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Pedagogy and Human–Nature Connection

A case study of two pedagogical approaches and their relation to pupils' human–nature connection in northern Mato Grosso, Brazil

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Picture from Escola Comunitária Ciranda da Terra. Photographed by the author and published with permission from the child and her parents.

To all the children and adolescents whom I encountered during this journey. You gave me a lot of inspiration and hope for a bright future for our Planet.

A todas as crianças e a todos os adolescentes que eu encontrei durante esta viagem. Vocês me deram muita inspiração e esperança para um futuro lindo para o nosso Planeta.

ABSTRACT

As environmental challenges are increasing in the current era of the Anthropocene, there is a growing need to understand what would instigate pro-environmental behaviour. One such factor that research has suggested is to (re)connect people with nature. This research aims to find out whether school pedagogy can have a role in this by investigating the relation between pupils' human–nature connection (HNC) and the pedagogy of the school they attend. In order to do this, the study uses ACHUNAS, a recently developed framework to assess where and how children connect to nature. Two types of school took part in the research: one conventional school and two alternative schools, all rural schools. Based on semi-structured interviews and participant observations, the study found that there is indeed a relation between the pedagogical approach of the school and the HNC of the pupils. Alternative schools offered more recurring and more versatile nature experiences than the conventional school, and pupils in alternative schools had developed more abilities of HNC than their peers in conventional schools. Pupils in alternative schools stated that the school had changed their HNC, while in the conventional school half of the pupils stated that the school had made no impact on their HNC. On top of the findings related to the relation between school pedagogy and HNC, the study found two aspects of HNC that could be included in the ACHUNAS framework.

Keywords: human–nature connection, situated pedagogy, rural education, environmental education, assessment, Brazil

RESUMO

Tendo em vista que os desafios ambientais estão se tornando mais comuns no atual Antropoceno, há uma necessidade crescente de se entender os fatores que favorecem um comportamento sustentável. Um fator sugerido por várias pesquisas é a (re)conexão com a natureza. Esta pesquisa tem como objetivo descobrir se a pedagogia escolar possui um papel neste processo, ao investigar a relação entre a conexão com a natureza de estudantes e a abordagem pedagógica utilizada pela escola em que frequentam. Para isto, esta pesquisa empregou o método "ACHUNAS", desenvolvido recentemente para avaliar onde e como as crianças desenvolvem uma conexão com a natureza. Três escolas do campo participaram desta pesquisa: uma escola convencional e duas escolas alternativas. Utilizando os métodos de entrevistas semiestruturadas e observações participativas, esta pesquisa descobriu que há uma relação entre a abordagem pedagógica da escola e a conexão com a natureza dos seus estudantes. As escolas alternativas ofereceram experiências na natureza com maior frequência e variação comparadas à escola convencional. Os estudantes das escolas alternativas mostraram maiores habilidades de conexão com a natureza do que os estudantes da escola convencional. Os estudantes das escolas alternativas afirmaram que a escola mudou a conexão deles com a natureza, enquanto que a metade dos estudantes na escola convencional disseram que a escola não teve um impacto na conexão deles com a natureza. Além dos resultados relacionados à relação entre a pedagogia e a conexão com a natureza, esta pesquisa descobriu dois aspetos da conexão com a natureza que poderiam ser incluídos no ACHUNAS.

Palavras-chave: conexão com a natureza, pedagogia situada, educação do campo, educação ambiental, avaliação

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1 INTRODUCTION

Today's society is facing an increasing amount of environmental challenges (Ripple et al., 2017). Many know about these challenges, but this knowledge rarely leads to action. There seems to be a missing link from knowledge about environmental problems to behaviour that would take care of the environment, i.e., stewardship behaviour (see e.g. Raymond et al., 2013; Steffen et al., 2011). Human behaviour and the motivations behind it are complex issues, and stewardship behaviour cannot be explained by one factor only. The relationship that a person has with nature, or human–nature connection (HNC), as some in academia call it (Giusti et al., 2018; Ives et al., 2017), is one attempt to encompass many determining factors to individual and social pro-environmental behaviours. In many academic realms, HNC has shown to foster a range of pro-environmental behaviour (Chawla, 2007; Kals et al., 1999; Wells & Lekies, 2006). Reversely, an increasing alienation from nature makes people not feel motivated to act for its wellbeing.

HNC is fostered and strengthened by first-hand experiences in nature, also called *significant nature situations* (Giusti et al., 2018). The more recurring and the more versatile these nature situations are, the more multifaceted the HNC becomes, i.e., the more *abilities of HNC* the person develops (Giusti et al., 2018). Taking part in significant nature situations is particularly effective during the formative years of childhood (Chawla, 2007; Giusti et al., 2018; Kals et al., 1999). Thus, making nature situations part of the everyday life of children can make them learn that nature is a fundamental part of their life, just as they are intrinsically a part of nature. Instead of being abstract facts outside of their lived reality, these experiences become an embodied part of the lived reality of children. In this way, the mental divide between nature and self, so common in today's societies (Folke et al., 2011; Haila, 2000), could be replaced by a mental model where nature is part of people's personal identity, which, in turn, may foster stewardship behaviour.

Children spend a large amount of their time at school. Therefore, nature experiences offered by the school can play a significant role in the development of children's HNC. Hence, the question arises, what kind of school pedagogy supports the development of the different abilities of HNC. Guided by this question, this research investigates two pedagogical approaches and their potential relation to pupils' HNC. The research was conducted in the Brazilian countryside where three schools took part in the research: one conventional school and two alternative schools. Conventional pedagogy refers to the type of pedagogy that mostly takes place in a class-room setting, where pupils are taught knowledge and facts about different

phenomena. The alternative pedagogical approach, on the other hand, follows the principles of situativity theory, which stresses the importance of concrete first-hand experiences that are directly situated in the everyday life of pupils.

1.1 AIM OF THE RESEARCH AND RESEARCH QUESTIONS

The main aim of this research project is to find out the relation between school pedagogy and pupils' human–nature connection (HNC). In order to do this, the study uses a recently developed framework, ACHUNAS (Assessment framework for Children's Human Nature Situations) (Giusti et al., 2018). The second aim of the study is to test, validate and further develop the ACHUNAS framework, as this is the first time it was operationalised into assessing children and adolescents' HNC. The hypotheses are that the alternative schools provide a fuller range of significant nature situations than the conventional school and that pupils attending alternative schools have more abilities of HNC than pupils attending the conventional school.

The following research questions will be studied:

1) What kind of qualities of significant nature situations (SNSs) are provided in alternative schools and in the conventional school?
2) How does the presence of the 10 abilities of human–nature connection (HNC) differ in pupils attending these two types of school?
3) How do the pupils reflect upon the impact of school on their HNC?
4) Do any aspects of HNC that are not in the ACHUNAS framework emerge from the data?

2 HUMAN–NATURE CONNECTION (HNC)

The psychological qualities and processes that constitute people's relationship with nature is a field of study that has grown remarkably since 2010 (Ives et al., 2017). A recent multidisciplinary literature review (Ives et al., 2017) has developed an umbrella concept called human–nature connection to encompass the multitude of fields of knowledge that address this topic.

In the field of environmental psychology, Zylstra and colleagues (2014) have recognised that the psychological traits that define a relationship with nature consist of interrelated cognitive, affective and behavioural aspects. This means that knowing about nature, feelings towards nature and actions with nature are all important for a holistic HNC. This definition paints a multifaceted and holistic view on human–nature connection, recognising that it is not merely a property of the mind. Instead, human–nature connection is an emerging property of intertwined relations between mind, body, culture, and environment (Raymond et al., 2017). HNC uses an embodied ontology to describe HNC. This is because many aspects of one's relationship with nature are not solely psychological. We connect to nature with our bodies, in a specific place, using a set of norms that define our culture.

But why is HNC important? In the face of the sustainability challenges faced by today's societies, it is clear that changes are needed in the way we relate to the natural environment. Abson and colleagues (2017) have identified three leverage points for a sustainability transformation: re-structure, re-connect and re-think. The way humans perceive themselves as either part and dependent or separate and independent of the natural world influences the way we govern for the natural world. Therefore, scientists are calling for a re-connection with the biosphere (Ripple et al., 2017; Folke et al., 2011; Abson et al., 2017).

Several studies have shown that psychological attachment to nature is linked to a variety of different pro-environmental behaviours (Chawla, 2007; Kals et al., 1999; Wells & Lekies, 2006; Zylstra et al., 2014). Chawla (2007) studied environmental activists and what had made them choose this career. Their common narrative was linked to HNC: significant nature experiences during childhood and adolescence had made them develop a keen interest in nature, which then made them want to protect it. Kals and colleagues (1999) studied emotional affinity towards nature and found it to be a crucial predictor of nature-protecting behaviour. On similar lines, the results of Well and Lekies (2006) show that nature activities during childhood had a significant effect on positive attitudes towards the environment and pro-

environmental behaviour. This suggests that fostering the development of children's HNC is a way to make them become biosphere stewards in the future.

2.1 ROOTS OF THE CURRENT DISCONNECT AND WHAT TO DO ABOUT IT

Today's dominant worldview is characterised by a mental disconnect between development and the biosphere that sustains it (Folke et al., 2011). How did humanity get to this point? According to Zylstra and colleagues (2014), the Western disconnection from nature has its roots in the Cartesian ontology of separation. This ontology creates dualisms, such as that between mind and body, and between human and nature. This, in turn, has made it possible to conceive of economic and human development as something that is independent of the wellbeing of the natural world (Folke et al., 2011).

Increasingly, the social-ecological problems stemming from the ontology of separation are being recognised, and many in academia are calling for a new ontology (Abson et al., 2017; Folke et al., 2011). An answer to this call could be the relational ontology of embodied ecosystems (Raymond et al., 2017). In this view, an ecosystem is "a web of embodied relations that exist between humans and environment" (Raymond et al., 2017, p. 794). That is, humans experience the ecosystem in an embodied way: one experience is therefore co-created by relations between the person's mind and body, with the spatial and cultural environment. This resonates with the calls from scholars studying HNC to take into account the full spectrum of human experience: human–nature connection can be strengthened by providing "full-bodied experiences" (Chawla, 2007, p. 153) with nature, using "all five senses" (Kals et al., 1999, p. 183).

2.2 ENVIRONMENTAL EDUCATION THAT FOSTERS THE DEVELOPMENT OF CHILDREN'S HNC

In their seminal paper, Hungerford and Volk (1990) call for a new kind of environmental education. The authors note that most environmental education programmes have an excessive focus on cognitive knowledge. Knowledge, however, doesn't lead to behavioural change, they argue. The authors advocate for a new model of education that would focus on students' empowerment to become active and responsible citizens instead of their acquisition of knowledge (Hungerford & Volk, 1990). On similar lines, Chawla and Cushing (2007) call for environmental education that prepares students for collective action for the environment.

This view can be associated with the teachings of Paulo Freire, a world-renowned Brazilian educator. In his classic book *Pedagogia do oprimido*, Freire (1970) criticises the model of education that sees students as empty vessels that are filled with knowledge given to them by the teacher, the "holder of knowledge". Instead, he advocates for 'problematising education'. Problematising education teaches students that they are deeply embedded in the world they learn about and are agents of change in this world (Freire, 1970, Chapter 2). Freire does not write specifically about environmental education, but his teaching resonates well with the call for holistic learning that is present in recent environmental education literature (e.g. Nazir & Pedretti, 2016) of holistic students using all their senses to learn about nature and make actions to protect it. Therefore, it seems clear that environmental education that merely provides knowledge about the environment and environmental problems is not enough: "environmental consciousness raising is really about 'turning ecological ethics into life practice', or making ecological principles into habits of mind, body and heart" (Bai and Romanycia 2013, cited in Nazir and Pedretti 2016, p. 2). I argue that Freire's problematising education provides a suitable goal for modern environmental education.

3 THEORETICAL FRAMEWORK

This section presents the ACHUNAS framework that was the base of the assessment of pupils' HNC and of the nature experiences provided by the schools. Then situativity theory is presented.

3.1 ACHUNAS – WHERE AND HOW CHILDREN CONNECT TO NATURE

ACHUNAS (Giusti et al., 2018) is a recently developed framework to assess where and how children connect with nature. I chose ACHUNAS as the theoretical framework of this study as it provides a tool to assess HNC in a holistic way, focusing not solely on the mind, but on the body, heart and spirit as well. It conceives of HNC as an embodied capacity, which is in line with the embodied ontology guiding this thesis. The framework identifies 10 abilities (see table 1) that characterise children's HNC. These abilities intertwine cognitive (e.g. 'knowing about nature'), affective (e.g. 'feeling attached to natural places') and behavioural (e.g. 'taking care of nature') aspects. These abilities are then aggregated into three clusters: 'being *in* nature' (feeling comfortable in natural spaces, and being curious about nature), 'being *with* nature' (reading natural spaces, acting in natural spaces, feeling attached to natural spaces, and recalling memories with nature) and 'being *for* nature' (taking care of nature, caring about nature, and being one with nature). There is a progression between these clusters, meaning that a child needs to able to be *in* nature before being able to be *with* or *for* nature (Giusti et al., 2018).

Table 1: The 10 abilities of HNC and descriptions (direct citation from Giusti et al., 2018, p. 9)

ABILITIES OF HNC	DESCRIPTION
Feeling comfortable in natural spaces	The child demonstrates ease in natural spaces and feels comfortable with natural elements in the outdoors (e.g. dirt, mud, rain, or the sun).
Being curious about nature	The child shows interest and motivation in exploring nature.
Reading natural spaces	The child is able to see the possibilities for action in natural spaces that are not purposefully designed by man.
Acting in natural spaces	The child is able to perform activities in nature, for example, nature playing, camping, or outdoor sports in nature.
Feeling attached to natural spaces	The child shows a sense of belonging to specific natural spaces, to which they feel part of.
Knowing about nature	The child demonstrates knowledge of animals, plants, and ecological dynamics.
Recalling memories with nature	The child is able to recall past nature experiences and tell stories of lived life with nature.
Taking care of nature	The child is able to be responsible for nature and feels empowered to act for the wellbeing of nature.
Caring about nature	The child is able to feel care, concern, sensitivity, empathy, and respect for nature.
Being one with nature	The child is able to identify with nature and has a sense of profound personal attachment to nature that can be described as spiritual. Love for nature, humbleness in relation to nature, and assuming to be a small part of the immensity of nature are manifestations of this ability.

In order to develop these abilities, children need to take part in recurring nature situations with different qualities that have potential to develop their relationship with nature. ACHUNAS has identified 16 qualities of significant nature situations (SNS, see table 2 for descriptions). The qualities are divided into six categories: entertaining (entertainment), environmental epiphanies (though-provocation, awe, surprise), restorative experiences (intimacy, mindfulness, self-restoration), nature free play (creative expression, physical activity, challenge, engagement of senses, child-driven), nature school (involvement of mentors, structure/instructions, social/cultural endorsement) and animal engaging (involvement of animals). It is important for environmental education to provide a range of these different qualities in order for a child to develop the different abilities of HNC (Giusti et al., 2018).

Table 2: The 16 qualities of significant nature situations (direct citation from Giusti et al., 2018, p.7)

QUALITIES OF SNSs	DESCRIPTION
Entertainment	Nature situations that are joyful, amusing, or enjoyable.
Thought-provocation	Nature situations that create new ways of conceiving human-nature interaction.
Intimacy	Nature situations that are private or intimate and allow a personal experience with nature.
Awe	Nature experiences that are amazing, of overwhelming attraction, or mesmerizing, that create a "wow effect".
Mindfulness	Nature situations that grasp children's focus and alertedness, that make children "be in the flow".
Surprise	Nature situations that are unpredicted or unexpected. In these nature situations children's line of thought is interrupted, and nature draws their attention.
Creative expression	Nature situations that involve arts, myths, stories, music, or role-play.
Physical activity	Nature situations that require body movement or any form of physical activity.
Engagement of senses	Nature situations that activate children's senses (smell, touch, hearing, etc.)
Involvement of mentors	Nature situations that involve persons, such as teachers, experts or relatives, who are capable of inspiring, encouraging or leading the nature experience for the child.
Involvement of animals	Nature situations that involve interaction with animals.
Social/cultural endorsement	Nature situations that involve positive peer pressure, support from significant others, social acceptance or cultural reinforcement.
Structure/instructions	Nature situations characterized by a set of rules that define the frame within which the child can act.
Child-driven	Nature situations that are chosen by the child, child-initiated (children autonomously decide when to begin the nature activity), and open-ended (children autonomously decide when to conclude the nature activity).
Challenge	Nature situations in which children overcome psychologically or physically adverse conditions, such as fear or cold.
Self-restoration	Nature situations of psychological, physical, or social relief. For example, relief from stress, fatigue, or gender stereotypes.

3.2 SITUATIVITY THEORY

Situativity theory offers insights into what kind of learning becomes meaningful for pupils. According to situativity theory, knowledge is not something abstract that can simply be extracted from its context and transferred to the minds of the pupils (Brown et al., 1989). Instead, knowledge is situated, which means that it exists in the culture and context where it is produced and utilised (Haraway, 1988). When knowledge is extracted from its context, its usefulness in the everyday life becomes unclear, and the pupils may end up learning merely to pass exams instead of learning useful skills for their life (Barab & Roth, 2006).

Brown and colleagues (1989) make a distinction between classroom activities and the activities that practitioners do in real-life settings. Practitioners solve problems within the culture and place that created these problems, whereas in the classic class-room setting, problems are often taken out of the culture where they belong and presented to students in a decontextualised way. Therefore, Brown and colleagues (1989) argue for problem-solving that would use the environment and the body instead of only the head. This resonates with the embodied view presented by Raymond and colleagues (2017) and the call of scholars for a more holistic environmental education (Hungerford & Volk, 1990; Nazir & Pedretti, 2016).

4 CASE DESCRIPTION

This section presents the geographical area where the research took place, the context of education in the Brazilian countryside, and the three schools that took part in this research.

4.1 STUDY AREA

The research was conducted in central-western Brazil, in the very northern part of the state of Mato Grosso (MT) (see map 1). This is an Amazon frontier area, i.e., the southern edge of the Amazon biome. Since its colonisation in the 1940s, the area has been characterised by land-use conflicts between the colonisers, impoverished immigrant groups and the indigenous people who have inhabited the area since a long time (Horiye Rodrigues, 2017). Nowadays, the region is threatened by growing interests of big agribusinesses that are supported by the government (Horiye Rodrigues, 2017). Due to the practices of these agribusinesses, MT has the highest deforestation rate in Brazil, and it ranks 5th among all Brazilian states when it comes to the use of harmful agro-toxins (Horiye Rodrigues, 2017).

Map 1: Location of the study area. Source: Google maps.

4.2 EDUCAÇÃO DO CAMPO – RURAL EDUCATION IN THE BRAZILIAN CONTEXT

The term *educação do campo* means literally 'education of the field' or 'education of the countryside' and is used in Brazil to refer to rural education. *Educação do campo* is closely linked to a fight for a better life and recognition of the way of life in the rural areas. One is the fight of the rural population against the big agri-businesses that often brutally take the land of family farmers (Antunes-Rocha et al., 2012). This take-over of these companies results in rural exodus and consequent closing of rural schools. In this context, the rural populations struggle and fight to maintain their way of life and make it better from their own cultural standpoint, not giving up to the agri-businesses (Antunes-Rocha et al., 2012). *Educação do campo* has a central role in this class fight and a responsibility to contribute to resistance and hope in the countryside (Antunes-Rocha et al., 2012). According to Wrublevski Aued and Vendramini (2012), succeeding in this requires overcoming dualistic discourses. This means going beyond the discourse of the "traditional" or "backwards" rural and the "modern" or "developed" urban (Wrublevski Aued & Vendramini, 2012). Instead, *educação do campo* needs to give students tools to produce their existence collectively, in a constant dialogue with others (Wrublevski Aued & Vendramini, 2012).

4.3 STUDIED SCHOOLS

Three schools of educação do campo took part in the research: Escola Comunitária Ciranda da Terra, Escola Agrícola Terra Nova and Escola Estadual Rodrigues Alves. The schools wanted to be presented by their real names. From now on, the schools will be referred to as CT (Escola Comunitária Ciranda da Terra), TN (Escola Agrícola Terra Nova) and RA (Escola Estadual Rodrigues Alves). CT and TN represent alternative pedagogical approaches that are in line with situativity theory, and RA is a conventional school. All three are rural schools and belong to the public education system.

4.3.1 ESCOLA COMUNITÁRIA CIRANDA DA TERRA (CT)

Escola Comunitária Ciranda da Terra (CT, see image 1) is a small elementary school located in the community Comunidade Nossa Senhora do Guadalupe, in the municipality of Alta Floresta, Mato Grosso. CT was born out of the desire of the parents in the community to provide education for their children within the community. Previously, there was no school in the community and the children had to take a school bus to the nearest town, Alta Floresta, and

attend the urban school there. However, many parents felt uncomfortable sending their children on this daily journey that was perceived as stressful for many young children. At the same time, several parents felt that the teachings of the urban school didn't reflect the reality lived in the community, and wanted to offer their children an education that would be more linked to their everyday lives (Associação ONG Amigos do Vale do Rio Teles Pires, 2017). This led to the creation of CT – a small elementary school run by the community's agro-ecological association, AGuA. The guiding principle of CT is to provide "differentiated education, based on respect towards nature and the individual rhythms of each child, giving value to their culture and origin" (Ciranda da Terra, Educação em Movimento, 2017, p. 2 translated from Portuguese by the author).

Image 1: Escola Comunitária Ciranda da Terra, classroom. As the picture shows, the architecture of the school surpasses the distinction between indoors and outdoors. The walls are half-open and "let nature come in". Picture by author.

4.3.2 ESCOLA AGRÍCOLA TERRA NOVA (TN)

Escola Agrícola Terra Nova (TN, see image 2) is an agro-ecological upper-secondary school located in the municipality of Terra Nova do Norte, Mato Grosso. They offer a degree of technician in agroecology (*técnico em agroecologia*) combined with upper-secondary degree education. The whole degree lasts for four years. TN is a boarding school that functions with the principle of alternation, i.e., the students spend every second week at school and every second week at home. The week at home is called community time, and during this time the students work on different projects to deepen the knowledge they learned during the week at school, and to apply it to the context of their everyday life (Escola Agrícola Terra Nova, 2018). The needs of the community are central in the pedagogy of TN (Figueiredo, 2018).

During the week at school, pupils spend the mornings before lunch working in different project groups, while the afternoons are spent in classroom taking classes in the standard subjects taught in Brazilian upper secondary schools: languages, mathematics, natural sciences and social sciences. On top of the standard subjects, TN offers classes in agrarian sciences (Escola Agrícola Terra Nova, 2018). The project groups are the following (‘Grupos de trabalho’, n.d.):

- Garden – producing vegetables and legumes for school consumption
- Agriculture – producing food for school consumption
- Animals – producing pork, chicken and beef for school consumption
- Fruticulture – producing seedlings and fruit for school consumption
- Processing – using the products of the garden, agriculture, animal and fruticulture groups, to prepare complements for school meals
- Construction – constructing and taking care of the physical structure of the productive sector of the school
- Tools – providing and taking care of tools used in the other groups
- Organisation – cleaning the school and washing dishes after meals
- Media – documenting school work in pictures and Facebook posts
- Administration – managing the incoming and outgoing products

As the above list suggests, the pupils take part in all the activities that maintain the school, thus getting empowering experiences. They change group every five weeks, which means that everybody will take part in each group activity during their four years at the school. There is no gendered work: for example, girls do construction and boys cook. Reflection is central in Terra Nova's pedagogy (Figueiredo, 2018). Each pupil has a notebook for writing individual reflections, and common reflections take place at school every week.

Image 2: Escola Agrícola Terra Nova, pupils bringing harvest from the garden. Picture by the media group of the school, used with permission from the school.

4.3.3 ESCOLA ESTADUAL RODRIGUES ALVES (RA)

Escola Estadual Rodrigues Alves (RA, see image 3) is a combined elementary and upper-secondary school in the municipality of Alta Floresta, Mato Grosso, funded in the 1980s (Paulo de Lima, 2018). The pupils come from the surrounding communities, travelling to school by the school bus service provided by the municipality. This community is an *assentamento*, which means a rural territory that used to be uninhabited and unproductive and was then assigned to people without land (*"sem terra"*). The area has a history of gold-mining, that is related to harsh working conditions and environmental destruction. Nowadays the gold-mining activity has almost ceased, and most inhabitants get their living from doing paid work in big farms, *fazendas* (Paulo de Lima, 2018).

Image 3: Escola Estadual Rodrigues Alves, school yard and covered space used for serving school meals.

Picture by author.

5 METHODS

This study follows a qualitative methodology. The data is based on participatory observations and semi-structured interviews. The epistemological approach guiding this research is an interpretivist one, i.e., I seek to interpret and understand the way that my interviewees conceive the world (see Bryman, 2012, Chapter 2). The ontological view behind this study follows social-ecological systems thinking, conceptualising humans and the natural world as deeply intertwined and forming an inseparable entity (Walker & Salt, 2006). Further, the study employs an embodied ontology according to which human–nature connections are a dynamic and changing outcome of an interaction between mind, body, culture and environment instead of being produced in the mind only (Raymond et al., 2017).

5.1 SAMPLING

Two groups of pupils were interviewed (see table 3). The first group attends alternative schools, the pedagogical approach of which is in line with situativity theory, and the second group attends a conventional school in the same geographical region. The original plan was to have two conventional schools attending the research, but due to practical reasons during fieldwork, I was not able to visit one school and it was left out. Two age groups within both school groups were studied: children and adolescents (see table 3). It was not possible to get respondents of the exact same age range for the two groups. The requirement was that the interviewee had attended the school for at least one year so that there would have been time for the school to have a potential impact on the interviewee's HNC.

Table 3: The studied groups.

GROUP 1: PUPILS IN ALTERNATIVE SCHOOLS (n=16)		GROUP 2: PUPILS IN A CONVENTIONAL SCHOOL (n=16)	
Children (CT)	Adolescents (TN)	Children (RA)	Adolescents (RA)
6–9 years	16–19 years	7–9 years	13–17 years
n=7 (2 girls, 5 boys)	n=9 (6 girls, 3 boys)	n=6 (4 girls, 2 boys)	n=10 (4 girls, 6 boys)

The sampling methods were different in each studied school. As CT is a tiny school, I interviewed every pupil who was in the age range for my study, i.e. seven pupils between the

age of six and nine. In TN, I asked the teachers to present the research project to the pupils in

advance. I had emailed consent forms for the teachers to distribute to those pupils who were interested in participating in the study. The pupils then took the forms home to be signed by their parents during the week they spent at home and brought them back to the school and gave to me during the interview. This procedure was due to the fact that TN is a boarding school and hence it would not have been possible to get the consent from the parents during the week the pupils stayed at school. In RA, I presented the project to different classes during the first day of my stay and interviewed everyone who was willing to participate. I also recruited many of my interviewees from the school yard during intervals between classes. As TN and RA are larger schools, my interviewees present a small sample of the population of pupils, whereas in CT, my sample represents the entire population of pupils in the right age range.

5.2 DATA COLLECTION

The data consists of semi-structured interviews with pupils and observations of school activities in the three schools. The interview and observation guides (see appendices 1, 2 and 3) are based on the ACHUNAS framework (Giusti et al., 2018). The observation guide seeks to assess which of the 16 qualities of significant nature situations (SNSs) are found at the schools in order to assess what opportunities school pedagogy offers for pupils to connect with nature. The interview guide seeks to assess which of the 10 abilities of HNC the interviewees have in order to assess their HNC. Interviews and observations were conducted in August and September of 2018.

The aim of the observations was to identify the presence of SNSs in the everyday school life. In order to do this, I observed school activities that took place outdoors throughout the school day during 4–6 days per school. Due to practical reasons, I didn't stay exactly the same time in each school. I had my base in the community where CT is located, and hence was able to stay there more time. The other two schools were several hours' drive away, so I stayed in each for one school week. I conducted observations in CT for six days, in TN for five days, and in RA for four days. I wrote descriptions of the activities in my notebook while observing pupils and the situations to see which qualities they exhibited. For each activity, I noted all the qualities I saw taking place. I noted each observed quality only once per activity, e.g., if six pupils were doing free play in the school yard and all of them showed enjoyment, I noted down the quality 'entertainment' once, not six times.

The interviews sought to assess what abilities of HNC the pupils have in the different schools. I conducted 43 audio-recorded interviews in total, which resulted in 14 hours of recorded

material. The interviews were conducted and transcribed in Portuguese, which is the mother tongue of the interviewees. The interviews were conducted outdoors, in the school yard or at home.

5.3 DATA ANALYSIS

I used 32 interviews as the data for the study. 11 interviews were excluded from the analysis, because these interviewees had either attended the school for less than a year or were outside of the desired age group. The transcripts were analysed qualitatively using the Atlas.ti software. All data were coded using the ACHUNAS framework as a basis. The coding was abductive, i.e., the abilities of HNC (such as "feeling attached to natural spaces and "being one with nature") and qualities of SNSs (such as "thought-provocation" and "self-restoration"), defined in the ACHUNAS framework, were used as ready codes. During the coding process, new codes (such as "understanding human–nature interaction" and "spreading knowledge and inspiration") emerged from the data. Therefore, the data was coded iteratively, in order to make sure that the new codes were applied to the previously coded data.

I analysed the HNC of each interviewee separately first, and then aggregated the answers for each group. There were two or more question to assess each ability (see interview guide in appendix 2). If the responses of one interviewee to all the questions concerning a specific ability were coded as positive, the respondent was marked as having the ability fully developed. If some responses were positive and some negative, the respondent was marked as having the ability somewhat developed. For instance, when it comes to the ability 'being one with nature', the questions sought to see whether the interviewee loves nature and whether they feel sacredness in nature. If the interviewee loved nature but didn't experience anything sacred in nature, they were marked as having this ability somewhat developed. If all questions regarding one ability were coded as negative, the respondent was marked as not having that ability developed. After each interviewee was assessed this way, I aggregated them to their respective group (e.g. children in the alternative school, adolescents in the conventional school etc.). For each ability and each group, I calculated the percentage of interviewees who have an ability fully developed, who have an ability somewhat developed, and who don't have an ability at all. I made simple bar charts to visualise these results in an easy-to-understand way.

6 RESULTS

In this section, the results for each research question are presented.

6.1 RQ1: PRESENCE OF QUALITIES OF SNS IN THE STUDIED SCHOOLS

The observations showed a difference in the presence of qualities of significant nature situations between the alternative schools and the conventional school, and between the two alternative schools as well. Table 4 shows which qualities were present in each school. The qualities are categorised into the six clusters defined by Giusti et al. (2018). All schools exhibit the quality 'entertainment'. When it comes to the cluster 'environmental epiphanies' (violet), the conventional school does not have any of these qualities. The alternative schools have all qualities of the cluster 'restorative experiences' (green), while the conventional school has the quality 'self-restoration' from this cluster. The alternative schools perform well in the cluster 'nature free play' (red), while the conventional school exhibits two of the five qualities in this cluster. In the cluster 'nature school' (blue), the alternative schools have all qualities while the conventional school has the quality 'involvement of mentors'. The quality 'involvement of animals' (brown) is present in the conventional school and in Terra Nova from the alternative group, but not in Ciranda da Terra. However, the involvement of animals was a planned activity that happened daily in TN, while in RA it was occasional and unplanned (a parrot who stayed in one of the trees in the school yard and caught the attention of the pupils). More detailed results of the observations will be presented below school by school.

Table 4: Presence of qualities of SNS in the studied schools. The qualities are colour-grouped according to the clusters they belong to.

Qualities of SNS	Ciranda da Terra, alternative	Terra Nova, alternative	Rodrigues Alves, conventional
Entertainment	present	present	present
Thought-provocation	present	present	not present
Awe	present	present	not present
Surprise	not present	not present	not present
Intimacy	present	present	not present
Mindfulness	present	present	not present
Self-restoration	present	present	present
Creative expression	present	not present	not present
Physical activity	present	present	present
Challenge	present	present	not present
Engagement of senses	present	present	not present
Child-driven	present	present	present
Involvement of mentors	present	present	present
Structure/instructions	present	present	not present
Social/cultural endorsement	present	present	not present
Involvement of animals	not present	present	present

6.1.1 CIRANDA DA TERRA (CT)

The school day at CT starts with the pupils and teacher sitting in a circle and doing a short meditation together. Then they proceed to the 'circle of the heart' (*roda do coração*) where each pupil and teacher takes a turn to share with the others how they are feeling that day or anything that is on their mind / heart, while the others actively listen. After this, the planning of the day takes place, where the teacher and pupils go through the activities of the day together and the pupils can give input on the planned activities. These circle activities often take place in the school yard, under the shade of trees, and the following qualities of SNS were observed: entertainment, intimacy, mindfulness, engagement of senses, involvement of mentors, social/cultural endorsement, structure/instructions and self-restoration. This is followed by individual project-work by the pupils in the classroom or outdoors, free play outdoors, a snack (often outdoors), taking care of the school garden, and doing teacher-led activities outdoors, such as music and sports. The school day takes place from 8 to 12. Figure 1 shows how many times each activity was observed.

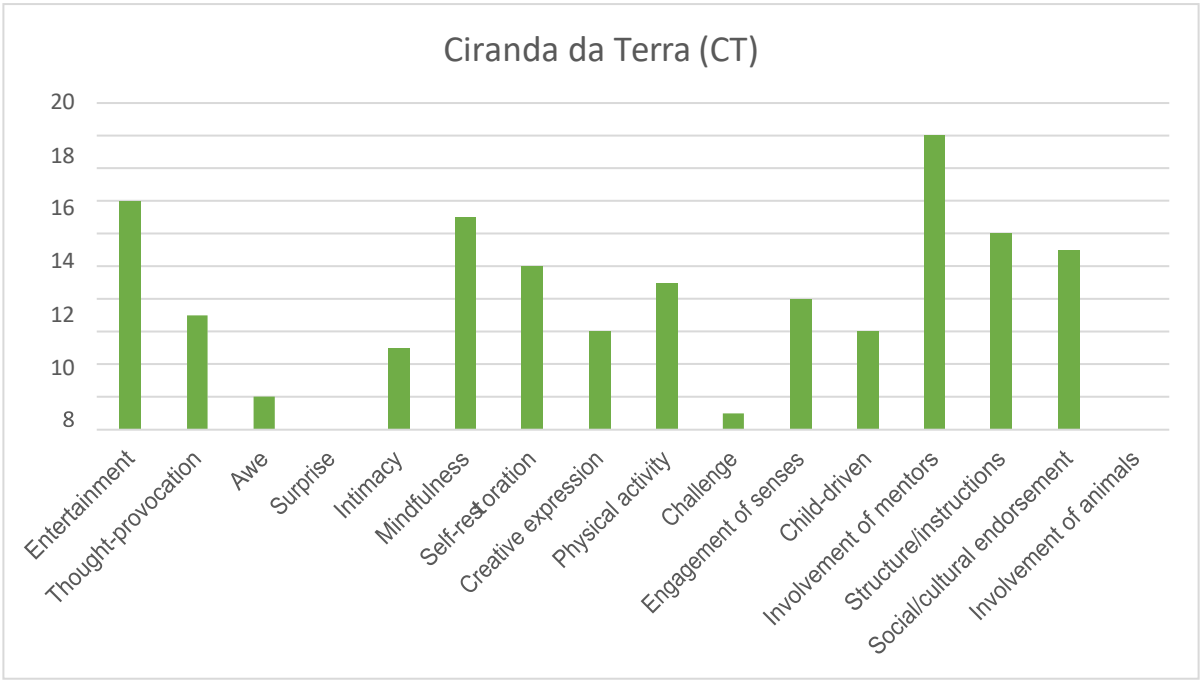

Figure 1: How many times each quality of SNS was observed in CT for six days.

6.1.2 TERRA NOVA (TN)

A typical week at TN goes as follows: on Monday morning, the pupils arrive to the school, at different times. After lunch, the planning of the week takes place in the different work groups. Then there are lessons in the school subjects. On Tuesday, Wednesday and Thursday, the time between breakfast and lunch is used for working in the different project groups (agriculture, animals etc.). Lessons in school subjects take place in the afternoon. On Thursday evening, a common reflection takes place. All classes first discuss within themselves what went well and what potentially did not go well during the week. Then everybody gathers together and one person from each class shares their reflections with the rest of the school. On Friday morning, there are lessons which are followed by the teachers of each subject introducing the project-work to be done during the week spent at home. After this, each pupil writes an individual reflection of their week. After lunch on Friday, the pupils leave the school, since many have long journeys home. Each evening spent at school, there is physical education (PE) outdoors. It is voluntary, and the pupils can choose what activities they want to do. Many play football or volleyball. After PE, there are common activities, such as reading circles, and each Wednesday, there is a small play performed by the theatre group. Figure 2 shows how many times each quality of SNS was observed during one school week at TN.

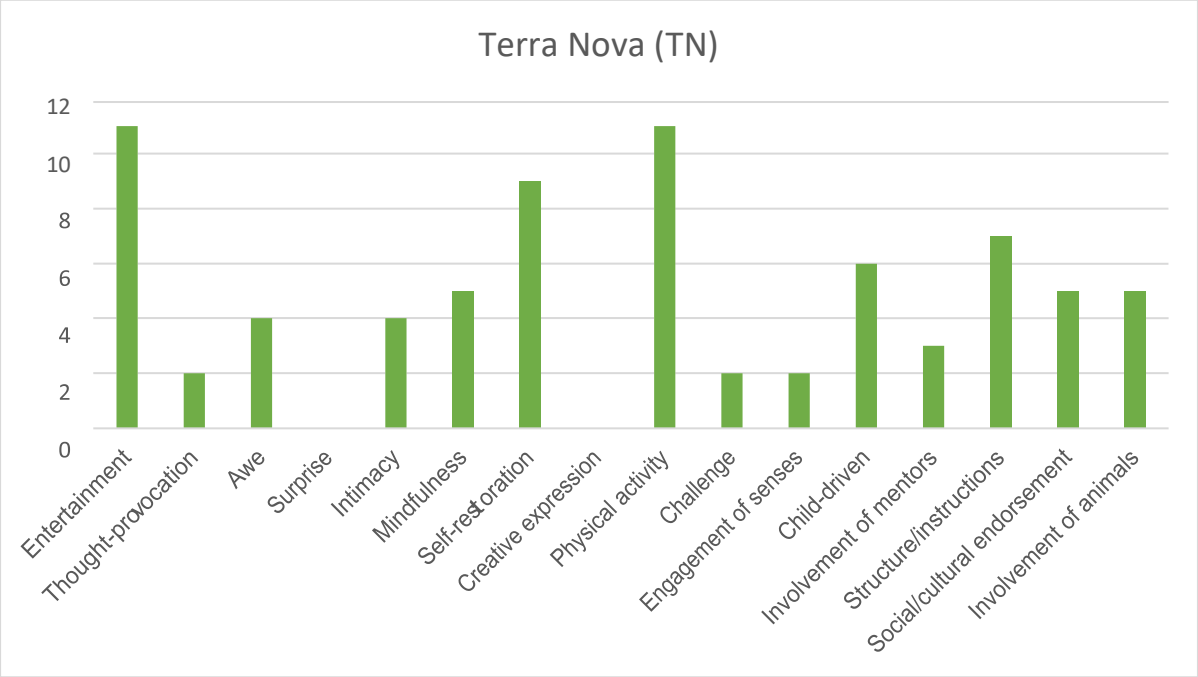

Figure 2: How many times each quality of SNS was observed in TN for five days.

6.1.3 RODRIGUES ALVES (RA)

In RA, there are lessons for the grades 1 to 5 in the morning from 8 AM to 12. In the afternoon, there are lessons for the grades 6–9 and upper secondary level, between 1 and 5 PM. Most school activities take place in the classrooms. Many times, however, the teachers take a group of pupils to work by tables under the shade of trees, since it's more fresh outdoors. The school provides a school meal, which is served outdoors. During breaks, students play football on a sandy pitch in the school yard or spend free time outdoors. Figure 3 shows how many times each quality of SNS was observed at RA.

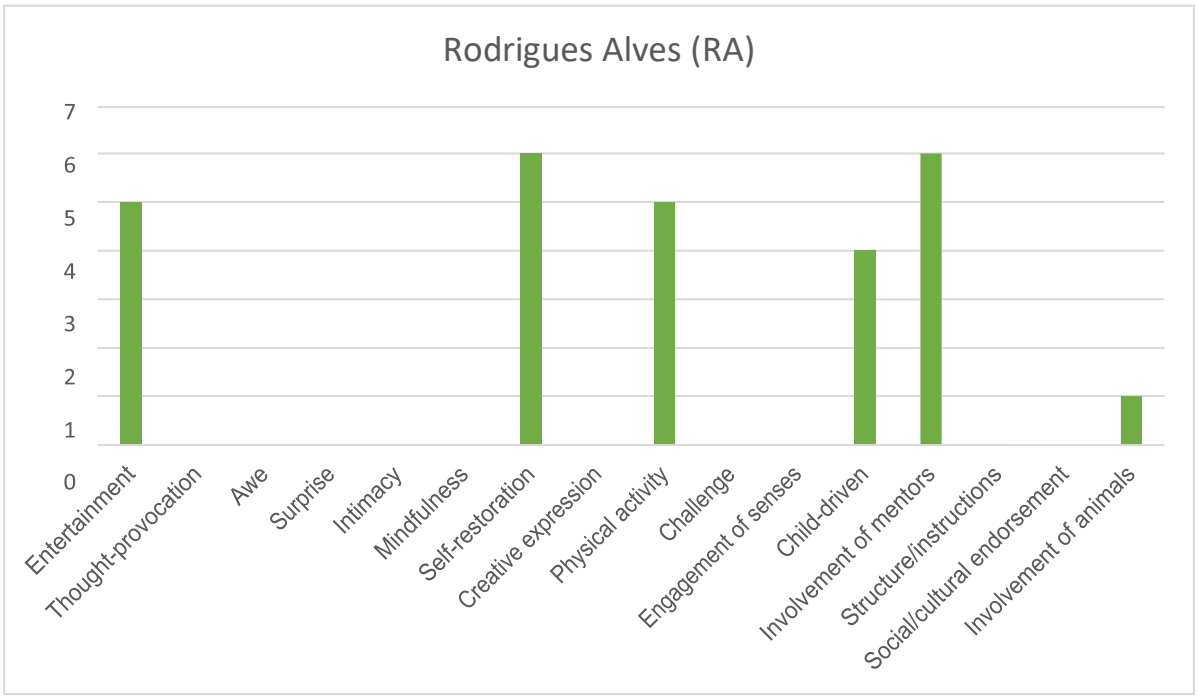

Figure 3: How many times each quality of SNS was observed in RA for four days.

6.2 RQ 2: PRESENCE OF ABILITIES OF HNC IN THE STUDIED GROUPS

This section presents the analysis of the interviews assessing which abilities of HNC the pupils had developed. Every single interviewee had the abilities 'caring about nature' and 'taking care of nature'. In the other abilities, there was variation between the different groups of pupils. For each of the following abilities: 'being curious about nature', 'reading natural spaces' and

'recalling memories with nature', there was only one interviewee who didn't have the ability. Those results are not presented here. The analysis focuses on the abilities with a larger

variation, i.e., more than two interviewees who either didn't have the ability or had it somewhat developed. Green shows the percentage of interviewees within each group who has the ability, yellow shows the percentage of those who have the ability somewhat developed, while red the percentage of those who do not have the ability developed. At the beginning of the section, table 5 gives examples of what kind of quotes were coded as having an ability developed (green in the figures) or not having ability developed (red in the figures). An interviewee was coded as having an ability somewhat developed (yellow) if she had some aspects of that ability but not all.

Table 5: Quotes to illustrate the 10 abilities of HNC – and the lack of these abilities. Ability descriptions from Giusti et al. (2018, P. 9)

ABILITY AND DESCRIPTION	ABILITY DEVELOPED	ABILITY NOT DEVELOPED
Feeling comfortable in natural spaces The child demonstrates ease in natural spaces and feels comfortable with natural elements in the outdoors (e.g. dirt, mud, rain, or the sun).	nature playing, camping, or outdoor sports in nature.	*"I feel normal, getting dirty. (…) I don't mind. (…) When I'm walking* *in nature, it doesn't matter if there are obstacles, if there are insects."* *(RA12, male, 14 years)*
Being curious about nature The child shows interest and motivation in exploring nature.		*"I'd like to see new trees. Next week we'll go to see a tree in Mundo Novo. People hug it. (…) There are many tree species that have gone extinct. I'd like to see them."* *(RA15, male, 17 years)*
Reading natural spaces The child is able to see the possibilities for action in natural spaces that are not purposefully designed by man.		*"To walk in the forest, to look carefully and pay attention to the trees and flowers. (…) I like to hike and camp."* *(RA6, female, 16 years)*
Acting in natural spaces The child is able to perform activities in nature, for example,		*"Oh, sometimes I get fascinated. There's a forest near my house and sometimes I go there. (…) One day I saw a puddle of mud and started to jump in it. It's really fun to play in nature, to climb in trees. I climb a lot."* *(RA13, female, 9 years)*

"I don't like getting dirty. It gives me bacteria."

(RA2, female, 8 years)

Are you curious about nature?

"Hmm, more or less. (…) Less."

For example, when you are in the forest, do you wonder what's that plant, that tree?

"No."

(CT, female, 9 years)

Imagine you're in the forest. What activities can you do there?

"Walking."

And no thing else?

"No"

, just walking." (RA7, male, 15 years)

Do you like to do physical activities in nature?

"No"

(RA16, male, 16 years)

Feeling attached to natural spaces The child shows a sense of belonging to specific natural spaces, to which they feel part of.	*Do you have a favourite place in nature?* *"I do. There's a waterfall close to my home. (…) You can climb up there and it's beautiful, it's really beautiful, and you can see everything from up there. That's my favourite place."* *(TN11, female, 18 years)*	*man has never been, but where rubbish enters."* *(TN4, female, 17 years)*
Knowing about nature The child demonstrates knowledge of animals, plants, and ecological dynamics.	*"Boar: quechada and cateto [two types of wild boar that live in this area], jaguar, arara, monkeys: spider monkey, howler monkey, titis monkey. Did you already see a titis?"* *I don't know, how is it?* *"Red."* *No, I only saw black ones.* *"That's a "macaco prego. They once ate my dad's bananas, pineapples and sweetcorn."* *(CT5, male, 8 years)*	
Recalling memories with nature The child is able to recall past nature experiences and tell stories of lived life with nature.	*"There was a frog that was hurt. I helped him. I took him in the house. And then one day he died."* *(CT8, male, 9 years)*	
Taking care of nature The child is able to be responsible for nature and feels empowered to act for the wellbeing of nature.	*"I like [to take care of nature], to preserve it. To preserve a tree that has been here for a long time. (…) Not just to plant, but also to take care of and preserve what you planted."* *(TN14, female, 17 years)*	
Caring about nature The child is able to feel care, concern, sensitivity, empathy, and respect for nature.	*"If there's something that I don't like, it's people degrading nature. (…) When I see this, it makes my heart sad. (…) I get angry. Sometimes I even go and tell the person off. (…) If I could, I would go to the sea and remove the rubbish. It's crazy to think of the sea so profound, places where*	

Do you have a favourite place in nature? *"No."* *(RA24, female, 14 years)*	*"No."* *(RA2, female, 8 years)*	*There are many things that I don't remember anymore."* *(RA3, male, 8 years)* -
Do you have knowledge on plants, animals?	*"I don't remember.*	-

Being one with nature The child is able to identify with nature and has a sense of profound personal attachment to nature that can be described as spiritual. Love for nature, humbleness in relation to nature, and assuming to be a small part of the immensity of nature are manifestations of this ability	*"That place where I go to bathe in the river. (…) There's a rock higher than the others. I climb on that rock and stay there, relaxing, my feet in the water. (…) It's a sacred place where I go to meditate, to think about life, sometimes to let angry feelings come out, to relax…"* *(TN13, male, 17 years)* *"Nature, I love it! (…) I am part of nature. There are moments when I lie down within the trees. I keep thinking that I'm a tree. It's so lovely."* *(RA13, female, 9 years)*	*"Sacred? No. (…) There are places I like, but to say sacred, I don't think so."* *(RA17, male, 17 years)* *"I like nature. I wouldn't say I love it, I just like it."* *(RA16, male, 16 years)*

Looking at the individual abilities more closely shows that each interviewee attending alternative schools had the ability 'being comfortable in natural spaces' developed, while some in the conventional school don't have this ability or have it somewhat developed (figure 4).

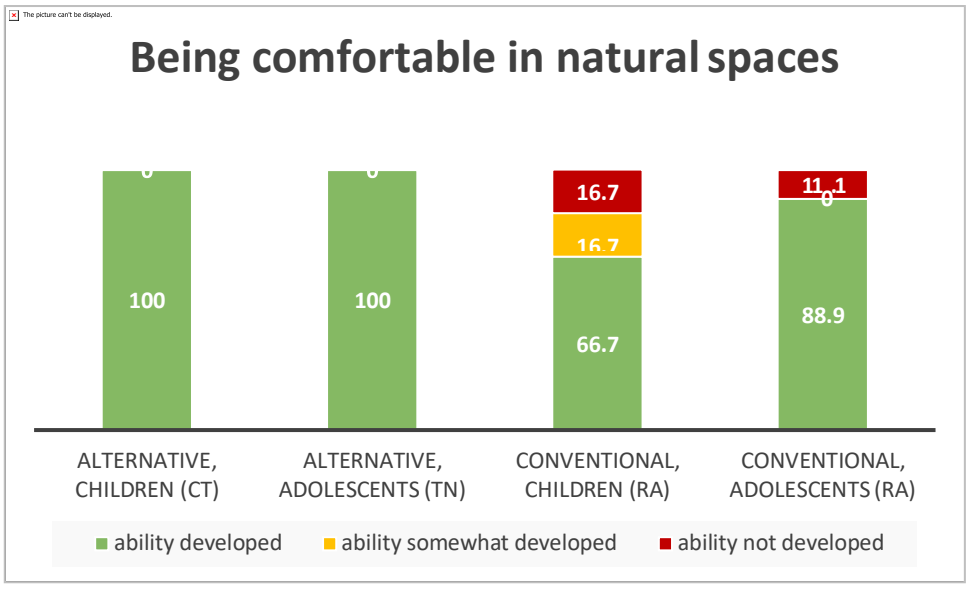

Figure 4: the presence of the ability 'being comfortable in natural spaces' within different groups (shown in percentages).

When it comes to the ability 'acting in natural spaces', both children's groups have it while there are some adolescents who have the ability either somewhat or not developed (figure 5).

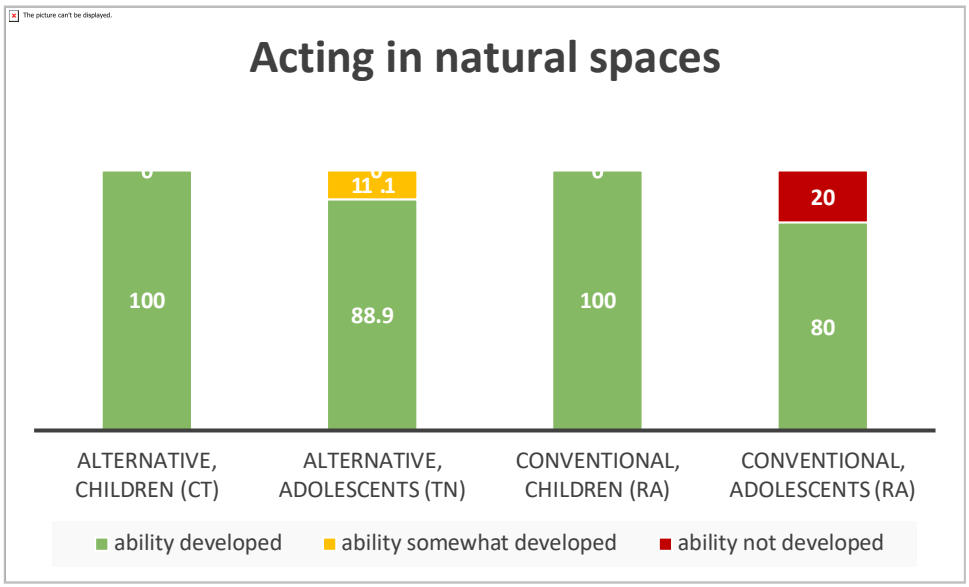

Figure 5: the presence of the ability 'acting in natural spaces' within different groups (shown in percentages).

All respondents in the alternative schools have the ability 'feeling attached to natural spaces' developed, while for some respondents in the conventional groups the ability is somewhat or not developed (figure 6).

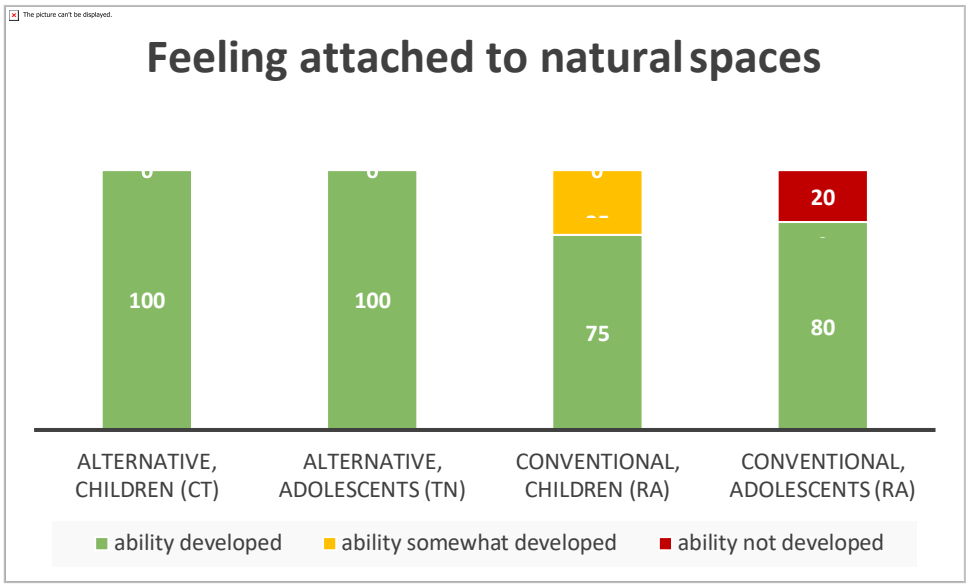

Figure 6: The presence of the ability 'feeling attached to natural spaces' within different groups (shown in percentages).

The ability 'knowing about nature' exhibits more variation between groups (figure 7).

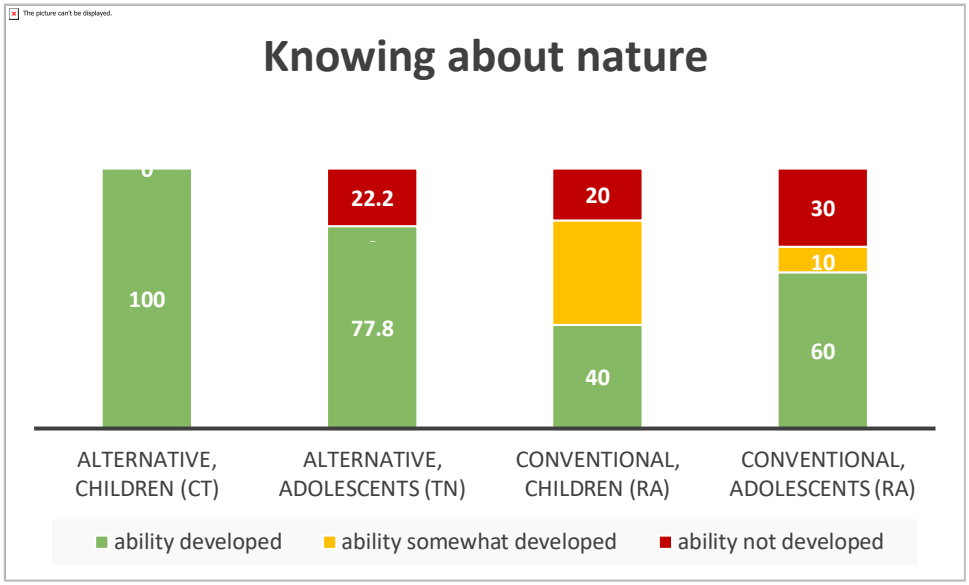

Figure 7: The presence of the ability 'knowing about nature' within different groups (shown in percentages).

When it comes to the ability 'being one with nature', children in both groups have it more developed than adolescents in the same group (figure 8). In the alternative schools, all children have this ability developed and most of the adolescents as well. One respondent (11,1 %) has the ability somewhat but not fully developed in the alternative school TN. In the conventional school, most children have the ability fully developed and some have it somewhat developed. None of the adolescents in the conventional school, however, have this ability completely developed.

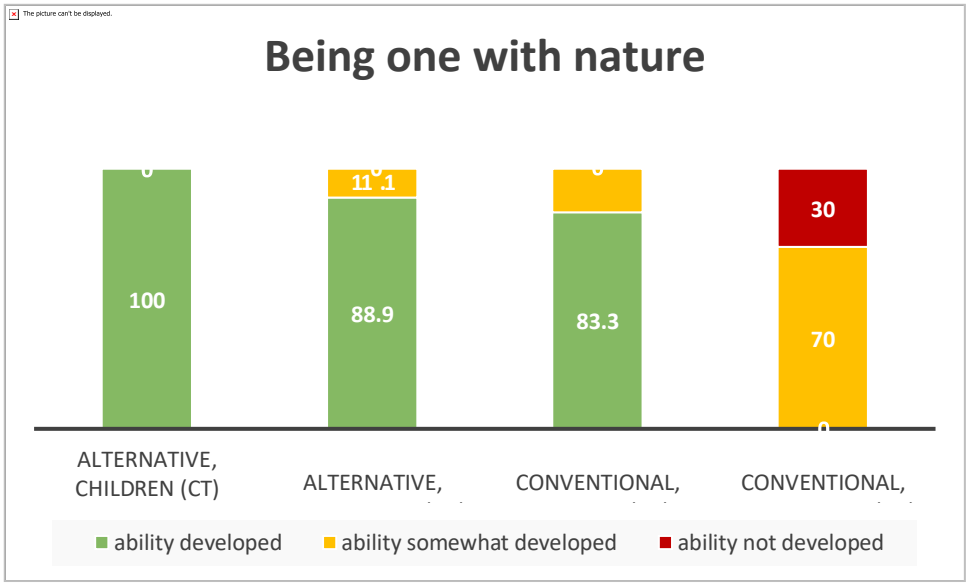

Figure 8: The presence of the ability 'being one with nature' within different groups (shown in percentages).

6.3 RQ 3: THE IMPACT OF THE SCHOOL ON PUPILS' HNC

In order to answer to RQ3 ("How do pupils reflect upon the impact of the school on their HNC?"), the answers from the adolescent groups were analysed. The children's groups were excluded from this analysis, as not all children answered to this question, or their answers showed that they hadn't understood the question. There was a clear difference between the alternative and conventional groups. In the alternative group, every interviewee (n=9) said that the school had had considerable impact on their HNC. In the conventional group, 50 % (n=5) said that the school had had an impact, whereas the other 50 % (n=5) said that the school had not had any impact on their HNC (table 6 shows examples).

Table 6: Quotes illustrating an impact versus no impact of the school on HNC.

IMPACT OF SCHOOL ON HNC	NO IMPACT OF SCHOOL ON HNC
"The school influences [it] a lot. Here we plant, we collect [what we planted]. We literally learn to love [nature]. Nowadays, at home, always when we have to plant something, I'm the one who plants." *(TN10, male, 18 years)*	*"Here at the school we don't deal much with nature. But since I arrived here [from the city to the countryside], my relationship with nature has changed because now I live in the countryside. But due to the school, no."* *(RA15, male, 17 years)*

The two groups also exhibit a qualitative difference in the way the pupils describe the impact of the school. In the conventional group, the impact of the school was not described as being very significant, or the interviewees showed some doubt about the impact. They used expressions such as "I think so", "I don't know" and "I believe so" while describing the impact of the school, whereas interviewees in the alternative group used expressions such as "definitely" and "goodness, a lot" (table 7 shows examples).

Table 7: Quotes illustrating the strength of the impact of school.

STRONG IMPACT	VAGUE IMPACT
"Goodness, a lot, a lot, a lot! Before I just learned things with my dad and my mum. Small things, let's put it that way. Here they have professional teachers. They teach you to like it." *(TN11, female, 18 years)*	

Do you think the school has changed your relationship with nature?

"I don't know. To a certain degree, I think that it has, because we study quite a lot about how nature can help us."

(RA8, female, 17 years)

The interviewees from TN mention several aspects of the school pedagogy that have made an impact on their HNC. An important aspect is that the school provides **first-hand experiences** with nature, experiences that are tied in to the every-day life of the pupils. Concretely working with nature, instead of only learning facts about nature, also makes the interviewees **understand the value of one's work**, which they describe as another aspect that improved their HNC. **Involvement of animals** is also important, as it gives a chance to build an emotional relationship with the natural world. The interviewees tell that the school has **awoken their curiosity** to learn more about nature, i.e. directly strengthened one of the abilities of HNC. All in all, the **ideology of the school** teaches them to preserve nature, and in this way deepen their HNC. Table 8 shows quotes illustrating these different aspects in the school pedagogy that have impacted on the interviewees' HNC.

Table 8: The aspects of school pedagogy at TN that have impacted on the pupils' HNC.

WHAT IN THE PEDAGOGY HAD MADE AN IMPACT ON THE INTERVIEWEES' HNC	ILLUSTRATIVE QUOTES
First-hand experience with nature	*"Before I only knew what I heard. Nowadays I know what I see, what I do, what I learn. There's a big difference. For example: you heard many things about our school, but it's very different to spend a week here, to interact. It works the same way with nature. These things go way beyond hearing what others say."* *(TN14, female, 17 years)* *"So, here at the school we learn a lot to give value, because we produce, we consume what we produced, so you see the importance of this."* *(TN8, female, 16 years)*
Understanding the value of one's own work	*"At the conventional school, I didn't have any contact.* *We didn't even have a garden. Everything was bought. Here we plant our food, our fruit. You learn it here. Your sweat will give your food."* *(TN11, female, 18 years)* *"Soon after entering the school, I ended up in the garden group. I went to the garden and didn't know almost anything, and the teacher taught us how to plant and it was a very good feeling. I had never planted lettuce, and lettuce has a very short cycle to mature and soon it's good for harvesting. So, what I planted, I harvested. It was the first thing that I had*

planted, and it felt very emotional. The best memory was to plant and harvest the fruit of our work."

(TN10, male, 18 years)

Involvement of animals	*"They teach us to work with plants, with animals, so when I came here, I took ownership of nature, because here they teach us how to like it. (…) Here I had more contact with the pigs. I find them really cute, those little piggies."* *(TN11, female, 18 years)* *"Here we get interested, you can go there with the animals, there are plants for you to see how they are, so we interact more. The school gives us these opportunities."* *(TN8, female, 16 years)*
Awakening curiosity	*Do you feel curious about nature?* *"Yes, definitely. Here we always learn about that. You always want more, you always devote yourself to the cause, you always want to explore and learn more. (…) Here we develop with this."* *(TN8, female, 16 years)* *"This school is great, it has made a big difference. It made me look at things that I didn't look at before."* *(TN6, female, 19 years)*
Ideology of the school	*"After I came here, [it] changed! Before, I found nature beautiful, I loved hiking, the river, but after I came here, on top of finding it beautiful, I got this vision of preserving, of taking care of nature. Of not destroying, you know? (…) When I came here, my mind opened like this! (…) It was the ideology of the school. They preach that we need to take care [of nature]."* *(TN6, female, 19 years)*

6.4 RQ 4: EXPANDING THE DESCRIPTIONS OF THE ABILITIES IN ACHUNAS

Two themes emerged from the data that seem important but are not included in the ACHUNAS framework. These themes I called 'spreading knowledge and inspiration' and 'understanding human–nature interaction'. I didn't see these themes as separate abilities of HNC, but rather as aspects of the abilities 'taking care of nature' (the former theme) and 'knowing about nature'

(the latter theme). As these themes were recurring in several interviews, they could be useful to include in the description of the abilities in ACHUNAS. Table 9 below shows quotes to illustrate these two themes.

One important theme that emerged from the data was that of 'understanding human–nature interaction'. This theme appeared in 26 out of 32 interviews, in 54 quotes in total. Many times, when analysing the responses to questions about the interviewees' knowledge about nature, the answers showed that they have knowledge about the human impact on nature and our dependence on nature. Many of these answers exhibit a worry about the current state of the natural world and the future of the biosphere, as the human impact on nature is growing. As this aspect is not present in ACHUNAS, the results of this study would suggest it could be included in the framework. The description for the ability 'knowing about nature' could be expanded as follows: *"The child demonstrates knowledge of animals, plants, ecological dynamics, and the interaction between humans and the natural world."*

Another interesting theme was 'spreading knowledge and inspiration'. This theme was present in 10 out of 32 interviews, and was most common in the alternative school TN. There were 16 quotes in total that exhibited this theme. These 10 interviewees talked about their desire to not only take care of nature themselves, but to make a larger impact by sharing knowledge and inspiration and in this way making others around them also take care of nature. This result suggests that the description for the ability 'taking care of nature' could be expanded as follows: *"The child is able to be responsible for nature and feels empowered to act for the wellbeing of nature. On top of this, the child seeks to spread knowledge and inspiration, and in this way make others around her also take care of nature."*

Table 9: Quotes to illustrate the two themes.

THEME	ILLUSTRATIVE QUOTES
Spreading knowledge and inspiration	*"[Before] it was something personal, something mine. But after I came here (…), I learned to take responsibility of others: not only do my part, but make sure that others do theirs as well. (…) There are some friends there that I even managed to change. And my brothers as well (…) As I don't have very much contact with nature [outside of school time], I can't just go there and fix everything. But I can talk to others and ask them to help."* *(TN4, female, 17 years)* *"This lesson of agrarian science impressed me the most, because I started to know more about the plants. And when I went home, I started to talk to my mum about these things. She liked it."*

	(TN6, female, 19 years)
Understanding human–nature interaction	*"When you destroy forests, they [the animals] will come to your house because they don't have anywhere to live and anything to eat anymore. It's sad."* *(RA18, female, 15 years)* *"But the hunters keep killing the jaguars. This is not nice. Nowadays there are very few of them, of the spotted jaguar. This is sad."* *(CT7, female, 6 years)* *"Nature is my source of life. Without nature, where would we be and what would we become? Our air comes from nature."* *(RA12, male, 14 years)*

7 DISCUSSION

Here the results are discussed in the light of theory and previous research. Then, the methodological strengths and shortcomings of this study are addressed.

7.1 DISCUSSING THE RESULTS

This study showed that pupils who got to experience diverse and recurring first-hand nature experiences at school were more connected with nature than those pupils whose school did not offer these recurring experiences. This resonates with previous research on how people develop a positive relationship with nature during childhood and adolescence (Chawla, 2007; Wells & Lekies, 2006; Giusti et al., 2014). This is also in line with situativity theory, according to which real-life experiences result in best learning. The observations showed that the alternative schools Ciranda da Terra and Terra Nova present pedagogical approaches that are based on the culture of practitioner activities instead of classroom activities (Brown et al., 1989). This means that learning happens in real-life settings, and hence becomes more experientially real for the pupils. They work as practitioners in a real-life context instead of learning abstractly in a class-room context. Situativity theory stresses the role of the context (Choi & Hannafin, 1995), and the context provided by the alternative schools for the pupils to develop a holistic HNC is a genuine one. When it comes to learning to connect with nature, a classroom does not offer a genuine context for this.

Holistic learning using the entire body and all the senses seems, therefore, more suitable for learning to connect with nature than learning only using our mind. This raises the importance of the embodied ontology. The multifaceted aspects of HNC explored in this study cannot be explained with an ontology that treats the mind and body as separate. As Hungerford and colleagues (1980) argue, environmental education has often focused on the knowledge aspect putting too little emphasis on experiential, embodied ways to learn about nature and learn to love nature. Human–nature connection is, however, developed through repeating nature routines that exhibit a wide range of embodied qualities (Giusti et al., 2018). The findings of this study strengthen this claim by showing that pupils have a stronger HNC in schools that provide opportunities for them to connect with nature in a holistic, embodied way: to climb in trees around the school, to get their hands dirty working in the garden, to hold new-born pigs in their arms…

This study reveals a difference in the qualities of significant nature situations offered by the two types of school. The conventional school offers fewer qualities, and hence fewer possibilities for pupils to develop the different abilities of HNC. This is apparent when comparing the results for RQ1 and RQ2. For example, when it comes to children developing the ability 'being comfortable in natural spaces', belonging to the cluster 'being *in* nature', the qualities of SNS that are important are 'child-driven', 'engagement of senses', 'awe' and 'physical activity' (Giusti et al., 2018, p. 12). The alternative schools provide all of these qualities, and all of the interviewees in these schools have this ability completely developed. However, in the conventional school, the qualities 'engagement of senses' and 'awe' are missing, and not all interviewees there are comfortable in natural spaces. The clearest difference between pupils in the alternative school and pupils in the conventional school is present in the ability 'being one with nature'. Most interviewees in the alternative schools have this ability completely developed and none of them has the ability missing. In the conventional school, instead, none of the adolescents have this ability completely developed even though most of the children do. This ability belongs to the cluster 'being *for* nature', which needs the following qualities of SNS to be developed: 'thought-provocation', 'social/cultural endorsement', 'structure/instructions' and 'mindfulness' (Giusti et al., 2018, p. 12). Each of these qualities are offered in the two alternative schools, but none of them is offered in the conventional school. This shows how important it is for the nature situations to be not only recurring, but also with a set of different qualities in order for them to make children and adolescents develop all of the abilities of HNC.

One contribution of this study is to suggest two themes to be included in the ACHUNAS framework. The more important one of them is 'understanding society-nature interaction', which relates to the knowledge aspect of HNC. I see this theme as crucial as it was present in a large number of interviews. This result gives a reminder that knowing about nature is deeply linked to knowing about the interaction between the natural and the human world. These two worlds cannot be considered as separate. Instead, they are intertwined and impact fundamentally on one another, particularly in the current era of the Anthropocene (Steffen et al., 2011; Rockström et al., 2009). In order for children and adolescents to become biosphere stewards, it is central for them to understand the dependence of humanity on the biosphere that sustains us, as well as the impact that humanity has on our biosphere. Therefore, I argue that knowing about nature only is not enough; the knowledge has to include knowing about the interaction between the human and the natural world.

Another interesting theme that emerges from the interviews is that of spreading knowledge and inspiration. It is not as prominent in the data as the theme of understanding society–nature interaction. Spreading knowledge and inspiration is strongly present in the alternative upper-secondary school Terra Nova. This raises the question what in the pedagogy makes the pupils feel a desire to spread knowledge and inspiration to people around them, and reversely, why most of the pupils in the other schools do not express this desire. This could be studied further.

Overall, it seems that school education can have a considerable impact on HNC. However, as this study is not a longitudinal study with data collected before and after a pupil entering a specific school, it cannot objectively indicate a causal impact. The finding that pupils in the alternative schools are more connected with nature than pupils in the conventional school may be related to other explaining factors. For instance, it may be that their families already appreciate nature more than an average family, and therefore they chose the alternative school in the first place. Therefore, it would be interesting to apply a longitudinal method to evaluate impact. The interview used in this research could be conducted with adolescents before they enter upper secondary school and one or two year(s) after. As all interviewees attending the Terra Nova school state that the school has had an impact on their HNC, it would be particularly interesting to see how the interview results vary before pupils entering this particular school and after they have spent some time at the school.

Finally, as stated in the beginning, (re)connecting with nature is a prerequisite for a sustainability transformation (Abson et al., 2017; Folke et al., 2011). The contribution of this study is to show what kind of pedagogical approach is linked to pupils connecting with nature. Since this study found that education that follows the principles of situativity theory is linked to a more developed HNC, it would be important to take this into account while planning environmental education in schools. In order for the children and adolescents of today to become biosphere stewards of tomorrow, schools should provide them with diverse first-hand experiences in nature; experiences that, as Bai and Romanycia (2013) put it, make "ecological principles into habits of mind, body and heart" (cited in Nazir and Pedretti 2016, p. 2). These children and adolescents can then spread their knowledge and inspiration to take care of the natural world to their friends and family, and in this way create a domino effect of positive change, as this 17-year-old girl describes.

"I can't just go there and fix everything. But I can talk to others and ask them to help. For example, if I do it, and you do it as well, there are already two people doing it. And if we talk in a gentle way, the other starts to get more interested in the cause. If you're a gentle person, and show example to others in an appealing way, the others will take this forward. (…) So, your brother will come, in the future he will teach his daughter, the daughter will teach her friends, and in this way, it will keep on going…" (TN4)

7.2 METHODOLOGICAL AND ETHICAL REFLECTIONS

The assessment of the pupils' HNC was based on self-assessment. As Zylstra and colleagues (2014, p. 129) note, "like all self-report measures, there is inherent uncertainty in the validity of the results produced". This is to be kept in mind when looking at the results. The interviewees had to self-report whether they, for example, like taking care of nature or love nature. I noticed a tendency for the interviewees to answer "yes" much more likely than "no" to all questions, which can be related to the social desirability bias (Bryman, 2012, pp. 227–228). This was apparent in the informal discussions as well. For instance, when asked if they liked the school, it happened that the interviewees answered "yes" in the beginning but digging deeper made them tell that actually they didn't like several things at the school.

The social desirability bias may distort the results. In some cases, it was evident that "yes" meant "yes". In these cases, the interviewees spontaneously deepened their answers by illustrating them with examples. The cases in which the interviewees merely answered "yes" without giving any examples raised some doubts whether they really meant it, or whether interviewees simply are more likely to answer "yes" than "no". Another reflection about self-reporting regards knowing about nature. I noticed that many respondents in Terra Nova assessed their knowledge about nature as not very high. However, the school teaches them a lot about nature, and it was apparent that they knew much more than an average adolescent. Perhaps when the level of knowledge is high, people also understand the complexity of the natural world and hence recognise that there is much that they do not know yet, much more to be learned.

When doing qualitative research, it is important for the researcher to understand the wider social context of the interviewees (Kvale, 1996). In the case of this research, I had a different level of understanding of the context of the three studied schools. I spent most time in the community where Ciranda da Terra is located, as this was my base camp during my two-month stay in Mato Grosso. Hence, I have a more nuanced understanding of the lives of the people there than in Terra Nova or Rodrigues Alves. In order to overcome this shortcoming, I did my best to immerse myself in all the activities and in the everyday life of the pupils in the other schools. It was easier in Terra Nova, as it is a boarding school, and the pupils and I stayed at the school for the entire week, sleeping there, sharing meals and doing informal activities such as sports together. This gave me countless opportunities to mingle with the pupils and with the teachers, and these informal discussions deepened my understanding of the context.

In Rodrigues Alves, I unfortunately did not have this same opportunity. I slept in the house of the school coordinator and the pupils lived spread out over a larger area, so I did not manage to mingle with them outside of school hours. In order to gain understanding of the history and everyday life of the community, I had informal discussions with an older man who had been living there for decades and was active in the community. These dinner-table discussions taught me a lot about the context of the community and the school.

The positionality of a researcher from a high-income country conducting research in lower or middle-income countries is not an unproblematic one (Manohar et al., 2019). Knowing this, I had felt doubts about how my participants would feel about my research project and if it would be ethical to conduct research in a context that is far away from my cultural roots. I was driven by a genuine interest to learn about the local context in Brazil but was aware that my doing research there could be seen in a negative light. However, this research project showed me a different viewpoint regarding this question. My interviewees seemed genuinely inspired by the fact that I had come from far away just to learn about their lives and their ways of thinking. I got this spontaneous feedback from several people in all of the schools. This was very encouraging and showed that this issue is not black and white. It depends on the context of the place studied and also a lot on the attitude of the researcher towards the interviewees. As with all interview research, it is extremely important in cross-cultural research for the researcher to communicate with the interviewees with an open mind and genuine interest to learn from them, instead of imposing anything on them or simply extracting knowledge from them.

This is related to Kvale's 'interviewer as a traveller' versus 'interviewer as a miner' metaphors (1996, pp. 3–5). In the interviewer as a miner metaphor, the researcher extracts knowledge from her interviewees like a miner extracts minerals from the ground. According to the interviewer as a traveller metaphor, the researcher is on a journey where she converses with people, and there is an inherent understanding that these conversations may change both the researcher and the interviewee. As Kvale (1996, p. 4) puts it, "the traveller can also lead others to new understanding and insight as they, through their own story-telling, may come to reflect on previously natural-seeming matters". This happened during this research project. An 18-year-old girl, for instance, reflected after the interview on how the interview questions had given her new insights on why she feels connected to certain natural spaces.

"I had never talked like this about nature before (…). Talking like this about these things I realised even more the importance of these things. Before, I never had thought about why I go to that waterfall (…). It was talking with you that I understood the meaning behind it." (TN11)

8 CONCLUSIONS

Human–nature connection (HNC) is one factor that contributes to sustainable behaviour. Therefore, by improving children and adolescents' HNC, they can become biosphere stewards and protect our planet in the future. The objective of this study was to investigate the relation between the pedagogical approach of the school and the HNC of the pupils in order to see what kind of pedagogy would be best for raising biosphere stewards.

Firstly, this study showed that alternative schools that follow the principles suggested by situativity theory, provided a larger range of qualities of significant nature situations. This means that they offered more chances for pupils to develop their HNC. Secondly, the study found that pupils in alternative schools had a more developed HNC than pupils in the conventional school. Accordingly, pupils in the alternative school stated that the school had had an impact on their HNC, while half of the pupils interviewed in the conventional school stated that the school had not made an impact on their HNC. Lastly, the study found two themes of HNC that could be included in the theoretical framework used in this research – ACHUNAS. These themes are 'understanding human–nature interaction' and 'spreading knowledge and inspiration'.

It would be important to get a deeper understanding of the relationship between school pedagogy and pupils' HNC. The results presented here show that there is indeed a relation, but the methods of this study don't allow for causal conclusions to be drawn. In order to understand the potential causality between a certain type of pedagogy and the development of pupils' HNC, it would be interesting to conduct a longitudinal study comparing pupils' HNC before and after they enter a specific school. Understanding how pedagogy creates biosphere stewards would then be useful for generating policy recommendations regarding environmental education.

9 LITERATURE CITED

Abson, D. J., Fischer, J., Leventon, J., Newig, J., Schomerus, T., Vilsmaier, U., … Lang, D. J. (2017). Leverage points for sustainability transformation. *Ambio*, *46*(1), 30–39. https://doi.org/10.1007/s13280-016-0800-y

Antunes-Rocha, M. I., de Fátima Almeida Martins, M., & Alves Martins, A. (Eds.). (2012). *Territórios Educativos na Educação do Campo: Escola, Comunidade e Movimentos Sociais* (2nd ed.). Belo Horizonte: Editora Gutenberg.

Associação ONG Amigos do Vale do Rio Teles Pires. (2017). *Democratização da educação do campo: fortalecimento da Escola Comunitária Ciranda da Terra*. Associação ONG Amigos do Vale do Rio Teles Pires.

Barab, S. A., & Roth, W.-M. (2006). Curriculum-Based Ecosystems: Supporting Knowing from an Ecological Perspective. *Educational Researcher*, *35*(5), 3–13. https://doi.org/10.3102/0013189X035005003

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated Cognition and the Culture of Learning. *Educational Researcher*, *18*(1), 32–42. https://doi.org/10.2307/1176008

Bryman, A. (2012). *Social Research Methods* (4th ed.). Oxford: Oxford University Press.

Chawla, L. (2007). Childhood Experiences Associated with Care for the Natural World: A Theoretical Framework for Empirical Results. *Children, Youth and Environments*, *17*(4), 144–170.

Chawla, L., & Cushing, D. F. (2007). Education for strategic environmental behavior. *Environmental Education Research*, *13*(4), 437–452. https://doi.org/10.1080/13504620701581539

Choi, J.-I., & Hannafin, M. (1995). Situated Cognition and Learning Environments: Roles, Structures, and Implications for Design. *Educational Technology Research and Development*, *43*(2), 53–69.

Ciranda da Terra, Educação em Movimento. (2017). Projeto Político Pedagógico.

Escola Agrícola Terra Nova. (2018). *Formação e planejamento*. PowerPoint Presentation.

Figueiredo, V. (2018, August 30). Personal communication with Vinicio Figueiredo, mathematics teacher at Escola Agrícola Terra Nova.

Folke, C., Jansson, Å., Rockström, J., Olsson, P., Carpenter, S. R., Chapin, F. S., … Westley, F. (2011). Reconnecting to the Biosphere. *AMBIO*, *40*(7), 719. https://doi.org/10.1007/s13280-011-0184-y

Freire, P. (1970). *Pedagogia do oprimido*. Rio de Janeiro: Editora Paz e Terra.

Giusti, M., Barthel, S., & Marcus, L. (2014). Nature Routines and Affinity with the Biosphere: A Case Study of Preschool Children in Stockholm. *Children, Youth and Environments*, *24*(3), 16–42. https://doi.org/10.7721/chilyoutenvi.24.3.0016

Giusti, M., Svane, U., Raymond, C. M., & Beery, T. H. (2018). A Framework to Assess Where and How Children Connect to Nature. *Frontier in Psychology*, *8*.

Grupos de trabalho. (n.d.). Retrieved 2 February 2019, from https://www.escolaagricolaterranova.com/grupos-de-trabalho

Haila, Y. (2000). Beyond the Nature-Culture Dualism. *Biology and Philosophy*, *15*(2), 155–175. https://doi.org/10.1023/A:1006625830102

Haraway, D. (1988). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies*, *14*(3), 575–599. https://doi.org/10.2307/3178066

Horiye Rodrigues, C. (2017). *Livelihood Strategies of Family Farmers in the Amazon Frontier of Mato Grosso, Brazil*. Retrieved from http://ufdc.ufl.edu/l/UFE0051532/00001.

Hungerford, H., Peyton, R. B., & Wilke, R. J. (1980). Goals for Curriculum Development in Environmental Education. *The Journal of Environmental Education*, *11*(3), 42–47. https://doi.org/10.1080/00958964.1980.9941381

Hungerford, H. R., & Volk, T. L. (1990). Changing Learner Behavior Through Environmental Education. *The Journal of Environmental Education*, *21*(3), 8–21. https://doi.org/10.1080/00958964.1990.10753743

Ives, C. D., Giusti, M., Fischer, J., Abson, D. J., Klaniecki, K., Dorninger, C., … von Wehrden, H. (2017). Human–nature connection: a multidisciplinary review. *Current Opinion in Environmental Sustainability*, *26-27*, 106–113. https://doi.org/10.1016/j.cosust.2017.05.005

Kals, E., Schumacher, D., & Montada, L. (1999). Emotional Affinity toward Nature as a Motivational Basis to Protect Nature. *Environment and Behavior*, *31*(2), 178–202. https://doi.org/10.1177/00139169921972056

Kvale, S. (1996). *InterViews. An Introduction to Qualitative Research Interviewing*. Thousand Oaks: SAGE Publications.

Manohar, N., Liamputtong, P., Bhole, S., & Arora, A. (2019). Researcher Positionality in Cross-Cultural and Sensitive Research. In P. Liamputtong (Ed.), *Handbook of Research Methods in Health Social Sciences* (pp. 1601–1616). Singapore: Springer Singapore. Retrieved from https://doi.org/10.1007/978-981-10-5251-4_35

Martin, C., & Czellar, S. (2016). The extended Inclusion of Nature in Self scale. *Journal of Environmental Psychology*, *47*, 181–194. https://doi.org/10.1016/j.jenvp.2016.05.006

Nazir, J., & Pedretti, E. (2016). Educators' perceptions of bringing students to environmental consciousness through engaging outdoor experiences. *Environmental Education Research*, *22*(2), 288–304. https://doi.org/10.1080/13504622.2014.996208

Paulo de Lima, P. (2018, September 10). Personal communication with Pedro Paulo de Lima, director of Escola Estadual Rodrigues Alves.

Raymond, C. M., Giusti, M., & Barthel, S. (2017). An embodied perspective on the co-production of cultural ecosystem services: Toward embodied ecosystems. *Journal of Environmental Planning and Management*.

Raymond, C. M., Singh, G. G., Benessaiah, K., Bernhardt, J. R., Levine, J., Nelson, H., … Chan, K. M. A. (2013). Ecosystem Services and Beyond: Using Multiple Metaphors to Understand Human-Environment Relationships. *BioScience*, *63*(7), 536–546.

https://doi.org/10.1525/bio.2013.63.7.7

Ripple, W. J., Wolf, C., Newsome, T. M., Galetti, M., Alamgir, M., Crist, E., … Laurance, W. F. (2017). World Scientists' Warning to Humanity: A Second Notice. *BioScience*, *67*(12), 1026–1028. https://doi.org/10.1093/biosci/bix125

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., Lambin, E. F., … Foley, J. A. (2009). A safe operating space for humanity. *Nature*, *461*(7263), 472–475. https://doi.org/10.1038/461472a

Schultz, P. W. (2001). Inclusion with Nature: The Psychology Of Human-Nature Relations. In *Psychology of Sustainable Development* (Schmuck, P., Schultz, P. W.). Boston, M.A.: Springer.

Steffen, W., Persson, Å., Deutsch, L., Zalasiewicz, J., Williams, M., Richardson, K., … Svedin, U. (2011). The Anthropocene: From Global Change to Planetary Stewardship. *AMBIO*, *40*(7), 739–761. https://doi.org/10.1007/s13280-011-0185-x

Walker, B., & Salt, D. (2006). *Resilience Thinking. Sustaining Ecosystems and People in a Changing World. How Can Landscapes and Communities Absorb Disturbance and Maintain Function?* Washington D. C.: Island Press.

Wells, N. M., & Lekies, K. S. (2006). Nature and the Life Course: Pathways from Childhood Nature Experiences to Adult Environmentalism. *Children, Youth and Environments*, *16*(1), 1–24.

Wrublevski Aued, B., & Vendramini (Eds.). (2012). *Temas e problemas no ensino em escolas do campo* (1st ed.). São Paulo: Editora Outras Expressões.

Zylstra, M. J., Knight, A. T., Esler, K. J., & Grange, L. L. L. L. (2014). Connectedness as a Core Conservation Concern: An Interdisciplinary Review of Theory and a Call for Practice. *Springer Science Reviews*, *2*(1-2), 119–143. https://doi.org/10.1007/s40362-014-0021-3

10 APPENDICES

10.1 APPENDIX 1: OBSERVATION GUIDE TO ASSESS THE PRESENCE OF SNS IN THE STUDIED SCHOOLS

QUALITIES OF SNSs	DESCRIPTION	OBSERVATION
Entertainment	Nature situations that are joyful, amusing, or enjoyable.	Children show enjoyment and joy in nature.
Thought-provocation	Nature situations that create new ways of conceiving human-nature interaction.	Children seem to change their thinking as a result of the nature situation, which is observable for instance in the way they speak about it.
Intimacy	Nature situations that are private or intimate and allow a personal experience with nature.	Children seem to experience something intimate with nature.
Awe	Nature experiences that are amazing, of overwhelming attraction, or mesmerizing, that create a "wow effect".	Children seem amazed and mesmerized by nature.
Mindfulness	Nature situations that grasp children's focus and alertedness, that make children "be in the flow".	Children's attention seems to be fully on the nature situation.
Surprise	Nature situations that are unpredicted or unexpected. In these nature situations children's line of thought is interrupted, and nature draws their attention.	Children seem surprised and shift their focus towards the nature situation.
Creative expression	Nature situations that involve arts, myths, stories, music, or role-play.	Children do arts, play music or role-play, or tell or listen to stories or myths in nature.
Physical activity	Nature situations that require body movement or any form of physical activity.	Children perform physical activity in nature.
Engagement of senses	Nature situations that activate children's senses (smell, touch, hearing, etc.)	Children seem present in the nature situation using their senses fully.
Involvement of mentors	Nature situations that involve persons, such as teachers, experts or relatives, who are capable of inspiring, encouraging or leading the nature experience for the child.	There are engaged adults are involved in then nature situation.
Involvement of animals	Nature situations that involve interaction with animals.	There are animals involved in the nature situation.
Social/cultural endorsement	Nature situations that involve positive peer pressure, support from significant others, social acceptance or cultural reinforcement.	Children get support and positive peer pressure from the nature situation.
Structure/instructions	Nature situations characterized by a set of rules that define the frame within which the child can act.	Children are led by rules and instructions within a structured nature situation.
Child-driven	Nature situations that are chosen by the child, child-initiated (children autonomously decide when to begin the nature activity), and open-ended (children autonomously decide when to conclude the nature activity).	Children choose to take part in nature situations and decide on the duration themselves.
Challenge	Nature situations in which children overcome psychologically or physically adverse conditions, such as fear or cold.	Children are challenged and overcome the challenges during the nature situation.
Self-restoration	Nature situations of psychological, physical, or social relief. For example, relief from stress, fatigue, or gender stereotypes.	Children overcome gender or other stereotypes during the nature situation. They seem restored.

10.2 APPENDIX 2: INTERVIEW GUIDE, TRANSLATED INTO ENGLISH

I will ask you about your relationship with nature and a bit about your experiences at this school as well. There are no wrong answers; all your thoughts are interesting to me. I'm interested in learning how you think and feel about nature.

Let's talk about the school a bit first. How long have you been to this school? Do you like the school? What do you like most at the school? Have you been to a different school before this one? Which one do you prefer and why?

So, let's talk more about nature now… What is nature for you?

ABILITIES	DESCRIPTION	INTERVIEW QUESTIONS
Feeling comfortable in natural spaces	The child demonstrates ease in natural spaces and feels comfortable with natural elements in the outdoors (e.g. dirt, mud, rain, or the sun).	Do you like to spend time in nature? Sometimes when you play in nature, you get muddy and dirty. How do you feel? Do you feel comfortable in different kinds of places in nature? Is there an animal that disgusts you?
Being curious about nature	The child shows interest and motivation in exploring nature.	What is most interesting at school? What do you most like to learn? Are you curious about nature? Are you interested and motivated to explore nature and learn more about it? What would you most like to learn?
Reading natural space	The child is able to see the possibilities for action in natural spaces that are not purposefully designed by man.	Imagine you are in the forest. What would you like to do there? What possibilities for playing or action do you see there? How about by the river?
Acting in natural spaces	The child is able to perform activities in nature, for example, nature playing, camping, or outdoor sports in nature.	Are you able to do the activities you just described? Are you able to fish or collect food in nature? Are you able to climb in trees or rocks? Can you do sports in nature?
Feeling attached to natural spaces	The child shows a sense of belonging to specific natural spaces, to which they feel part of.	

If your family moved to a city, what would you miss here?	a v e D o a y f o a u v o h	urite place in nature? Could you describe it to me? Is there a place that you feel part of?
Knowing about nature	The child demonstrates knowledge of animals, plants, and ecological dynamics.	Do you have knowledge about different plants? And animals? What species do you know in the forest and what is their role in the forest? What vegetables do you know in the garden? Would you say you have knowledge about how nature works?
Recalling memories with nature	The child is able to recall past nature experiences and tell stories of lived life with nature.	What´s your best memory in nature? And what would be your worst memory?

Taking care of nature	The child is able to be responsible for nature and feels empowered to act for the wellbeing of nature.	Do you like to take care of nature? What kind of activities do you do to take care of nature? How do you feel taking care of nature? Do you have a pet that you are responsible for? Can you take care of the garden? How do you feel when taking care of nature?
Caring about nature	The child is able to feel care, concern, sensitivity, empathy, and respect for nature.	Have you ever seen an animal that was hurt? Could you tell me more about the situation? How did you feel? Imagine that one morning you wake up and see that these trees were cut down. How would this make you feel? Do you feel empathy, respect and caring towards nature?
Being one with nature	The child is able to identify with nature and has a sense of profound personal attachment to nature that can be described as spiritual. Love for nature, humbleness in relation to nature, and assuming to be a small part of the immensity of nature are manifestations of this ability.	Do you love nature? How do you understand the word 'sacred'? Is there a place that you experience as sacred? What place is this? Is there something in nature that you experience as sacred? Which of these pictures would you most identify with? Which image best represent your relationship with nature? (Showing them the pictures from Inclusion of Nature in Self scale, developed by Schultz (2001). I had drawn the circles on a separate paper and the two circles were in different colours to make it visually more appealing to children.).  This picture copied from Martin & Czellar (2016, p. 186)

Do you think that this school has changed your relationship with nature? How?

Is there anything else you would like to add, anything you want to talk more about? Anything you want to ask me? Thank you so much for your time! It was really fun to talk with you and it helped me a lot with my research.

10.3 APPENDIX 3: INTERVIEW GUIDE IN PORTUGUESE

Eu vou te perguntar sobre a sua relação com a natureza e um pouco sobre as suas experiências aqui na escola também. Não há respostas erradas: eu estou interessada sobre como você sente a natureza como uma parte da sua vida.

Vamos falar sobre a escola um pouco. Quanto tempo você já frequenta essa escola? Você gosta dessa escola? O que você gosta mais aqui na escola? Você frequentou uma outra escola antes? Qual escola você prefere e por quê?

Vamos falar mais sobre a natureza agora... O que é a natureza para você?

HABILIDADE	DESCRIÇÃO	QUESTÕES
Sentir-se confortável nos espaços naturais	A criança demonstra bem-estar nos espaços naturais e sente-se confortável com elementos naturais ao ar livre (ex. sujeira, lama, chuva ou sol).	Você gosta de passar tempo na natureza? As vezes quando você brincar na natureza, você fica cheio de lama e sujo. Como você se sente? Geralmente, você se sente confortável em diferentes espaços naturais? Há algum animal que você não goste? Qual animal e por quê?
Estar curiosa sobre a natureza	A criança demonstra interesse e motivação para explorar a natureza	O que é mais interessante aqui na escola? Você sente curiosidade sobre a natureza? Você tem interesse e motivação para explorar a natureza e aprender mais sobre ela? O que você é mais curioso de aprender?
Ler os espaços naturais	A criança é capaz de perceber possibilidades de ação nos espaços naturais que não são propositalmente planejados pelo homem.	Imagina que você está na floresta. Quais possibilidades existem lá para brincar? Que tipos de coisas você pode fazer na floresta? E à beira do rio?
Agir nos espaços naturais	A criança é capaz de realizar atividades na natureza, por exemplo, brincar na natureza, acampamento ou esportes ao ar livre na natureza.	Você é capaz de fazer as atividades que você acaba de descrever? Você é capaz de pescar / colher comida? Você é capaz de subir em árvores ou rochas? Você sabe fazer esporte ou atividades físicas na natureza?
Sentir-se conectado a um espaço natural	A criança demonstra um sentimento de pertencimento a espaços naturais específicos, dos quais ela se senta parte.	Se a sua família se mudasse para cidade, do que você sentiria falta aqui? Você tem um lugar favorito na natureza? Você poderia descrevê-lo para mim? Então, há um lugar na natureza que você se sente parte?

Saber sobre a natureza	A criança demonstra conhecimento sobre animais, plantas e dinâmica ecológica.	Você conhece diferentes plantas na floresta? E animais? Quais espécies você conhece na floresta e qual o papel deles? Quais vegetais você conhece em uma horta? Você diria que você tem conhecimento sobre como a natureza funciona?
Lembrar-se de memórias com a natureza	A criança é capaz de lembrar de experiências antigas com a natureza e contar histórias de vida vividas com a natureza.	Qual é sua melhor memória na natureza? E qual seria sua pior memória na natureza?

Cuidar da natureza	A criança é capaz de ser responsável pela natureza e sente-se forte para agir para o bem-estar da natureza.	Você gosta de cuidar da natureza? Que tipo de cuidar? Você tem algum animal doméstico por qual você é responsável? Você é capaz de cuidar de uma horta? Como você se sente cuidando da natureza?
Importar-se com a natureza	A criança é capaz de sentir carinho, interesse, sensibilidade, empatia e respeito à natureza.	Já viu algum animal machucado alguma vez? Como você se sentiu? Imagine que em uma manhã você acorde e veja que todas estas árvores foram derrubadas. Como você se sentiria? Você sente carinho, empatia e respeito à natureza?
Ser integrado à natureza	A criança está capaz de se identificar com a natureza e tem um sentimento de ligação pessoal e profunda com a natureza, que pode ser descrito como espiritual. Esta habilidade se manifesta como amor pela natureza, humildade frente à natureza e a sensação de ser uma pequena parte da imensidão da natureza.	Você ama a natureza? Como você entende a palavra "sagrado"? Há algum lugar que você sente como sagrado? Que lugar é esse? Há algum lugar na natureza que você sente como sagrado? Com qual destas imagens você se identificaria mais? Qual imagem representaria a sua relação com a natureza? (Mostrando-lhes as imagens de *Inclusion of Nature in Self scale*, desenvolvida por Schultz (2001). Desenhei os dois círculos num papel separado usando cores diferentes para torná-lo visualmente mais atraente para crianças.)  Esta foto copiada de Martin & Czellar (2016, p. 186).

Você acha que essa escola tem mudado sua relação com a natureza? De qual jeito?

Já fiz todas as perguntas. Há alguma coisa mais que você gostaria de falar? Algo que você quer me perguntar? Muito obrigada por seu tempo! Foi legal falar com você e me ajudou muito na minha pesquisa.

10.4 APPENDIX 4: REVIEW OF ETHICS REVIEW (NOT REFERENCED TO IN THE TEXT)

Some minor changes to the research design were made after the ethics review was submitted. Below is a list of those changes and their motivations.

- In the ethics review, the studied age groups were planned to be 5–7-year-olds and 15–17-year-olds. However, this did not reflect the reality of the schools, and in order to get enough participants from each school, I had to change the age range. In the alternative schools, the children who took part in the research were 6–9-year-olds and the adolescents 16–19. In the conventional school, the child participants were 7–9-year-olds and adolescents 13–17.
- The number of participants indicated in the ethics review was 40. However, I ended up interviewing 43 people. This was because many pupils were keen and enthusiastic to be interviewed and I did not want to reject their enthusiasm. I used only 32 interviews as the data of the research as some interviews did not meet the criteria (either the pupil had attended the school for less than a year or was out of the desired age range).
- Four schools were meant to take part in the research according to the ethics review. However, one school was left out during fieldwork. This was because we did not manage to find a time that would have worked for them and for me. There were some special events taking place at the school that did not allow me to visit them during the time that would have suited my schedule.
- According to the ethics review, I should have organised an info meeting for the parents in each school in order to present the research project to them. However, discussing the possibility with the school staff I noticed that this would not be possible as many parents lived far away from the schools and would not have had time to come to the meeting. I met those parents that I could personally, and in the cases where I could not meet the parents, I sent the consent form to them and the pupil brought it back to me.
- I indicated in the ethics review that I might hire someone to help with the transcribing. I did not do this, but instead transcribed all the material myself. I had enough time to do this and I think listening to all the interviews again during the transcription process gave me a better understanding of the data.

As indicated in the ethics review, I will provide a summary of the results in Portuguese to the schools and participants. I will write this during the following weeks. I will also send the entire thesis to all of those who expressed an interest to read it. On top of this, I will try to visit the schools again in the spring of 2019 as I am returning to Brazil then.