firestarter's Last Image

When the firestarter zoomed in on the image of Orla's drying body, the fabric of Orla's past and present became visible revealing the shapes of all of the lepidopterans who had come before her.

Figure 43

Orla and Her Ancestors

As Orla faded into the mosaic of ancestral stardust, she carried with her the promise of infinite stories that would never be told.

– END –

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APPENDIX A

RECRUITMENT SCRIPT – ENGLISH VERSION (2019)

RECRUITMENT SCRIPT

What Matter(s) in Education Beyond the Human?

Thank you for welcoming me back. As you know, my name is Janna Goebel, and I am a graduate student under Dr. Iveta Silova in the department of Education at Arizona State University. I am here to conduct research for my dissertation to complete my doctorate. I am inviting participants to take part in my dissertation study while I am here in Brazil from June-August, 2019. Your participation in this study is voluntary. My research is about the connections and relationships among our community (coffee, the land, each other). It is about our story. I say 'our' because I include myself as a part of this story. You have been so kind to welcome me "home" again. There is not a specific story or conclusion that I am here to find. My hope is that we will write this story together. We can decide together what is important to us and to our story. We can think together about what we want to share with the world and how we want to share it.

The research may include voice-recorded interviews and photos and/or videos of the participants. Interviews will last approximately 60-90 minutes, and I will conduct 1-2 interviews with each participant over the 3-month period. These recordings, photos, and videos will be transferred directly from the recording device or camera to password-protected cloud storage on Google Drive where they will be saved indefinitely. I may send the recordings of our interviews via email to a company in Brazil that will transcribe the recording for me. The results of this study may be used in reports, presentations, or publications but no one's real name will not be used in connection to anything they say, the recordings of their voices, or the pictures and/or videos of them. I will use a fake name

(pseudonym) for everyone and the town where you live when I share anything about this study. Even with these privacy measures in place, I cannot guarantee that anyone's participation will be anonymous. Once I return to Arizona, I may send you short emails to ask a few questions in order to make sure that I am using all of your contributions and/or words in the way you intended.

If you have any questions, please email me, Janna Goebel, at Janna.Goebel@asu.edu or my supervisor, Iveta Silova, at Iveta.Silova@asu.edu.

Thank you for your consideration!

Janna

Janna Goebel

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Janna's mentor:

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ASU IRB STUDY00010192

APPENDIX B

RECRUITMENT SCRIPT – PORTUGUESE VERSION (2019)

DOCUMENTO DE RECRUTAMENTO

O que importa na educação além do ser humano?

Obrigada por me receber de volta. Como você sabe, meu nome é Janna Goebel e sou aluna de pós-graduação da Dra. Iveta Silova no departamento de Educação da Arizona State University. Estou aqui para realizar pesquisas para minha tese para concluir meu doutorado. Estou convidando os participantes para participar da minha pesquisa de tese enquanto estou aqui no Brasil de junho a agosto de 2019. Sua participação neste estudo é voluntária. Minha pesquisa é sobre as conexões e relacionamentos entre a nossa comunidade (café, a terra, uns aos outros). É sobre a nossa história. Eu digo "nossa" porque eu me incluo como parte desta história. Vocês foram tão gentis em me receber em casa novamente. Não há uma história ou conclusão específica que eu esteja aqui para encontrar. Minha esperança é que nós escrevamos esta história juntos. Podemos decidir juntos o que é importante para nós e para a nossa história. Podemos pensar juntos sobre o que queremos compartilhar com o mundo e como queremos compartilhá-lo.

A pesquisa pode incluir entrevistas gravadas por voz e fotos e / ou vídeos dos participantes. As entrevistas durarão aproximadamente 60 a 90 minutos e eu irei conduzir de 1 a 2 entrevistas com cada participante durante o período de 3 meses. Essas gravações, fotos e vídeos serão transferidos diretamente do dispositivo de gravação ou câmera para o armazenamento de arquivos na nuvem protegido por senha no Google Drive, onde serão salvos indefinidamente. Eu posso enviar as gravações de nossas entrevistas por e-mail para uma empresa no Brasil que irá transcrever a gravação para mim. Os resultados deste estudo podem ser usados em relatórios, apresentações/palestras ou publicações, mas o

nome verdadeiro de ninguém será usado nem relacionado a nada do que eles disserem, às gravações de suas vozes ou às fotos e / ou vídeos de vocês. Eu usarei um nome falso (pseudônimo) para todos e para o local em que você mora quando eu compartilhar alguma coisa sobre esta pesquisa. Mesmo com essas medidas de privacidade, não posso garantir que a participação de alguém seja anônima. Assim que eu retornar ao Arizona, posso enviar-lhe pequenos e-mails para fazer algumas perguntas, a fim de ter certeza de que estou usando todas as suas contribuições e / ou palavras da maneira que você pretendia.

Se você tiver alguma dúvida, por favor envie um email para mim, Janna Goebel, em Janna.Goebel@asu.edu ou minha supervisora, Iveta Silova, em Iveta.Silova@asu.edu.

Obrigada pela sua consideração!

Janna

Janna Goebel

Janna.Goebel@asu.edu

A supervisora da Janna:

Iveta Silova

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ASU IRB STUDY00010192

APPENDIX C

ADULT CONSENT FORM – ENGLISH VERSION (2019)

ADULT CONSENT FORM

What Matter(s) in Education Beyond the Human?

My name is Janna Goebel, and I am a graduate student in the College of Education at Arizona State University. I am conducting a research study to learn more about humans' relationships with nature in formal school settings and outside of school in their everyday lives.

I am inviting your participation, which will involve allowing me to spend time with you and your families in school and/or on your coffee plantations. You have the right not to answer any question and to stop participation at any time.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. Participants in this study will include members of this community of all ages from children to adults. I will invite students in the school as well as their parents, friends, family members, and teacher(s) to join the study.

There are no benefits to your participation in this study. There are also no foreseeable risks or discomforts to your participation.

I may record your voice in our interviews and take photos and/or videos of you and your work. Interviews will last approximately 90 minutes, and I will conduct 1-2 interviews with you over the 3-month period. These recordings, photos, and videos will be transferred directly from the recording device or camera to password protected cloud storage on Google Drive where they will be saved indefinitely. I may send the recordings of our

interviews via email to a company in Brazil that will transcribe the recording for me. The results of this study may be used in reports, presentations, or publications but your name will not be used in connection to anything you say, the recordings of your voice, or the pictures and/or videos of you. I will use a fake name (pseudonym) for you and the town where you live when I share anything about you. Even with these privacy measures in place, I cannot guarantee that your participation will be anonymous. Before I complete the study, I may send you short emails to ask a few questions in order to make sure that I am using all of your contributions and/or words in the way you intended.

If you give me permission, I will audio record our interviews. No interview will not be recorded without your permission. Please let me know if you do not want the interview to be recorded; you also can change your mind after the interview starts, just let me know. If you have any questions concerning the research study, please contact my supervisor Iveta Silova at Iveta.Silova@asu.edu or me, Janna Goebel, at Janna.Goebel@asu.edu. If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at +1 (480) 965-6788. Please let me know if you wish to be part of the study. By signing below you are agreeing to be part of the study.

Name:

Signature: Date:

Janna's signature: Contact Information: Janna Goebel | Janna.Goebel@asu.edu ASU IRB STUDY00010192

APPENDIX D

ADULT CONSENT FORM – PORTUGUESE VERSION (2019)

FORMULÁRIO DE CONSENTIMENTO (PARA ADULTOS)

O que importa na educação além do ser humano?

Meu nome é Janna Goebel e sou estudante de pós-graduação na Faculdade de Educação da Arizona State University. Eu estou conduzindo um estudo de pesquisa para aprender mais sobre as relações dos seres humanos com a natureza em ambientes escolares formais e fora da escola em suas vidas cotidianas.

Estou convidando a sua participação, o que envolverá permitir que eu passe tempo com você e suas famílias na escola e / ou em suas lavouras de café. Você tem o direito de não responder a qualquer pergunta e interromper a participação a qualquer momento.

Sua participação nesta pesquisa é voluntária. Se você optar por não participar ou se retirar do estudo a qualquer momento, não haverá penalidade. Os participantes deste estudo incluirão membros dessa comunidade de todas as idades, de crianças a adultos. Vou convidar os alunos da escola, bem como seus pais, amigos, familiares e professores para participar do estudo. Não há benefícios para sua participação neste estudo. Também não há riscos previsíveis ou desconfortos para a sua participação.

Posso gravar sua voz em nossas entrevistas e tirar fotos e / ou vídeos de você e de seu trabalho. As entrevistas durarão aproximadamente 90 minutos e eu irei conduzir entrevistas com você durante o período de 3 meses. Essas gravações, fotos e vídeos serão transferidos diretamente do dispositivo de gravação ou câmera para o armazenamento de arquivos na nuvem protegido por senha no Google Drive, onde serão salvos indefinidamente. Eu posso enviar as gravações de nossas entrevistas por e-mail para uma empresa no Brasil que irá transcrever a gravação para mim. Os resultados deste estudo

podem ser usados em relatórios, apresentações/palestras ou publicações, mas seu nome não será usado em conexão com qualquer coisa que você diga, com as gravações de sua voz, ou com as fotos e / ou vídeos de você. Eu usarei um nome falso (pseudônimo) para você e o local onde você mora quando eu compartilhar alguma coisa sobre você. Mesmo com essas medidas de privacidade, não posso garantir que sua participação seja anônima. Antes de concluir o estudo, posso enviar-lhe pequenos e-mails para fazer algumas perguntas, a fim de me certificar de que estou usando todas as suas contribuições e / ou palavras da maneira pretendida. Se você me der permissão, gravarei em áudio nossas entrevistas. Nenhuma entrevista será gravada sem a sua permissão. Por favor, me avise se você não quer que a entrevista seja gravada; você também pode mudar de ideia depois que a entrevista começar, é só me avisar.

Se você tiver alguma dúvida sobre o estudo da pesquisa, entre em contato com minha supervisora Iveta Silova em Iveta.Silova@asu.edu ou comigo, Janna Goebel, em Janna.Goebel@asu.edu. Se você tiver alguma dúvida sobre seus direitos como participante / participante desta pesquisa, ou se achar que foi colocado em risco, entre em contato com o Presidente do Conselho de Revisão Institucional de Assuntos Humanos, através do Escritório de Integridade e Garantia de Pesquisa da ASU, em +1 (480) 965-6788. Por favor, deixe-me saber se você deseja fazer parte do estudo. Ao assinar abaixo, você concorda em fazer parte do estudo.

Nome: Data de assinatura:

Assinatura de Janna: Informações de contato: Janna Goebel | Janna.Goebel@asu.edu

ASU IRB STUDY00010192

APPENDIX E

PARENTAL LETTER OF PERMISSION – ENGLISH VERSION (2019)

What Matter(s) in Education Beyond the Human?

PARENTAL LETTER OF PERMISSION

Dear Parent:

My name is Janna Goebel, and I am a graduate student under the direction of Professor Iveta Silova in the College of Education at Arizona State University. I am conducting a research study to learn more about humans' relationships with nature inside and outside of formal school settings.

I am inviting your child's participation, which will involve allowing me to observe his/her lives inside and outside of school, interview him/her 1-2 times for about one hour each time, and take photos and/or videos of him/her during a three month period from June-August, 2019. Your child's participation in this study is voluntary. If you choose not to have your child participate or to withdraw your child from the study at any time, there will be no penalty (it will not affect your child's grades in school, for example). Likewise, if your child chooses not to participate or to withdraw from the study at any time, there will be no penalty. The results of the research study may be published, but your child's name will not be used. I will use a fake name (pseudonym) for the town and for your child. After I return to Arizona, I may send you an email to ask follow-up questions so that I am sure I am using your child's information in the way s/he intended.

There are no direct benefits, foreseeable risks or discomforts to your child's participation in this study.

I will record the interviews with your child as well as take photos or videos of him/her. These recordings, photos, and videos will be transferred directly from the recording device or camera to password protected cloud storage on Google Drive where they will be saved indefinitely. I may send the voice recordings of our interviews via email to a company in Brazil that will transcribe the recording for me. Even though I will use audio and visual recordings of your child's voice and image, I will never use his/her name in connection to these recordings. The results of this study may be used in reports, presentations, or publications but your child's name will not be used. I will only use the pseudonym.

If you have any questions concerning the research study or your child's participation in this study, please send an email to me, Janna Goebel, at Janna.Goebel@asu.edu or to my supervisor, Iveta Silova, at Iveta.Silova@asu.edu.

Sincerely,

Janna Goebel

By signing below, you are giving consent for your child _____ (Child's name) to participate in the above study. You also give permission to Arizona State University, and its agents and employees (ASU), the absolute right to use, not use,

reuse, publish, republish and make derivative works of, all or any part of photographs and/or motion pictures and/or voice recordings and/or written/spoken statements taken of child without restriction.

_____ _____ _____

Signature Printed Name Date

If you have any questions about you or your child's rights as a subject/participant in this research, or if you feel you or your child have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the Office of Research Integrity and Assurance, at +1 (480) 965-6788.

Janna's Signature:

Janna's information:

Janna Goebel

Janna.Goebel@asu.edu

Janna's mentor:

Iveta Silova

Iveta.Silova@asu.edu

ASU IRB STUDY00010192

APPENDIX F

PARENTAL LETTER OF PERMISSION – PORTUGUESE VERSION (2019)

O que importa na educação além do ser humano?

CARTA DE PERMISSÃO PARENTAL

Prezado Pai, Mãe ou Responsável:

Meu nome é Janna Goebel e sou estudante de pós-graduação sob a direção da professora Iveta Silova na Faculdade de Educação da Arizona State University. Estou conduzindo um estudo de pesquisa para aprender mais sobre as relações dos seres humanos com a natureza dentro e fora dos ambientes escolares formais.

Estou convidando a participação do seu filho, o que envolverá permitir que eu observe suas vidas dentro e fora da escola, entreviste-o 1-2 vezes por cerca de uma hora cada vez e tire fotos e / ou vídeos dele / dela durante um período de três meses, de junho a agosto de 2019. A participação de seu filho neste estudo é voluntária. Se você optar pela não participação do seu filho ou retirar o seu filho do estudo a qualquer momento, não haverá penalidade (isso não afetará as notas do seu filho na escola, por exemplo). Da mesma forma, se o seu filho escolher não participar ou se retirar do estudo a qualquer momento, não haverá penalidade. Os resultados da pesquisa podem ser publicados, mas o nome do seu filho não será usado. Eu vou usar um nome falso (pseudônimo) para o local e para o seu filho. Depois que eu retornar ao Arizona, posso enviar-lhe um e-mail para fazer perguntas de acompanhamento, para que eu tenha certeza de que estou usando as informações do seu filho da maneira pretendida.

Não há benefícios diretos, riscos previsíveis ou desconfortos para a participação do seu filho neste estudo.

Vou gravar as entrevistas com o seu filho, bem como tirar fotos ou vídeos dele / dela. Essas gravações, fotos e vídeos serão transferidos diretamente do dispositivo de gravação ou câmera para o armazenamento de arquivos na nuvem protegido por senha no Google Drive, onde serão salvos indefinidamente. Posso enviar as gravações de voz de nossas entrevistas por e-mail para uma empresa no Brasil que transcreverá a gravação para mim. Embora eu use gravações de áudio e vídeo da voz e da imagem do seu filho, nunca usarei o nome dele / dela em conexão com essas gravações. Os resultados deste estudo podem ser usados em relatórios, apresentações/palestras ou publicações, mas o nome do seu filho não será usado. Eu só usarei o pseudônimo.

Se você tiver alguma dúvida sobre o estudo ou sobre a participação de seu filho neste estudo, por favor, envie um e-mail para mim, Janna Goebel, em Janna.Goebel@asu.edu ou para minha supervisora, Iveta Silova, em Iveta.Silova@asu. edu.

Atenciosamente,
Janna Goebel

Ao assinar abaixo, você está dando consentimento para seu filho _____ (nome da criança) para participar do estudo acima. Você também dá permissão para a Arizona State University, e seus agentes e funcionários (ASU), o direito absoluto de usar,

não usar, reutilizar, publicar, re publicar e fazer trabalhos derivados de, todas ou qualquer parte de fotografias e / ou filmes e / ou gravações de voz e / ou declarações escritas / faladas tomadas de criança sem restrição.

_____ _____ _____

Assinatura Nome Data

Se tiver alguma dúvida sobre você ou sobre os direitos de seu filho como participante / participante desta pesquisa, ou se achar que você ou seu filho estiveram em risco, entre em contato com o Presidente do Conselho de Revisão Institucional de Assuntos Humanos, por meio do Escritório. de Integridade e Garantia de Pesquisa, +1 (480) 965-6788.

Assinatura de Janna:

Informações de Janna:

Janna Goebel

Janna.Goebel@asu.edu

A supervisora da Janna:

Iveta Silova

Iveta.Silova@asu.edu

ASU IRB STUDY00010192

APPENDIX G

ASSENT FORM (15-17 Years) – ENGLISH VERSION (2019)

ASSENT FORM (15-17 Years)

What Matter(s) in Education Beyond the Human?

My name is Janna Goebel. I am a graduate student under the direction of Professor Iveta Silova at Arizona State University in the United States.

I am asking you to take part in a research study because I am trying to learn more about humans' relationships with nature inside and outside of school as a part of my graduate studies. Your parent(s) have given you permission to participate in the study.

If you agree, you will be asked to allow me to spend time with you and your family inside of school and/or outside of school on your family's plantation. I may ask you to participate in 1 or 2 interviews with me that would last about one hour each. These interviews may be recorded so that I can listen to them later. I may send the recordings of our interviews to a company in Brazil that will transcribe the recording for me. I may also take photos or videos of you. These recordings, photos, and videos may be used in publications, including my doctoral dissertation, reports and presentations. While I may use recordings of your voice or photos and videos of you in my writing and presentations, I will never use your real name or the name of your hometown in connection to what you say. I may reach out to your parents by email to ask you follow-up questions to be sure I am using your interview information correctly before I publish what you've said.

You will be asked to talk with me about your experiences at school and at home. You'll also be asked to tell me about your experiences living here including questions about your relationship to the coffee plantation where you live and your studies in school. By signing here, you give me permission to record your voice and take photos or videos of you. These recordings, photos, and videos will be transferred directly from the

recording device or camera to password protected cloud storage on Google Drive where they will be saved indefinitely. I will use a pseudonym instead of your real name when sharing these photos, videos, and voice recordings with others.

You do not have to be in this study. No one will be upset with you if you decide not to do this study. Even if you start the study, you can stop later if you want. You may ask questions about the study at any time.

If you decide to be in the study I will not tell anyone else how you respond or act as part of the study. Even if your parents or teachers ask, I will not tell them about what you say or do in the study.

Signing here means that you have read this form or have had it read to you and that you are willing to be in this study. If you have any questions, you can contact me, Janna Goebel at Janna.Goebel@asu.edu or my supervisor, Iveta Silova, at Iveta.Silova@asu.edu.

Name:

Signature:

Date:

Janna's signature:

Janna's information: Janna Goebel | Janna.Goebel@asu.edu

Janna's mentor: Iveta Silova | Iveta.Silova@asu.edu

ASU IRB STUDY00010192

APPENDIX H

ASSENT FORM (15-17 Years) – PORTUGUESE VERSION (2019)

FORMULÁRIO DE ASSENTIMENTO (15-17 Anos)

O que importa na educação além do ser humano?

Meu nome é Janna Goebel. Eu sou uma estudante de graduação sob a direção da professora Iveta Silova na Arizona State University, nos Estados Unidos.

Eu estou lhe pedindo para participar de um estudo de pesquisa porque estou tentando aprender mais sobre os relacionamentos dos seres humanos com a natureza dentro e fora da escola como parte de meus estudos de pós-graduação. Seu(s) pai(s) lhe deram permissão para participar do estudo.

Se você concordar, será solicitado que eu passe tempo com você e sua família dentro da escola e / ou fora da escola na lavoura da sua família. Posso pedir-lhe para participar de uma ou duas entrevistas comigo que durariam cerca de uma hora cada. Essas entrevistas podem ser gravadas para que eu possa ouvi-las mais tarde. Eu posso enviar as gravações de nossas entrevistas para uma empresa no Brasil que irá transcrever a gravação para mim. Eu também posso tirar fotos ou vídeos de você. Essas gravações, fotos e vídeos podem ser usados em publicações, incluindo minha tese de doutorado, relatórios e apresentações/palestras. Embora eu possa usar gravações de sua voz ou fotos e vídeos seus em meus textos e apresentações, nunca usarei seu nome verdadeiro ou o nome do local em conexão com o que você diz. Posso entrar em contato com seus pais por e-mail para fazer perguntas de acompanhamento para ter certeza de que estou usando as informações da sua entrevista corretamente antes de publicar o que você disse.

Eu vou solicitar que você converse comigo sobre suas experiências na escola e em casa. Eu também vou solicitar que você me conte sobre suas experiências vivendo aqui, incluindo perguntas sobre seu relacionamento com a lavoura de café onde mora e seus

estudos na escola. Ao assinar aqui, você me dá permissão para gravar sua voz e tirar fotos ou vídeos de você. Essas gravações, fotos e vídeos serão transferidos diretamente do dispositivo de gravação ou câmera para o armazenamento de arquivos na nuvem protegido por senha no Google Drive, onde serão salvos indefinidamente. Eu usarei um pseudônimo em vez de seu nome real ao compartilhar essas fotos, vídeos e gravações de voz com outras pessoas.

Você não precisa estar neste estudo. Ninguém ficará chateado se decidir não fazer este estudo. Mesmo se você começar o estudo, você pode parar mais tarde, se quiser. Você pode fazer perguntas sobre o estudo a qualquer momento.

Se você decidir participar do estudo, não direi a ninguém o que você respondeu ou como agiu como parte do estudo. Mesmo que seus pais ou professores perguntem, não vou falar sobre o que você diz ou faz no estudo.

Assinar aqui significa que você leu este formulário ou alguém o leu para você e você está disposto a participar deste estudo. Se você tiver alguma dúvida, entre em contato comigo, Janna Goebel pelo Janna.Goebel@asu.edu ou minha supervisora, Iveta Silova, pelo Iveta.Silova@asu.edu.

Nome:	Assinatura de Janna:
Assinatura:	Informações: Janna Goebel | Janna.Goebel@asu.edu
Data:	A supervisora da Janna: Iveta Silova | Iveta.Silova@asu.edu

ASU IRB STUDY00010192

APPENDIX I

ASSENT FORM (11-14 Years) – ENGLISH VERSION (2019)

ASSENT FORM (11-14 Years)

What Matter(s) in Education Beyond the Human?

I have been told that my parent(s) have given permission for me to participate in a study about my relationship with nature.

I will be asked to talk with Janna about my experiences at school and at home for about one hour in 1-2 interviews. I will be asked to tell her about my experiences living here including my relationship to the coffee plantation where I live and my studies in school. I give Janna permission to record my voice and take photos or videos of me. Janna has my permission to send the recordings of our interviews to a company in Brazil that will transcribe the recording for her so she can re-read our interview later. I know she will use a pseudonym instead of my real name when sharing these photos, videos, and voice recordings with others. I also know that she might email my parents to make sure she is using my interview information correctly before she publishes what I say.

My participation in this project is voluntary and I have been told that I may stop my participation in this study at any time. If I choose not to participate, it will not affect my grades at school in any way. I know if I have questions, I can email Janna (Janna.Goebel@asu.edu) or her mentor Iveta Silova (Iveta.Silova@asu.edu).

Name: _____

Signature: _____

Date: _____

Janna's Signature:_____

Janna's information:

Janna Goebel

Janna.Goebel@asu.edu

Janna's mentor:

Iveta Silova

Iveta.Silova@asu.edu

ASU IRB STUDY00010192

APPENDIX J

ASSENT FORM (11-14 YEARS) – PORTUGUESE VERSION (2019)

FORMULÁRIO DE ASSENTIMENTO (11-14 anos)

O que importa na educação além do ser humano?

Me disseram que meus pais deram permissão para eu participar de um estudo sobre meu relacionamento com a natureza.

Vão me pedir que fale com a Janna sobre as minhas experiências na escola e em casa durante cerca de uma hora em 1-2 entrevistas. Vão me pedir que lhe conte as minhas experiências aqui, incluindo a minha relação com a lavoura de café onde eu moro e os meus estudos na escola. Eu dou permissão à Janna para gravar minha voz e tirar fotos ou vídeos de mim. Janna tem minha permissão para enviar as gravações de nossas entrevistas para uma empresa no Brasil que irá transcrever a gravação para que ela possa reler nossa entrevista mais tarde. Eu sei que ela usará um nome falso (pseudônimo) em vez do meu nome verdadeiro quando compartilhar essas fotos, vídeos e gravações de voz com outras pessoas. Eu também sei que ela pode enviar e-mail aos meus pais para se certificar de que ela está usando as informações da entrevista corretamente antes de publicar o que eu digo.

Minha participação neste projeto é voluntária e me disseram que posso interromper minha participação neste estudo a qualquer momento. Se eu optar por não participar, isso não afetará minhas notas na escola de forma alguma. Sei que, se tiver dúvidas, posso enviar um e-mail para Janna (Janna.Goebel@asu.edu) ou para sua supervisora Iveta Silova (Iveta.Silova@asu.edu).

Nome: _____

Assinatura: _____

Data: _____

Assinatura da Janna: _____

Informações da Janna:

Janna Goebel

Janna.Goebel@asu.edu

A supervisora da Janna:

Iveta Silova

Iveta.Silova@asu.edu

ASU IRB STUDY00010192

APPENDIX K

ASSENT FORM (6-10 Years) – ENGLISH VERSION (2019)

ASSENT FORM (6-10 Years)

What Matter(s) in Education Beyond the Human?

I have been told that my mom or dad has said it's okay for me to take part in a project about my relationship with nature.

I will be asked to talk with Janna once or twice about my experiences at school and at home for a short period of time (about one hour). I will be asked to tell her about things that are important to me in my world. Janna will take my picture and record my voice when I am talking to her. Janna may also send my mom or dad an email to ask me more about our conversation.

I am taking part because I want to. I know that I can stop at any time if I want to and it will be okay if I want to stop.

My name is: _____

This is my signature: _____

Today's date is: _____

Janna's Signature:_____

Janna's information:

Janna Goebel

Janna.Goebel@asu.edu

Janna's mentor:

Iveta Silova

Iveta.Silova@asu.edu

ASU IRB STUDY00010192

APPENDIX L

ASSENT FORM – PORTUGUESE VERSION (2019)

FORMULÁRIO DE ASSENTIMENTO (6-10 anos)

O que importa na educação além do humano?

Me foi dito que minha mãe ou meu pai disseram que está tudo bem para mim participar de um projeto sobre minha relação com a natureza.

Vão me pedir que eu fale com a Janna uma ou duas vezes sobre as minhas experiências na escola e em casa por um curto período de tempo (cerca de uma hora). Vão me pedir que lhe fale sobre coisas que são importantes para mim no meu mundo. A Janna tirará minha foto e gravará minha voz quando eu estiver falando com ela. Janna também pode enviar um email a minha mãe ou a meu pai para me perguntar mais sobre nossa conversa.

Eu estou participando porque quero. Eu sei que posso parar a qualquer momento se quiser e tudo ficará bem se eu quiser parar.

Meu nome é: _____

Esta é minha assinatura: _____

A data de hoje é: _____

Assinatura da Janna: _____

Informações da Janna:

Janna Goebel

Janna.Goebel@asu.edu

A supervisora da Janna:

Iveta Silova

Iveta.Silova@asu.edu

ASU IRB STUDY00010192

APPENDIX M

SEMI-STRUCTURED PROTOCOL FOR WALKING INTERVIEWS – ENGLISH VERSION (2019)

Semi-structured protocol for walking interviews

Place-based

These three questions will guide my walking interviews with the participants inside and outside of school:

- Can you tell me more about this place?
- Why is it important to you?
- What do you like to do here?

Artifact-based

These two questions will be used when a participant chooses to share an item, artifact, or artwork of importance:

- What is the story that this (photo, object, drawing) tells?
- What would you like others to know about this (photo, object, drawing)?

ASU IRB STUDY00010192

APPENDIX N

SEMI-STRUCTURED PROTOCOL FOR WALKING INTERVIEWS – PORTUGUESE VERSION (2019)

Protocolo semi-estruturado para entrevistas a pé

Baseado no lugar

Estas três perguntas guiarão minhas entrevistas de caminhada com os participantes dentro e fora da escola:

- Você pode me falar mais sobre esse lugar?
- Por que isso é importante para você?
- O que você gosta de fazer aqui?

Baseado nos artefatos

Essas duas perguntas serão usadas quando um participante optar por compartilhar um item, um artefato ou uma obra de arte de importância:

- Qual é a história que este (foto, objeto, desenho) conta?
- O que você gostaria que os outros soubessem sobre este (foto, objeto, desenho)?

ASU IRB STUDY00010192

APPENDIX O

TRANSLATION CERTIFICATE (2019)

Translation Certification Form
Institutional Review Board (IRB)

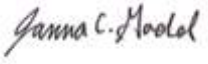
PROTOCOL TITLE:	What Matter(s) in Education Beyond the Human
HS NUMBER:	STUDY00010192
PRINCIPAL INVESTIGATOR:	Iveta Silova
LANGUAGE OF TRANSLATED DOCUMENTS:	Portuguese

TYPE OF SUBMISSION	
X	The initial submission of the following forms that have been IRB approved in English: Goebel_Dissertation_Recruitment Script_v3.pdf, Category: Recruitment Materials Goebel_Dissertation_Adult Consent_v3.pdf, Category: Consent Form Goebel_Dissertation_Parental Permission_v3.pdf, Category: Consent Form Goebel_Dissertation_Assent form 15-17_v3.pdf, Category: Consent Form Goebel_Dissertation_Assent form 11-14_v2.pdf, Category: Consent Form Goebel_Dissertation_Assent form 6-10_v2.pdf, Category: Consent Form Goebel_Dissertation_Semi-structured Interview Protocol.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions)
☐	The modification of the following forms that have been approved.
☐	Other

CERTIFICATION OF TRANSLATION

I certify that I have performed the translation of the following documents for the referenced project:
Goebel_Dissertation_Recruitment Script_v3.pdf, Category: Recruitment Materials
Goebel_Dissertation_Adult Consent_v3.pdf, Category: Consent Form
Goebel_Dissertation_Parental Permission_v3.pdf, Category: Consent Form
Goebel_Dissertation_Assent form 15-17_v3.pdf, Category: Consent Form
Goebel_Dissertation_Assent form 11-14_v2.pdf, Category: Consent Form
Goebel_Dissertation_Assent form 6-10_v2.pdf, Category: Consent Form
Goebel_Dissertation_Semi-structured Interview Protocol.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions)

Printed Name of Translator: Janna C. Goebel

Signature of Translator:  Date: June 12, 2019

CERTIFICATION OF BACK-TRANSLATION

I certify that I have performed the back-translation of the following documents for the referenced project:
Goebel_Dissertation_Recruitment Script_v3.pdf, Category: Recruitment Materials
Goebel_Dissertation_Adult Consent_v3.pdf, Category: Consent Form
Goebel_Dissertation_Parental Permission_v3.pdf, Category: Consent Form
Goebel_Dissertation_Assent form 15-17_v3.pdf, Category: Consent Form
Goebel_Dissertation_Assent form 11-14_v2.pdf, Category: Consent Form
Goebel_Dissertation_Assent form 6-10_v2.pdf, Category: Consent Form
Goebel_Dissertation_Semi-structured Interview Protocol.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions)

Printed Name of Back-Translator: Esther Pretti

Signature of Back-Translator :  Date: June 12, 2019

APPENDIX P

LETTER OF EXPEDITED REVIEW APPROVAL

APPROVAL: EXPEDITED REVIEW

Iveta McGurty
Division of Educational Leadership and Innovation - Tempe
-
Iveta.Silova@asu.edu

Dear Iveta McGurty:

On 5/28/2019 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	What Matter(s) in Education Beyond the Human
Investigator:	Iveta McGurty
IRB ID:	STUDY00010192
Category of review:	(6) Voice, video, digital, or image recordings, (7)(b) Social science methods, (7)(a) Behavioral research
Funding: Name:	US Agency for International Development (USAID), Grant Office ID: GR35814; Cost Center 310, Funding Source ID: FP 00015813; Name: US Agency for International Development (USAID), Grant Office ID: GR35814; CC310, Funding Source ID: FP 00015813
Grant Title:	GR35814; Cost Center 310; GR35814; CC310;
Grant ID: GR35814;	Cost Center 310; GR35814; CC310;
Documents Reviewed:	• Signed contract: USAID Global Development Research Scholars Program, Category: Sponsor Attachment; • Goebel_Dissertation_Semi-structured Interview Protocol.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Goebel_Dissertation_Recruitment Script_v3.pdf, Category: Recruitment Materials; • Goebel_Dissertation_Protocol_v3.docx, Category: IRB Protocol; • Goebel_Dissertation_Assent form 15-17_v3.pdf, Category: Consent Form;

	• Goebel_Dissertation_Assent form 6-10_v2.pdf, Category: Consent Form; • Goebel_STUDY00010192 Modifications_Track Changes.pdf, Category: Other (to reflect anything not captured above); • Goebel_Dissertation_Parental Permission_v3.pdf, Category: Consent Form; • Goebel_Pilot Study_IRB Approval.pdf, Category: Other (to reflect anything not captured above); • Goebel_Dissertation_Assent form 11-14_v2.pdf, Category: Consent Form; • Grant Application - USAID/First Solar/GDR Scholars Program, Category: Sponsor Attachment; • IRB Wizard Response ID: R_2TS4yrlstAGhYK5, Category: Other (to reflect anything not captured above); • Goebel_Dissertation_Adult Consent_v3.pdf, Category: Consent Form;

The IRB approved the protocol from 5/28/2019 to 5/27/2020 inclusive. Three weeks before 5/27/2020 you are to submit a completed Continuing Review application and required attachments to request continuing approval or closure.

If continuing review approval is not granted before the expiration date of 5/27/2020 approval of this protocol expires on that date. When consent is appropriate, you must use final, watermarked versions available under the "Documents" tab in ERA-IRB.
In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator
cc: Janna Goebel
Iveta McGurty
Janna Goebel

APPENDIX Q

LETTER OF CONTINUING REVIEW APPROVAL

APPROVAL: CONTINUATION
Iveta McGurty
Division of Educational Leadership and Innovation - Tempe
-
Iveta.Silova@asu.edu
Dear Iveta McGurty:
On 5/13/2020 the ASU IRB reviewed the following protocol:

Type of Review:	Continuing Review
Title:	What Matter(s) in Education Beyond the Human
Investigator:	Iveta McGurty
IRB ID:	STUDY00010192
Category of review	
Funding:	Name: US Agency for International Development (USAID), Grant Office ID: GR35814; Cost Center 310, Funding Source ID: FP 00015813; Name: US Agency for International Development (USAID), Grant Office ID: GR35814; CC310, Funding Source ID: FP 00015813
Grant Title:	None
Grant ID:	None
Documents Reviewed:	None

The IRB approved the protocol from 5/13/2020 to 5/12/2021 inclusive. Three weeks before 5/12/2021 you are to submit a completed Continuing Review application and required attachments to request continuing approval or closure.

If continuing review approval is not granted before the expiration date of 5/12/2021 approval of this protocol expires on that date. When consent is appropriate, you must use final, watermarked versions available under the "Documents" tab in ERA-IRB.
In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).
Sincerely,

IRB Administrator
cc: Janna Goebel, Iveta McGurty

APPENDIX R

RECRUITMENT SCRIPT – ENGLISH VERSION (2018)

RECRUITMENT SCRIPT

Dear [potential participant]:

My name is Janna Goebel, and I am a doctoral student under the direction of Dr. Iveta Silova in the Mary Lou Fulton Teachers College at Arizona State University. In collaboration with Vinícius Gomes Ferreira of REVO Coffee Co. and Dra. Sandra Regina Sales at the Federal Rural University of Rio de Janeiro, I am conducting a research study about environmental education, land use, and interactions between humans and nature as a part of my doctoral work. This project will be supervised by my doctoral advisor, Dr. Silova.

I am recruiting individuals to participate by allowing me to observe their work [on a coffee plantation/ in a classroom] over the course of 6-10 days. I may take pictures of your [plantation/classroom/textbooks], but I will not take pictures of you or any other people. Additionally, I would like to conduct brief, 60-minute, audio recorded interviews with you. Recorded interviews will be transcribed by a third-party. Recordings of your voice may be used in presentations, but your name will never be associated with your voice or anything you say. [For teachers only: I am hoping to conduct a review of class materials such as textbooks. I may ask you to share some of these materials as well.] In total, your involvement in this project will take approximately 30 hours.

However, I do not intend to interrupt your daily activities during my observation time. Your participation in this study is voluntary. If you have any questions concerning the

research study, please call or message me at xxx-xxx-xxxx. Participants must be 18 years of age or older. Many thanks in advance for your consideration!

Janna Goebel

Phone/WhatsApp: xxx-xxx-xxxx

Email: jcgoebel@asu.edu

CC: Vinícius Gomes Ferreira e Sandra Regina Sales

ASU IRB # STUDY00008313 | Approval Period 5/23/2018

APPENDIX S

RECRUITMENT SCRIPT – PORTUGUESE VERSION (2018)

SCRIPT DE RECRUTAMENTO

Caro [Nome]:

Meu nome é Janna Goebel, e sou estudante de doutorado sob a direção da Dra. Iveta Silova na Faculdade de Educação Mary Lou Fulton na Arizona State University. Em colaboração com Vinícius Gomes Ferreira da REVO Coffee Co. e Dra. Sandra Regina Sales na Universidade Federal Rural do Rio de Janeiro, estou realizando uma pesquisa sobre educação ambiental, o uso da terra e as interações entre seres humanos e a natureza como parte do meu trabalho de doutorado. Este projeto será supervisionado pela minha orientadora de doutorado, Dr. Silova.

Estou recrutando pessoas para participar, permitindo-me observar seu trabalho [numa lavoura de café / numa sala de aula] ao longo de 6-10 dias. É possível que eu tire fotos da sua [lavoura / sala de aula / livros didáticos], mas não vou tirar fotos de você nem de qualquer outra pessoa. Além disso, gostaria de realizar breves entrevistas de 60 minutos com você gravadas em áudio. As entrevistas gravadas serão transcritas por terceiros. As gravações de sua voz podem ser usadas em apresentações, mas seu nome nunca será associado à sua voz ou a qualquer coisa que você disser. [Somente para professores: espero realizar uma revisão de materiais de aula, como livros didáticos. É possível que eu lhe peça para compartilhar alguns desses materiais também.] No total, o seu envolvimento neste projeto levará aproximadamente 30 horas.

No entanto, não pretendo interromper suas atividades diárias durante meu tempo de observação. A sua participação neste estudo é voluntária. Se você tiver alguma dúvida

sobre o estudo da pesquisa, ligue ou envie uma mensagem para mim no número xxx-xx-xxxx. Os participantes devem ter 18 anos de idade ou mais.

Muito obrigada pela sua consideração!

Janna Goebel

Telefone / WhatsApp: xxx-xxx-xxxx

Email: jcgoebel@asu.edu

CC: Vinícius Gomes Ferreira e Sandra Regina Sales

APPENDIX T

CONSENT FORM – ENGLISH VERSION (2018)

CONSENT FORM

Intersecting Ecosystems: An exploratory case study of the environment and education

I am a doctoral student under the direction of Dr. Iveta Silova in the Mary Lou Fulton Teachers College at Arizona State University. In collaboration with Vinícius Gomes Ferreira of REVO Coffee Co. and Dra. Sandra Regina Sales at the Federal Rural University of Rio de Janeiro, I am conducting a research study about environmental education, land use, and interactions between humans and nature as a part of my doctoral work. This project will be supervised by my doctoral advisor, Dr. Silova.

I am inviting your participation, which will involve allowing me to observe your work [on a coffee plantation/ in a classroom] over the course of 6-10 days. I may take pictures of your [plantation/classroom/textbooks], but I will not take pictures of you or any other people. Additionally, I would like to conduct brief, 60-minute, audio recorded interviews with you. [For teachers only: I am hoping to conduct a review of class materials such as textbooks. I may ask you to share some of these materials as well]. In total, your involvement in this project will take approximately 30 hours. However, I do not intend to interrupt your daily activities during my observation time.

You have the right not to answer any question, and to stop participation at any time. Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. You must be 18 years of age or older to participate.

There are no foreseeable benefits, risks or discomforts to your participation.

Additional information about Interview Recordings:

I would like to audio record our interviews. The interview will not be recorded without your permission. Please let me know if you do not want the interview to be recorded; you also can change your mind after the interview starts, just let me know.

The interview recordings will be sent to a third party to be transcribed. Transcripts will be de-identified so that your name will not be connected to what you say. Recordings of your voice may be used in presentations, but your name will never be associated with your voice or anything you say. The results of this study may also be used in reports, presentations, or publications but your name will not be used. Your responses will be confidential.

If you have any questions concerning the research study, please contact the research team: (Janna Goebel: jcgoebel@asu.edu or Iveta Silova: Iveta.Silova@asu.edu). If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at +1 (480) 965-6788. Please let me know if you wish to be part of the study. By signing below, you are agreeing to be part of the study.

Name: Signature:

Date:

ASU IRB # STUDY00008313 | Approval Period 5/23/2018

APPENDIX U

CONSENT FORM – PORTUGUESE VERSION (2018)

FORMULÁRIO DE CONSENTIMENTO

Ecossistemas em intersecção: Um estudo de caso exploratório de meio ambiente e educação

Eu sou uma estudante de doutorado sob a orientação da Dra. Iveta Silova na Faculdade de Educação Mary Lou Fulton na Arizona State University. Em colaboração com Vinícius Gomes Ferreira da REVO Coffee Co. e a Dra. Sandra Regina Sales da Universidade Federal Rural do Rio de Janeiro, estou realizando uma pesquisa sobre educação ambiental, o uso da terra e interações entre seres humanos e a natureza como parte do meu trabalho de doutorado. Este projeto será supervisionado pela minha orientadora de doutorado, Dra. Silova.

Estou convidando você para participar desse estudo, o que envolverá permitir que eu observe seu trabalho [numa lavoura / numa sala de aula] durante de 6 a 10 dias. Existe a possibilidade de eu tirar fotos da sua [lavoura / sala de aula / livros didáticos], mas não vou tirar fotos de você nem de qualquer outra pessoa. Além disso, gostaria de realizar breves entrevistas de 60 minutos com você gravando o áudio. [Somente para professores: pretendo realizar uma revisão de materiais de aula, como livros didáticos. É possível que eu lhe peça para compartilhar alguns desses materiais também]. No total, o seu envolvimento neste projeto levará aproximadamente 30 horas. No entanto, eu não pretendo interromper suas atividades diárias durante meu tempo de observação.

Você tem o direito de não responder a qualquer pergunta e de interromper a sua participação a qualquer momento.

A sua participação neste estudo é voluntária. Se você optar por não participar ou quiser se retirar do estudo a qualquer momento, não haverá penalidade. Você deve ter 18 anos de idade ou mais para participar.

Não há benefícios, riscos ou desconfortos previstos para a sua participação.

Informações adicionais sobre gravações de entrevistas:

Eu gostaria de gravar nossas entrevistas em áudio. A entrevista não será gravada sem a sua permissão. Por favor, me avise se você não quer que a entrevista seja gravada; você também pode mudar de ideia depois que a entrevista começar, é só me avisar.

As gravações da entrevista serão enviadas à terceiros para serem transcritas. Sua identidade não será revelada nas transcrições para que seu nome não seja conectado ao que você diz. As gravações de sua voz podem ser usadas em apresentações, mas seu nome nunca será associado à sua voz ou a qualquer coisa que você disser. Os resultados deste estudo também podem ser usados em relatórios, apresentações ou publicações, mas seu nome nunca será usado. Suas respostas serão confidenciais.

Se você tiver alguma dúvida sobre o estudo, entre em contato com a equipe de pesquisa: (Janna Goebel: jcgoebel@asu.edu ou Iveta Silova: Iveta.Silova@asu.edu). Se você tiver alguma dúvida sobre seus direitos como participante desta pesquisa, ou se achar que foi colocado em risco, entre em contato com o Presidente do Conselho de Revisão

Institucional de Assuntos Humanos, através do Escritório de Integridade e Garantia de Pesquisa da ASU a +1 (480) 965-6788. Por favor, me avise se você deseja fazer parte do estudo.

Ao assinar abaixo, você concorda em fazer parte do estudo.

Nome:

Assinatura: Data de assinatura:

ASU IRB # STUDY00008313 | Approval Period 5/23/2018

APPENDIX V

SEMI-STRUCTURED INTERVIEW PROTOCOL – ENGLISH VERSION (2018)

Semi-structured Interview Protocol

Intersecting Ecosystems: An exploratory case study of the environment and education

Research team roles:

Janna Goebel – co-principal investigator and interviewer

Dr. Iveta Silova – co-principal investigator and research supervisor

I. Introduction and Informed Consent (10 minutes)

Introduction Script:

Welcome. Thank you for joining me today. I appreciate your willingness to participate in this study. My name is Janna Goebel. I am a doctoral student at Arizona State University. I am conducting research about environmental education and land use in [region name]. I am here to learn from you by listening to what you would like to share with me and observing your life [on the plantation/ in school].

Consent

Before we begin, I need to get your consent to participate in the study. We will go through the informed consent form in front of you. Take some time to read through it and then I will walk you through it.

The interviewer will walk the participant(s) through the informed consent document and will answer any questions that the participant(s) have about the procedure prior to obtaining a signed form.

Demographic form

The interviewer will then ask participant(s) to complete a demographic sheet (see attached). She will collect the demographic sheet and begin the discussion with an introduction to the project.

Transition to starting the conversation portion

As I mentioned earlier, your participation in this project is voluntary. I will not use your name or any identifying information in any publications or presentations. Your name will never be linked to any comment you make in the reports, publications, or presentations that result from our discussion. I am committed to maintaining your confidentiality.

My main focus today is to listen to what you share with me. Again, there is no right or wrong answer so I encourage you to feel comfortable to express your honest opinions. I am here to listen, not to judge.

- **What questions do you have about what we have discussed so far?**

Pause to answer questions about the introduction.

III. Reminder about recording (5 minutes)

Before we begin, I wanted to remind you that our discussion today will be recorded. As a reminder:

You are free to leave the conversation at any point without question or consequence. If you need to excuse yourself for any reason, please do so.

The conversation is recorded only when you agree to be recorded. **If, at any point, you wish to stop the recording, please tell us and I will do so.** If you make a comment that you would not like us to use, even though it will not be connected to you, please just say so and I will be sure to remove the comment from the transcription of the recording.

There are no right or wrong answers. This is a safe space to share your thoughts.

Does this all sound ok with you? May I start the recording?

Janna turns on recorder.

IV. Discussion (45 minutes total)

Introductions	Narrative elicitation
Please tell me a little bit about yourself: How long have you been a teacher/coffee producer? What made you want to become a teacher/coffee producer? What brought you to this location? What are your connections to this area? How has the way you teach/farm changed since you started?	Please tell me about one of your earliest memories of teaching/ farming here. What do you remember? Why did that memory come to mind? I am interested in learning more about stories that are shared between generations. Would you mind telling me a story that was told to you when you were a child? Or a story you share with your children?
Teaching	**Plantation**
Please tell me more about the curriculum you use here. Who decides what is included in the curriculum? How do your students respond to the curriculum? How are students taught about nature in the curriculum you use? What would you like to keep the same about your curriculum? What would you change if you could?	Please tell me more about your experiences on the plantation here. How did you learn to produce coffee the way you do now? How do you share what you know with others on the plantation? beyond? How have you responded to climate changes/ global warming? Has anything changed with the way you farm as a result of these climate changes?

APPENDIX W

SEMI-STRUCTURED INTERVIEW PROTOCOL – PORTUGUESE VERSION (2018)

Protocolo de entrevista semiestruturado

Ecossistemas de interseção: Um estudo de caso exploratório do meio ambiente e educação

Funções da equipe de pesquisa:

Janna Goebel - co-investigadora principal e entrevistadora

Dra. Iveta Silova – co-investigadora principal e supervisor de pesquisa

I. Introdução e Consentimento Informado (10 minutos)

Script de Introdução:

Seja bem-vindo. Obrigada por conversar comigo hoje. Agradeço sua disposição em participar deste estudo. Meu nome é Janna Goebel. Eu sou uma estudante de doutorado na Arizona State University nos Estados Unidos. Estou realizando pesquisas sobre educação ambiental, o uso da terra e as interações entre os seres humanos e a natureza aqui no Espírito Santo. Estou aqui para aprender com você, ouvindo o que você gostaria de compartilhar comigo e observando sua vida [na lavoura / na escola].

Consentimento informado

Antes de começarmos, preciso de seu consentimento para participar do estudo. Nós iremos ler o formulário de consentimento informado à sua frente. Reserve algum tempo para lê-lo e depois eu irei ler junto com você todos os itens.

O entrevistador irá ler - junto com o(s) participante(s) - o documento de consentimento informado e responderá a quaisquer perguntas que o(s) participante(s) tenha(m) sobre o procedimento antes de obter o formulário assinado.

Forma demográfica

a entrevistadora pedirá então ao participante(s) para preencher um formulário demográfico (anexado). Ela coletará o formulário demográfico e iniciará a discussão com uma introdução ao projeto.

Transição para iniciar a parte da conversa

Como mencionei anteriormente, sua participação neste projeto é voluntária. Não usarei seu nome ou qualquer informação de identificação em publicações ou apresentações. Seu nome nunca será vinculado a qualquer comentário que você fizer nos relatórios, publicações ou apresentações resultantes de nossa discussão. Estou comprometido em manter sua confidencialidade.

Meu foco principal hoje é ouvir o que você compartilhar comigo. Novamente, não há resposta certa ou errada, por isso, encorajo-o(a) a se sentir confortável para expressar suas opiniões honestas. Estou aqui para ouvir, não para julgar.

Que perguntas você tem sobre o que discutimos até agora?

Pause para responder a perguntas sobre a introdução.

II. Lembrete sobre a gravação (5 minutos)

Antes de começarmos, gostaria de lembrar que nossa discussão hoje será gravada. Como lembrete:

Você é livre para deixar a conversa a qualquer momento sem questionamentos ou consequências. Se você precisar se ausentar por qualquer motivo, faça isso.

A conversa é gravada apenas quando você concorda em ser gravado. Se, a qualquer momento, você quiser interromper a gravação, por favor me avise e eu farei isso. Se você fizer um comentário que não gostaria que usássemos, mesmo que ele não esteja conectado a você, apenas diga e removerei o comentário da transcrição da gravação.

Não há respostas certas ou erradas. Este é um espaço seguro para compartilhar seus pensamentos.

Isso tudo soa bem com você? Posso começar a gravação?

Janna liga o gravador.

III. Discussão (45 minutos em total)

Introduções	Elucidação narrativa
Por favor, me conte um pouco sobre você: Há quanto tempo você é professor / agricultor? O que fez você querer se tornar um professor / agricultor? O que te trouxe para esse local? Quais são suas conexões com essa área? Como a maneira que você ensina / pratica agricultura mudou desde que você começou?	Por favor, conte-me sobre uma das suas primeiras lembranças do ensino / da agricultura aqui. O que você lembra? Por que essa lembrança me veio à mente? Estou interessada em aprender mais sobre histórias que são compartilhadas entre gerações. Você se importaria de me contar uma história que lhe foi contada quando você era criança? Ou uma história que você compartilha com seus filhos?
Ensino	Agricultura
Por favor, me conte mais sobre o currículo que você usa aqui. Quem decide o que está incluído no currículo? Como seus alunos respondem ao currículo? Como os alunos aprendem sobre a natureza no currículo que você usa? O que você gostaria de manter o nesse currículo? O que você mudaria se pudesse?	Por favor, me conte mais sobre suas experiências na lavoura aqui. Como você aprendeu a cultivar a maneira como você faz agora? Como você compartilha o que sabe com os outros na lavoura? E além da lavoura? Como você respondeu às mudanças climáticas / aquecimento global? Alguma coisa mudou na maneira como você cultiva como resultado dessas mudanças climáticas?

APPENDIX X

DEMOGRAPHIC FORM – ENGLISH VERSION (2018)

Demographic Form

I would like to know some basic demographic information about you to keep for my records. Your responses on this sheet are voluntary. They will be used in my analysis of our conversation.

Full name:

Selected pseudonym:

Age:

Gender:

Number of years working in agricultre/as a teacher:

ASU IRB STUDY00008313

APPENDIX Y

DEMOGRAPHIC FORM – PORTUGUESE VERSION (2018)

Formulário Demográfico

Eu gostaria de saber algumas informações demográficas básicas sobre você para manter nos meus registros. Suas respostas nesta folha são voluntárias. Elas serão usadas na minha análise da nossa conversa.

Nome completo:

Pseudônimo selecionado:

Idade:

Gênero/Sexo:

Número de anos trabalhando na agricultura / como professor(a):

ASU IRB STUDY00008313

APPENDIX Z

TRANSLATION CERTIFICATE (2018)

Translation Certification Form
Institutional Review Board (IRB)

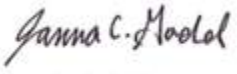
PROTOCOL TITLE: Intersecting Ecosystems: An exploratory case study of the environment and education
HS NUMBER: STUDY00008313
PRINCIPAL INVESTIGATOR: Iveta Silova (McGurty) , Co-PI Janna Goebel
LANGUAGE OF TRANSLATED DOCUMENTS: Portuguese

TYPE OF SUBMISSION	
X	The initial submission of the following forms (Please list the forms). Recruitment script, consent form, demographic form, semi-structured interview protocol.
☐	The modification of the following forms that have been approved. (Please list forms)
☐	Other (Please describe and list forms)

CERTIFICATION OF TRANSLATION

I certify that I have performed the translation of the following documents: (Recruitment script, consent form, demographic form, semi-structured interview protocol) for the referenced project.

Printed Name of Translator: Janna Goebel

Signature of Translator: 
Date: June 14, 2018

CERTIFICATION OF BACK-TRANSLATION

I certify that I have performed the back-translation of the following documents: (Recruitment script, consent form, demographic form, semi-structured interview protocol) for the referenced project. Please note that it is preferable if the back-translation is done by someone who is not part of the research team.

Printed Name of Back-Translator: Esther do Lago e Pretti

Signature of Back-Translator : 
Date: June 15, 2018

APPENDIX a

LETTER OF EXEMPTION (2018)

EXEMPTION GRANTED

Iveta McGurty
Division of Educational Leadership and Innovation - Tempe
-
Iveta.Silova@asu.edu

Dear Iveta McGurty:

On 5/23/2018 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Intersecting Ecosystems: An exploratory case study of the environment and education
Investigator:	Iveta McGurty
IRB ID:	STUDY00008313
Funding:	Name: US Agency for International Development (USAID)
Grant Title:	
Grant ID:	

Documents Reviewed:	• Goebel_USAID_Recruitment Script_v1.pdf, Category: Recruitment Materials; • Goebel_USAID Application Packet_v1.pdf, Category: Sponsor Attachment; • Goebel_USAID_Consent Form_v2.pdf, Category: Consent Form; • Goebel_USAID_Interview Protocol_v1.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Goebel_USAID_Demographic Form_v1.pdf, Category: Other (to reflect anything not captured above); • Goebel_USAID_IRB Protocol_v2.docx, Category: IRB Protocol;

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 5/23/2018.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,
IRB Administrator

cc: Janna Goebel
Iveta McGurty
Janna Goebel

APPENDIX b

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