FACULTY OF EDUCATION
DEPARTMENT OF PEDAGOGICAL CURRICULAR AND PROFESSIONAL STUDIES

LESSONS FROM WASTE

FROM IGNORANCE TO AWARENESS

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Master's thesis:	30 credits
Programme/course:	S2ESD ESD700
Level:	Second cycle
Term/year:	Spring 2022
Supervisor:	Anette Olin, Ingela Bursjöö
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Abstract

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Keywords:	anthropocentrism, ecocentrism, circular economy, Theory of Experience and Education, sustainability, Education for Sustainable Development, ESD

Aim: This study aimed to introduce elementary school students to an ecocentric worldview by creating opportunities in class for actions that could lead to changes locally and at the global level regarding the disposal of materials.

Theory: This thesis used a combination of theories to challenge the anthropocentrism practice in our schools and societies and facilitate the development of an ecocentric worldview in students. A circular economy model was applied taking into consideration the boundaries proposed by Raworth (2017) known as the "doughnut economy" which contemplates economic development between a social foundation and an ecological ceiling. The Theory of Experience and Education (Dewey, 1963) was used to allow meaningful experiences for students that could be extended beyond the school walls and facilitate profound changes in students' future experiences.

Method: An action research method was used in this thesis taking into consideration the model of experiential learning proposed by Dewey (1963) with the following phases: impulse, observation, knowledge, and judgment. A narrative analysis was conducted with the data collected throughout the process of this intervention using the framework proposed by Braun and Clarke (2006).

Results: The study shows that learning and reflecting in class about the impacts of human waste and the consumption of certain products and materials facilitated an ecocentric view of students at school. The experiences children had in improving recyclability in their classrooms and in modifying some of the spaces at school to improve recyclability along with the incorporation of some circularity strategies, allowed students' engagement and participation towards sustainability. Despite their young age, students could critically reflect on their consumption behaviours and habits in recycling and disposing of waste. The results also suggest that attitudinal changes occurred in students that might influence future experiences and relations with other non-human life and the natural world.

List of Abbreviations

ESD – Education for Sustainable Development

IPBES - The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

WWF - World Wide Fund for Nature

IGBP - International Geosphere-Biosphere Programme

GCE - Global Citizenship Education

UNEP - United Nations Environmental Programme

GDP - Gross Domestic Product

CIHR - Canadian Institutes of Health Research

NSERC - the Natural Sciences and Engineering Research Council

SSHRC - the Social Sciences and Humanities Research Council

List of Figures

List of tables

Table of contents

Introduction

Although humankind has modified its environment considerably in order to flourish over millennia, the accelerated degradation of the last century has put the survival of many of the world's species, including humans, at risk (IPBES, 2019). The Industrial Revolution marked an increase in human alteration of the environment with advancements in human technology, which was greatly increased since the middle of the last century in what is known as "The Great Acceleration". Brundtland report (1987) expressed that over the last century, human activities have reached such planetary alterations that they are even difficult for the scientific disciplines to assess and advise about its consequences:

> When the century began, neither human numbers nor technology had the power radically to alter planetary systems. As the century closes, not only do vastly increased human numbers and their activities have that power, but major, unintended changes are occurring in the atmosphere, in soils, in waters, among plants and animals, and in the relationships among all of these. The rate of change is outstripping the ability of scientific disciplines and our current capabilities to assess and advise.

Today, humanity has greatly degraded and altered all Earth's ecosystems, much more rapidly and extensively than in any other period and there has been an alarming expansion of unsustainable economic practices after World War II (Kahn, 2010, p. 1-2). The modification of Earth has reached unprecedented levels: "The human imprint on the global environment has now become so large and active that it rivals some of the great forces of Nature in its impact on the functioning of the Earth system" (Steffen, Grinevald, Crutzen, & McNeill, 2011, p. 842). According to IPBES (2019, pp. 11-12), 65% of the land surface has been significantly altered by humans, 66% of the ocean area is experiencing increasing cumulative impacts, over 85% of wetlands have disappeared, and around 25% of species in the assessed animal and plant groups are threatened, which suggest that without actions to reduce the drivers of biodiversity loss, around one million species already face extinction within decades.

The alteration of the environment for human "benefit" and consumption is so remarkable, that it has been claimed that we have entered a new geological epoch, "the Anthropocene", in which mankind has a central role in shaping the geology and the ecology of the planet (Crutzen, 2006). Humanity is responsible for leaving significant geological strata and the alteration of the Earth system, however, there is no consensus on a starting point to place the term Anthropocene (Ellis, 2018). Furthermore, it can also be argued that not all humanity is responsible for the same degree of environmental impact. Patterns of consumption exercised by some countries, and more specifically certain groups of the population, are greatly responsible for the large amounts of natural resources that are extracted, consumed, used, and disposed of. The question we might ask is: *Why?* As Davis, Moulton, Van Sant, and Williams (2019, p. 4) point out: "The Anthropocene is clearly not the product of "human nature," or humanity as a whole, but rather interrelated historical processes set in motion by a small minority". As Moore (2016) points out:

> The Anthropocene makes for an easy story. Easy, because it does not challenge the naturalized inequalities, alienation, and violence inscribed in modernity's strategic relations of power and production. It is an easy story to tell because it does not ask us to think about these relations at all (p. 82).

Advocates of using the word Capitalocene argued that this term better provides an explanation of the causes of the present environmental crisis. Although the use of the term Anthropocene answers some questions about how humanity is altering the Earth system such as technology, demography, consumerism, etc., it does not address questions of power, work, and capital (Moore, 2016, p. 83). Capitalism is usually identified with economics, however, the relationships it establishes surpass the

economic sphere. Moore (2016) proposes to start looking at capitalism as *world-ecology* instead of *world-economy*, which will allow us to uncover it as a new way of organizing nature.

In the past fifty years, we have seen a proliferation of global trade and an increase in consumption, which has been driving the destruction of nature (WWF, 2020). The continuation of resource extraction from nature is today seen by advocates of capitalism as inevitable to continue our current standards of living, and the current society continues to perpetuate that thought. But today "…humans extract more from the Earth and produce more waste than ever before" (IPBES, 2019, p. 28). This is also critiqued by Kopnina, Washington, Taylor, and Piccolo (2018, p. 117): "…if all of us lived as Western consumers right now, we would need four new planet Earth to satisfy our consumption desires". We should recognize that Earth has limitations, and the current linear economy is no longer viable, so new models to relate to the environment are needed.

Education today is very human-centered, and nature is seen mainly as a resource to be exploited. Quinn et al. (2016) explain that anthropocentrism is a human-centered view that confers value only to humans, whereas non-human entities are considered only to have an instrumental value. This value of nature creates a justification for human use of nature as a resource to be exploited or for enjoyment, "…non-human species are separated into culturally constructed categories, like resources, by which their existences are understood only through their relationship not only to humans but specifically to humankind living in accordance with Western industrial culture." (Lupinacci and Happel-Parkins, 2016, p. 14). Nature for its own value is displaced and devaluated. School curricula, textbooks, and teaching continue to perpetuate the centeredness of humans, whereas the Earth and other living species are displaced. But education is also an important driver of changes in society, and as Bruner (2014) stated, teaching opens up the learner to a wide range of possibilities. He further argues that teaching and learning as a mere transfer of information are not only not advisable, but it does not lead to a real learning experience, as he mentioned: it can be done better just by reading a book. The past and the present are important in teaching, but it is also crucial to project our thinking considering the future. This way the learner can be engaged in exploring different possibilities and ways of doing things. We also need to acknowledge that in recent decades there has been a rise in demands for changes to live within our planetary boundaries (Khan, 2010; Raworth, 2017). Education for Sustainable Development (ESD) aims precisely to facilitate these paths in education to engage learners by exposing and opening them up to other ways to create a future in a sustainable world. Students, and teachers, need to move beyond the information and engage in reflective thinking about the possibilities in the future, taking into consideration the past and present as explained before. This is a radical idea of what capitalism is doing in our societies, where "here and now" is given prevalence over the future.

ESD can be an important way to advance education in creating a more sustainable society, but it is still, in many ways, very human-centered where levels of sustainability are considered in parameters for humans to continue living on this planet. There is less attention in ESD on the need for sustainability of other living species on the planet. The consideration of a more ecocentric approach in ESD would allow shifting this humankind-centeredness, or anthropocentric view, towards an ethical consideration of other things (living or non-living) in this world. As Pierre (2004) points out, "we need new concepts in order to think and live education differently" (p. 285). Ecocentrism can be an important pedagogical approach in ESD to open up students to new possibilities to address, discover or learn considering different perspectives about sustainable issues and specifically our relationships with other species and the natural world around us. Or as Dinker and Pedersen (2016) express: "Education can become a space for unthinking the human, ourselves and our relations to the world" (p. 427). In this aspect ecocriticism, as critical pedagogy, can contribute to exploring different didactical ways to provide a voice to the non-human world.

This thesis hopes to provide an example of how an ecocentric point of view can be introduced among elementary school students. During my years of teaching, I have observed the disconnection of students from the resources extracted from nature as well as the environmental impacts of their behaviours. The

idea for this study originated after the school where I am currently teaching approved the implementation of a new plan to improve recyclability and reduce waste at our school site. I took this idea as an opportunity to create a waste plan for the school that could put into practice a circular economy model to create opportunities for students and teachers to move towards sustainability. By creating opportunities for students to engage in critical thinking about their behaviors regarding waste, I aimed to create opportunities in class for actions that could lead to changes locally and at the global level in the use and disposal of materials and facilitate students' reflections and connections with a non-anthropocentric world.

1. Literature Review

The dichotomy between anthropocentrism and ecocentrism has been analyzed in research (Crist & Kopnina, 2014; Kortetmäki, 2013), especially in recent decades. The division between anthropocentric and non-anthropocentric is in many ways driven by an ethical classification of intrinsic and instrumental value (Ott, 2010, p. 294). Lupinacci and Happel-Parkins (2016) argue that the manifestation of human supremacy worldview is cultural, and anthropocentrism is a dominant and foundational perspective in schools and society. As a cultural construct, anthropocentrism can be (un)learned: "Since meaning is constructed culturally, it can be constructed differently. Thus, our foundational assumptions can be made explicit, interrupted, and shifted if we learn to think differently about our relationships to each other and to the natural world." (Lupinacci & Happel-Parkins, 2016, p. 14). With this literature review, I am aiming to provide some justification for the need for further implementation of an ecocentric view in school where students might have the opportunity to judge their experiences and connections with the natural world and rethink their values regarding nature.

1.1 Anthropocentrism

Western thought is highly shaped by the idea of humans being separated and superior to other species, but it is important to understand some of the reasons behind the persistence of this thought. As Sessions (1995) explains, ecocentric nature religions were practiced in Ancient Greece, but after Socrates philosophers began to move away from previous ideas and exaggerate the comparison of man with the universe. Aristotle went even further, rejecting Pre-Socratic ideas of an infinite universe, cosmological and biological evolution, and heliocentrism. Aristotle considered that Nature was made for the sake of humans. These ideas supposed the establishment of an anthropocentric system of philosophy and science that dominated Western thought until the seventeenth century (Sessions, 1995, p. 159). To justify the superiority of humans, Aristotle believed that the possession of *logos*, which changed in classical Greek to mean both language/speech and reason/rationality, was a definite feature for the rejection of moral consideration toward non-humans. Non-humans in this vision were considered not only other animal species but also other human populations that did not have the ability to speak in an understandable way to the Greeks (Delapp, 2011, as cited in Boddice, 2011, p. 40). This could be considered one of the reasons why western thought has tended through history to exercise domination over other worldviews.

Humanism is sometimes associated with anthropocentrism, as Nimmo (2011, as cited in Boddice, 2011) explains: "People will not often label themselves anthropocentrists, but they will proclaim that they are humanists" (p. 60). Humanism was the most important movement in the Renaissance, promoting human welfare above other objectives (Kopnina, 2022). But it is important to consider the historical context: humanism originated as a reaction to the wars of the sixteenth and seventeenth centuries, where philosophers looked to emphasize our common humanity despite differences in belief and ethnicity (Sax, 2011, as cited in Boddice, 2011, p. 34). Despite the good intentions of the establishment of

humanism, "...the humanist image of thought also sets the frame for a self-congratulating relationship of Man to himself" (Braidotti, 2013, p. 67) which could have contributed to withering the dichotomy between humans and non-humans. Furthermore, the justification for human welfare that humanism was seeking and its installation in Western thought will have unpredictable consequences towards nature, as Sax (2011, as cited in Boddice, 2011, p. 34) expressed: "What they did not realise is that this human solidarity they endeavoured to establish would eventually be directed against the natural world.". In the same terms the philosopher Roderick French (1980, as cited in Sessions, 1995, pp. 33-34) noted regarding the consequences of humanism:

> ...it is very unsettling. . . ,to be forced to consider the idea that the formation of human consciousness through training in literature, philosophy, history, religion and related disciplines may in fact inculcate values and behaviors that jeopardize the continuation of life itself (p. 98).

Anthropocentrism in environmental ethics is "…the belief that value is human-centred and that all other beings are meant to human ends" (Kopnina et al., 2018, p. 109). According to this view, nonhuman organisms have no intrinsic value (Kortetmäki, 2013), so their value is only considered regarding their usefulness to humankind. There are however differences in the interpretation of the term, Kortetmäki (2013) distinguished between "old anthropocentrism" and "new anthropocentrism". "Old anthropocentrism" being characterized by the division of humans from the rest of life on Earth, considering us to have superiority, soul, free will, morality, and intrinsic value. "New anthropocentrism", on the contrary, rejects many of these ideas, however, the division between humans from the rest of the other species persists, and nature or other life-forms do not have an intrinsic value independent from human value. This view of anthropocentrism considers the following characteristics as well: humans are placed as managers of the biotic community, a priority is given to human ethics but a limitation for the justification of the environmental damage is acknowledged, some animals which are considered to have sentiments might have a moral standing but no nature. (Keller, 2010, as cited in Kortetmäki, 2013, pp. 22-27)

Jonge (2011, as cited in Boddice, 2011) argues that anthropocentrism is more than just a generalized attribute since not all human populations are responsible for the domination of nature, and he considers that it must be a strategy that many, but not all humans adopt for their own purposes. Consequently, this view of anthropocentrism does not put humans at the center of the universe, but some that choose to dominate others (Jonge, 2011, as cited in Boddice, 2011, p. 313). Sax also provides an explanation of the practice of anthropocentrism: "'Anthropocentrism' is this tendency to vastly exaggerate human dominance, understanding, power, autonomy, unity, guilt, virtue, wickedness, and morality" (Sax, 2011, as cited in Boddice, 2011, p. 36).

Not just the centredness of humans, but the duality between human/non-human is also challenged by those who look to the end of anthropocentrism (Nimmo, 2011, as cited in Boddice, 2011; Callicot, 2017). Tonutti (2011, as cited in Boddice, 2011, p. 185) analyzed the dichotomy between nature (animals) and culture (humans), where the latter reduces animal traits into a single category, ignores or denies elements of continuity between humans and other animal species, and ignores the phylogenic links between our species and other animals. Callicot (2017) explained that "...ethicists had long assumed that moral ontology should be conceived in essence-and-accident terms". This has facilitated the argumentation to look for unique characteristics in humans to support their exclusivity as beneficiaries of ethics (Callicott, 2017, p.114). Nimmo (2011, as cited in Boddice, 2011, p. 62) argues the human dedication to the construction of separation from the natural world, as he expressed:

> For as soon as one begins to question humanist discourse and its division of the world into two incommensurable domains, then it begins to become apparent that this division is not simply given in the nature of things, but must be perpetually reconstituted in the face of a world in which human and non-human are thoroughly and constitutively intermixed; far from being given, it is the unlikely product of an enormous labour. (p. 62)

Regardless of the justification for the continuation of an anthropocentric worldview today, the debate about the mere term is considered by some scholars as a way to move our attention from the real problems of the current environmental crisis that we are experiencing nowadays (Crist & Kopnina, 2014). Climate change, mass extinction due to our dominance of the Earth, the depletion of natural resources, and the alteration of natural ecosystems, to name a few, are some symptoms that we cannot further ignore. As Crist and Kopnina (2014) expressed, the position of Western thought to position *anthopros* in the center has consequences for what is being displaced to the periphery, positioning nonhumans as deficient, inferior, and dominated (pp. 388-389). He further argues that the centredness of humans and the dominance of many realms of the world, have disallowed any desire for limiting human expansion (Crist & Kopnina, 2014, p. 390). This situation has worked for humanity for some time, where human growth and expansionism have not been problematic for our survival. However, the limitations of the Earth are a reminder that humans are as dependent on their resources as other living organisms, and the displacement of humans from their own proclaimed centeredness is necessary to stop the current environmental crisis that we are facing today.

1.2 Ecocentrism

Different cultures around the world have recognized the dependence of humans on their environment and have even developed Nature-oriented religions that expressed this ecocentric perspective (Sessions, 1995, p. 158). Grey et al. (2018) explain this worldview as:

> Ecocentrism sees the ecosphere – comprising all Earth's ecosystems, atmosphere, water and land – as the matrix which birthed all life and as life's sole source of sustenance. It is a worldview that recognizes intrinsic value in ecosystems and the biological and physical elements that they comprise, as well as in the ecological processes that spatially and temporally connect them. So when human wants clash with the health of the Earth as a whole or any of its ecosystems, the former should, practically and ethically speaking, give way to the latter: human needs, like the needs of other species, are secondary to those of the Earth as the sum of its ecosystems. (p. 1)

Ecocentrism is a completely different way of positioning humans, a perspective in which they are not the ultimate beneficiaries or have a privileged status quo as in an anthropocentrism view that confers value only to humans and considers non-human entities to have only an instrumental value (Quinn et al., 2016). Sessions (1995) argued that despite the West having several opportunities through history to leave the path to ecological destruction and return to ecocentrism, in what he called "anthropocentric detour", it has failed in those attempts.

Redfield (1953,1956, as cited in Narvaez, 2020, p. 398) distinguished between two different worldviews: the more recent common view in what was frequently called "civilized nations" and the oldest worldview (called Indigenous worldview today). In Indigenous worldviews, humans have traditionally a deeper sensibility towards environmental conservation, and some Indigenous nations have even attributed value to animals, plants, rivers, mountains... (Knudtson & Suzuki, 1992, as cited in Kopnina et al., 2018, p. 123). However, it is also important to acknowledge that other cultures around the world had also developed an ecocentric approach in different parts of the world (Diez et al., 2015, as cited in Taylor et al., 2020). The more recent worldview, as expressed by Narvaez (2020) "...considers the universe to be disenchanted, fragmented and amoral" (p. 398). This view has not only increasingly facilitated the separation from the natural environment but has modified and shaped every corner of the planet to meet human needs in its vertiginous expansion. Human-built environments can be seen everywhere today and, with the movement of large populations to the cities, the proportion of humanity that lacks contact with nature is constantly increasing. As Narvaez (2020) noted: "As people moved into human built environments and away from immersed experience in healthy forests, mountains and

waterways, their senses were increasingly dulled and their skills to get along with a diverse natural world atrophied" (p. 399).

As opposition to anthropocentrism, ecocentrism looks to position humans in a more equal relationship with the Earth. One of the first philosophers to propose a non-anthropocentric worldview was Stoics, who considered it important to live in agreement with nature (Kortetmäki, 2013). Keller (2011, as cited in Kortetmäki, 2013, p. 28) named individualistic non-anthropocentrism as polycentrism whereas ecocentrism was considered a more holistic approach. Polycentrism or biocentrism can be divided into egalitarian biocentrism (all organisms have both intrinsic and instrumental value) and hierarchical biocentrism (more weight is put on certain properties of the organism which creates hierarchical differentiation). In holistic anthropocentrism or ecocentric perspective humans are considered members of the biotic community instead of being separated from nature (Kortetmäki, 2013).

Ecocentric ethics was introduced by A. Leopold in 1949 with his work about land ethics in "A sand county almanac", which is considered the first draft of holistic ecocentrism (Kortetmäki, 2013), focusing on the value system rather than on dimensions (Svetina et al., 2014). Leopold acknowledged Darwin's explanation of the origin and cultural evolution of ethics. He also recognized the tendency of interdependent groups to evolve different modes of cooperation, and he further advocated the inclusion of ecological boundaries as an extension of humanity's relationship to the land (plants, animals, soil, water, etc.) (Callicott, 2017, p. 119). Without Leopold's intention, he re-established in Western thought the idea of human relationships with their environment, moving away from the anthropocentrism view that had dominated all aspects of the intellectual debate. Leopold's land ethic opened the exploration of a different human-nature relation during the last century. In many ways, Leopold's work has been an inspiration to later environmentalists and scholars, as Kopnina (2016) expressed: "Leopold's vision is that wilderness, interconnected with diversity, complexity, and subtlety, has been an inspiration and impetus for the multitude of human cultures that exist across the globe" (p. 416). A great example is the inspiring work of Rachel Carson in 1962 "Silent Spring", where she was able to explain, using scientific knowledge and delicate use of language, the impacts of human activities in the natural world and the importance of preserving it, not just for the benefits of humankind, but also for its own rights to exist and be respected. This work has been considered the start of the modern environmental movement, challenging the anthropocentrism of Western culture (Sessions, 1995). The Ecological Revolution of the 1960s saw the resurgence of ecocentrism for the first time in the intellectual and social life of American life (Sessions, 1995, p. 169).

Callicott (2017) has further developed Leopold's ethical consideration toward ecological collectives and the Earth. Callicott analyzed the different ethical considerations of other life, and he argued that it has been difficult, using a non-anthropocentric ethical perspective, to identify definite criteria to justify why humans should be the only ones to have ethical consideration. Callicott argued that not only selected members of the class of moral patients (not just humans) that show essential characteristics should be considered morally relevant but also accidental or non-essential characteristics. In his opinion, a more radical non-anthropocentric ethical theory is needed in order to include ecological collectives that exceed the ethical concern for only sentient beings, since the prevailing essence-accident form of ethical theory cannot solve this problem (Callicott, 2017, p. 117). Although the previous consideration is more inclusive of other species, Callicott (2017) explained that non-anthropocentric ethics still excludes some collectives from ethical consideration:

> In revolutionary non-anthropocentric ethics, while the class of moral patients becomes more inclusive, the class of moral agents must remain limited to rational beings, because we cannot expect the human marginal cases and non-human animals- let alone insects, microbes, and plants-to be morally considerate, nor can we hold them responsible for those of their actions that adversely affect moral patients (including human moral patients)." (p. 116)

Despite the fact that anthropocentrism continues to dominate many aspects of our life, it is important to acknowledge that some scholars and authors are also interested in exploring a more ecocentric view when considering our relations with the environment (Brower, 1990; Callicott, 2017; Nash, 1982, 1973; White, 1967). An example is Næss's work "The Shallow and the Deep" in 1973 which marked the beginning of what is known as the "deep ecology" movement, which explores in a profound way human actions and relations with nature. Madsen (2016) defined it as an "environmental philosophy and social movement based in the belief that humans must radically change their relations to nature from one that values nature solely for its usefulness to human beings to one that recognizes that nature has an inherent value." Næss (2005) distinguished between shallow and deep ecology:

> The *shallow ecology* movement is concerned with fighting pollution and resource depletion. Its central objective is the health and affluence of people in developed countries.
>
> The *deep ecology* movement has deeper concerns, which touch upon principles of diversity, complexity, autonomy, decentralization, symbiosis, egalitarianism, and classlessness. (p. 2)

Næss' categories of ecology are very illustrative in understanding how anthropocentrism is even practiced from an environmental point of view as well. Kopnina (2012) analyzed some of the reasons behind the lack of understanding of the deep ecology perspective, and she argues that the reason might be due to the anthropocentric bias which are present in advanced industrial neo-liberal democratic societies. Recognizing that this anthropocentric bias is present in many aspects of our contemporary societies, it is an important point of departure to advance to construct a more sustainable future where humans are one among other living things in the ecosystem of Earth.

2. Statement of Relevance and Research Questions

The alteration of the environment for human "benefit" and consumption is so remarkable, that it has been claimed that we have entered a new geological epoch, "the Anthropocene", in which mankind plays a central role in shaping the geology and the ecology of the planet (Crutzen, 2006). Even though the term was used earlier, Crutzen and Eugene (2000) introduced the name in the scientific debate in a conference of the International Geosphere-Biosphere Programme (IGBP) in Cuernavaca (Mexico) where they showed evidence of the massive alteration of human activities on geological strata and life. This recognition of the human impact on ecosystems and the Earth system has led to a criticism of the current economic model as well as our relations with nature. As Malm and Hornborg (2014) said: "Now that humanity is recognised as a geological force, the story goes, we must reconceptualize not only the relations between natural and social sciences but also history, modernity and the very idea of the human." (p. 62)

Humanity is responsible for leaving significant geological strata and the alteration of the Earth system, however, there is no consensus on a starting point to place the term Anthropocene. Crutzen and Eugene proposed that it started at the end of the 18th century with the Industrial Revolution because they linked Anthropocene to carbon dioxide emissions from fossil fuels (Ellis, 2018, p. 2). However, Ellis (2018) recognized that the term remains controversial even among geologists and different parameters are considered in proposing an initiation for this epoch. Furthermore, it can also be argued that not all humanity is responsible for the same degree of environmental impact. Patterns of consumption exercised by some countries, and more specifically certain groups of the population, are greatly responsible for the large amounts of natural resources that are extracted, consumed, used, and disposed of. The question we might ask is: *Why?* As Davis, Moulton, Van Sant, & Williams (2019, p. 4) point out: "The Anthropocene is clearly not the product of "human nature," or humanity as a whole, but rather interrelated historical processes set in motion by a small minority". As Moore (2016) points out:

> The Anthropocene makes for an easy story. Easy, because it does not challenge the naturalized inequalities, alienation, and violence inscribed in modernity's strategic relations of power and production. It is an easy story to tell because it does not ask us to think about these relations at all (p. 82).

Because only some humans are mainly responsible for altering the Earth system, it has been argued that the term Anthropocene does not fully correspond to the reasons behind those changes. Advocates of using the word Capitalocene think that this term better provides an explanation of the causes of the present environmental alteration of the planet. Although Anthropocene answers some questions of how humanity is altering the Earth system through technology, demography, consumerism, etc., it does not address questions of power, work, and capital (Moore, 2016, p. 83). Capitalism is usually identified with economics, however, the relationships it establishes surpass the economic sphere. Moore (2016) proposes to start looking at capitalism as world-ecology instead of world-economy, which will allow us to uncover it as a new way of organizing nature.

Despite the numerous warnings from the scientific community throughout the last decades that urgent changes are needed to avoid a collapse of the current Earth system, we continue educating future generations to be consumers in a world that have already exceeded its capacity. Consumerism is an important driver of ecological degradation. One-third of the terrestrial land surface is now used for agriculture or animal husbandry, while of the total amount of water that people withdraw from available freshwater resources, 75% is used for crops or livestock (WWF, 2020, p. 54). According to UN statistics (as cited in WWF, 2020) we have surpassed the planet's biocapacity (ability to regenerate) by at least 56%, which means we are living off 1.56 Earths. This trend continues to grow, and it is estimated that our global levels of unsustainable production and consumption would require 1.75 Earths (WWF, 2020, p.99). This level of consumption has a great impact on other life on Earth. In the 2020 Living Planet Report (WWF, 2020), it is expressed with concern that an average 68% decline has been observed in monitored vertebrate populations from 1970 to 2016 (ranging from 26% in Europe to 94% in Latin America). Seventy-five percent of the Earth's ice-free land surface has been significantly altered by human activities, 85% of wetlands have been lost, and most of the oceans are polluted. We have seen in the past fifty years a proliferation of global trade and an increase in consumption, which has been driving the destruction of nature (WWF, 2020). It is estimated that 25% of species in the assessed animal and plant groups are threatened, which suggests that without actions to reduce the drivers of biodiversity loss, around one million species already face extinction within decades (IPBES, 2019).

It is easy to see the direct drivers of environmental degradation, such as habitat loss and degradation, overexploitation, climate change, pollution, and invasive species; however, the indirect drivers of threats to nature, including consumption, demographic, institutions, governance, economic, technology, conflicts, and epidemics, are less obvious (WWF, 2020). Although human population increase is related to a rise in the extraction of natural resources, it is also important to notice that patterns of consumption also play a significant role. Developed countries are the recipient of most of the resources extracted from Earth today, but they are also responsible for the majority of pollution, waste disposal, and the release of toxins and gasses into the atmosphere globally. The migration of large populations (260 million since 1970) to mainly developed countries, seeking to raise their standards of living, has also led to an increase in consumption of resources from other areas of the world, which depend on the extraction of those resources for economic growth (WWF, 2020). Today, more than 50% of the world's population lives in cities (WWF, 2020) and consumes commodities from many parts of the world thanks to the increase in global trade. This also contributes to a disconnection from the environments where the consumed commodities come from. Consequently, this disconnection creates in developed countries invisibility for their citizens regarding the environmental consequences of their behaviors, at the same time they increase the protection of natural areas within their own territories.

The continuation of resource extraction from nature is today seen by advocates of capitalism as inevitable to continue our current standard of living, and today's society continues to perpetuate that

thought. But today "…humans extract more from the Earth and produce more waste than ever before" (IPBES, 2019, p. 28). This is also critiqued by Kopnina, Washington, Taylor, and Piccolo (2018, p. 117): "…if all of us lived as Western consumers right now, we would need four new planet Earths to satisfy our consumption desires". Waste generated by human societies is largely the result of the lifestyles and consumerism promoted by capitalism and neoliberalism. The vast quantities of waste generated today reflect our actual unsustainable and linear model of the economy, where products are extracted, manufactured, and soon discharged. We should recognize that the Earth has limitations, and the current linear economy is no longer viable, so new models to relate to the environment are needed.

Education toward consumerism is often unintentional by teachers, who are also immersed in a world that considers growth at the expense of the natural environment and does not promote a direct inclusion of non-human life in education (Kopnina & Cherniak, 2015). In this regard, Misiaszek explained (2016):

> Neoliberal GCE systematically normalises and intensifies individuals' desires for money, commodities and associated economic power, in line with the ideology of neoliberalism and neoliberal measures of progress This, in turn, intensifies the phenomena of schooling justifying consumerism and, in many cases, teaching consumption as a normative and defining progress – this directly conflicts with ecopedagogical and ESD goals (p. 596).

A circular economy model of the economy at school is considered in this study to not only maximize the use of the resources that have already been extracted and improve their recyclability, but most importantly to allow critical thinking about humanity's relations with a non-anthropocentric world. Students' experiences with waste are considered within this study, but also the new experiences created with the proposed activities. The development of an ecocentric view in the classroom through some educational lessons and the modification of some spaces to facilitate learning about waste and its environmental impacts aims to engage students in critical thinking about human relations with the environment. The experiences for learning seek not only to be enjoyable to students but also to influence their future experiences. Therefore, Dewey's Theory of Experience and Education is used during the process of this intervention, as well as in the analyses of the data collected. As Dewey explained (1938): "The quality of experience has two aspects. There is an immediate aspect of agreeableness or disagreeableness, and there is its influence upon later experiences" (p. 27). This can allow students' reflection about what impacts their patterns of consumption and dispose of waste might have at the local and global levels.

This thesis hopes to provide an example of how an ecocentric point of view can be introduced among elementary school students. During my years of teaching, I observed the disconnection between students from the resources extracted from nature as well as the environmental impacts of their actions. The idea for this study originated after the school I am currently teaching approved the implementation of a new plan to improve recyclability and reduce waste at our school site. I took this idea as an opportunity to create a waste plan for the school that could put into practice a circular economy model to create opportunities for students and teachers for sustainability. This plan contemplated the incorporation of some of the principles of circularity to reduce the use of materials, reuse them, and improve their recyclability. It also included the modification of some spaces in classrooms and other parts of the school. The consideration of a circular economy model in the classroom seeks to provide spaces for both students and teachers to reflect on how we can sustain our societies in more balance with the world.

The study aimed to introduce elementary school students to an ecocentric worldview by creating opportunities in class for actions that could lead to changes locally and at the global level regarding the use and disposal of materials. Through this action research project, I plan to answer the following research questions:

a. How do students talk about recycling and waste?
b. How do students relate to their environment?

c. What patterns of consumption are changed among students after reflecting on waste at school?

3. Theoretical Framework

3.1 Circular Economy

Raworth (2017) proposed a model of development known as the doughnut economy, where a safe space for humanity should be between a social foundation and the ecological ceiling. The current model of extraction of materials is increasingly moving to exceed both boundaries. At the social foundation level, it is clearly seen that resource extraction is very unequal and creates many social injustices and conflicts. At the ecological level, non-renewable and renewable resource extraction and overuse are creating great disturbances in the ecosystem and globally as well. Furthermore, the exhaustion of some resources, such as phosphates used for food production, could compromise the living conditions for humankind in the future.

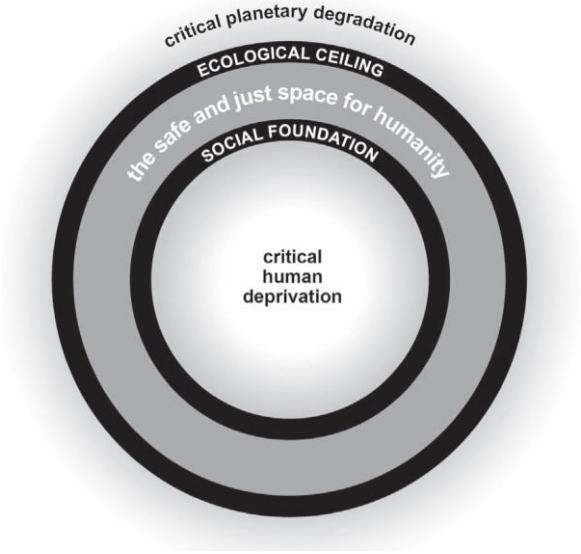

Figure 1: Doughnut Economy (Raworth, 2017)

According to the doughnut economy model, human activities should not exceed the ecological ceiling proposed as it will lead to a tremendous degradation of the Earth with unpredictable consequences. Capitalism is based on a linear model of activities from extraction, manufacturing, use, and disposal. The extraction of renewable resources to manufacture commodities needs to be sustainable, not only for humanity but also for other living species. Non-renewable resources should be considered as a temporary solution until other renewable substances or materials substitute them because every time they are used, we are compromising future generations. Because they are so valuable, they will need to be reused, well managed, and protected so they could be used on a long-time scale. If the management of non-renewable resources is left to capitalism, it is difficult to achieve a sustainable balance. A circular model of economy will be valuable to continue using the materials already extracted and contribute to achieving a safe level of the economic activities that also considers the social and ecological dimensions.

A shift from our current economic models of production is necessary to achieve a balance within planetary boundaries (Rockström et al., 2009; Steffen et al., 2015). In this aspect a new concept introduced by the United Nations Environmental Programme (UNEP) in 2011 known as "green economy", which is defined as "one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities". One of the easiest ways to mitigate scarcities is to reduce their consumption, in this aspect it is unbelievably valuable to explore the concept of "decoupling" to have more efficient resource management over extracting new resources. Resource decoupling in this context means "reducing the rate of use of (primary) resources per unit of economic activity" (UNEP, 2011, p. 4). Consequently, there is an increase in resource productivity, which is also an economic asset as well. Decoupling principles have somehow started to be applied without specific political implementation. In Figure 2 we can see that although the use of material resources increased in the 20th century, this happened at a slower pace than the world economy (UNEP, 2011, p. 11). However, in order for decoupling to take place efficiently in the global economy, significant changes in government policies, corporate behaviour, and consumption patterns need to occur (UNEP, 2011, p. xiv).

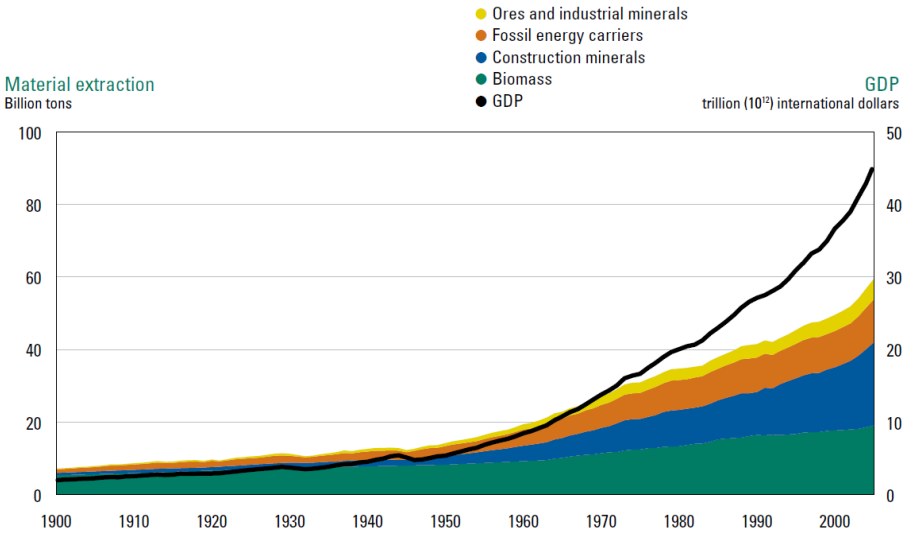

Figure 2. Global material extraction in billion tons and Gross Domestic Product (GDP) growth 1900-2005 (Reproduced from UNEP, 2011)

To facilitate the decoupling of the economy and mitigate the environmental impacts of human activities, a new model, known as *circular economy*, was proposed (Murray, Skene, & Haynes, 2017; Quian & Wang, 2016). Liu (2012) defined circular economy as: "An economy system which is characterized by the principle of sustainable growth and depends less on depletion of natural resources than traditional economies through the mechanism of recycling the waste output of its system. "(p. 256). Murray et al. (2017) explain that the term circular economy brings two important meanings, the antonym of a linear economy and the consideration of cycles (biogeochemical cycles and the idea of recycling products). He further argues that almost all biogeochemical cycles of the Earth have been altered by human activity and if a circular economy model is considered a viable proposition this would "…seek to restore fluxes to their natural levels, reducing the excessive removal of material from a cycle, and the excessive release of materials into a cycle" (Murray et al., 2017, p. 371). Recyclability is an important aspect of a circular economy since it reduces new material extractions and waste generated. Hofman explained in 1848 that "…in an ideal chemical factory there is, strictly speaking, no waste but only products. The better a real

factory makes use of its waste, the closer it gets to its ideal, the bigger is the profit" (Lancaster, 2002, as cited in Murray et al., 2017, pp. 372-373). This is precisely what a circular economy model tries to implement, a better design of products to improve their longevity and recyclability to avoid waste and the need to extract new resources which will have an inevitable environmental impact. If a circular economy is fully implemented, it will not depend on new raw materials to function.

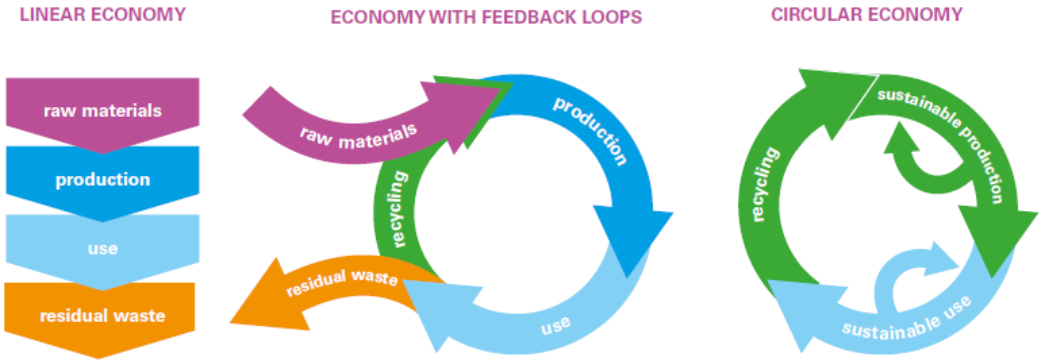

Figure 3: Comparison of different economy models (Van Buren, Demmers, Van der Heijden, & Witlox, 2016)

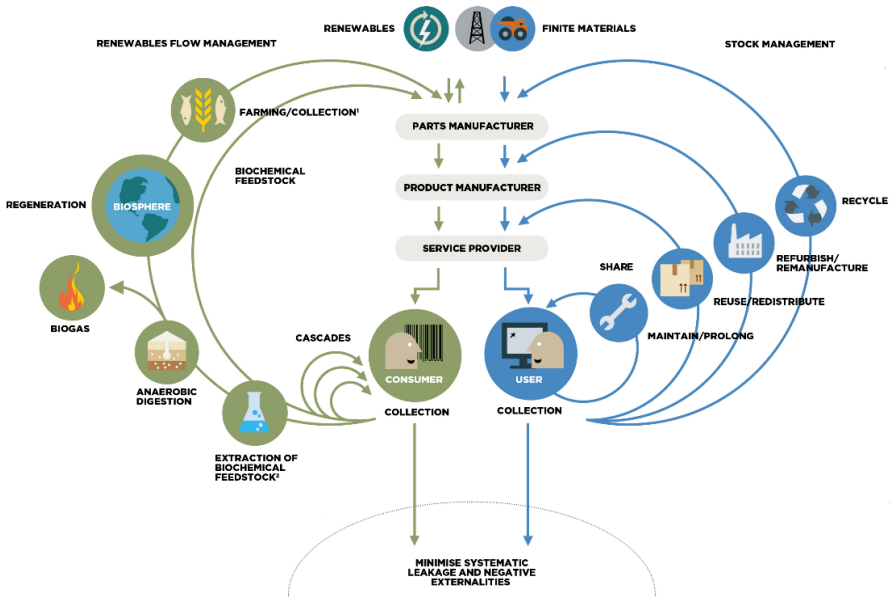

Figure 4: Circular Economy Systems (Ellen MacArthur Foundation, 2020)

Even though the recyclability of certain products has a long trajectory in recent decades, a circular economy model is much more ambitious since it aims toward total elimination of waste generated by human activities. The initial 3R model (Reduce, Reuse, Recycle) has been expanded in recent years to what is now commonly known as the 9Rs, in the following order from most favorable to least favorable, as Van Buren et al. (2016) explain:

(1) Refuse: preventing the use of raw materials;
(2) Reduce: reducing the use of raw materials;
(3) Reuse: product reuse (second-hand, sharing of products);
(4) Repair: maintenance and repair;
(5) Refurbish: refurbishing a product;
(6) Remanufacture: creating new products from (parts of) old products;
(7) Repurpose: product reuse for a different purpose;
(8) Recycle: processing and reuse of materials; and
(9) Recover energy: incineration of residual flows (p. 3)

3.2 Dewey's Theory of Experience and Education

The theory of experience proposed by Dewey is based on a great analysis of the errors of both traditional and progressive education. Dewey (1963) was against formulating belief using terms of Either-Or, as if there was a magic way to choose between one way or another. For Dewey, it is important to create a better education by seeing things as modifiable by experience and the knowledge acquired by that experience. The traditional school assumed that education is a transmission of accumulated knowledge and values, and students are mere recipients. It is noticeable how well Dewey knew both educational systems firsthand since his insights are very well expressed and explained through examples. Although his work was published at the beginning of the last century, many of the questions raised by Dewey are still valuable and have inspired the development of new curriculums and theories in education.

The major features of the Theory of Experience and Education are:

a) Role of the Teacher.

   The teacher is a facilitator of learning through experiences; his/her role is not just to transmit content, but to guide the process of acquiring experiences and allowing reflections in his/her students. It is a much more challenging role than the role assigned in traditional education, in which content organization and rational explanation were considered the practice of teaching.

b) Role of the Student

   Students have a central role. They are provided with opportunities to interact with and understand their environment through experience with the help of adults and their teachers. In traditional education they had a passive role in their learning, they were merely expected to acquire the content organized by teachers based on what was considered consolidated knowledge.

c) Place-based Learning

   To benefit from experiences, they need to happen and be significant to the learner. Place-based learning, where education is not only contained in traditional classrooms but taken into the real world, can be a good way to facilitate meaningful experiences for students.

d) Continuity and Interaction

   Dewey presents two important principles in this theory: continuity and interaction. The principle of continuity "means that every experience both takes up something from those which have gone before and modifies in some way the quality of those which come after" (Dewey, 1963). The principle of interaction results from the interaction with the environment, between the learner and what it is to be learned. Both principles interact and work simultaneously, or how

Dewey (1963) explained it himself “They are, so to speak, the longitudinal and lateral aspects of experience”.

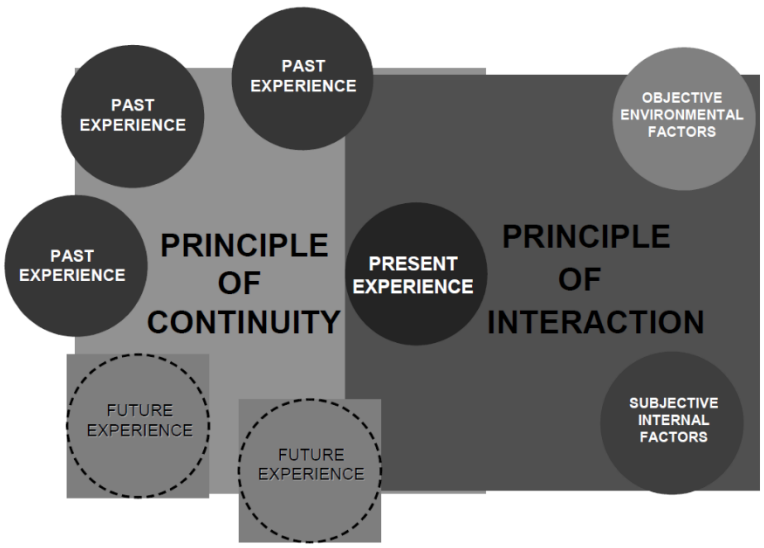

Figure 5: Principles of Continuity and Interaction (Ponzio & Enfield, 2004)

The exploration of spaces for action is crucial in moving forward from theory to action. As everyone experiences and learns in a different way, the same experiences could lead to a great variety of different actions. The application of the Theory of Experience in concrete situations for ESD is a shift from educating by transmitting knowledge to developing competencies. In ESD, learners are encouraged to play a central role in seeking their own experiences, and the adoption of this model that benefits from experiences could make significant contributions. Walls (2012, as cited in Tarrant & Thiele, 2016), explains how the Decade of Education for Sustainable Development underlined the importance for developing the following capacities:

a) an integrative capacity
b) a critical capacity
c) a transformative capacity
d) a contextual capacity

Dewey’s Theory of Experience is still particularly useful in the exploration of new ways to integrate ESD into educational practices. ESD precisely looks to promote critical thinking, debates, and actions towards sustainability issues. Dewey’s ideas, even though written almost a hundred years ago, are still particularly important today and their potential application in ESD could be promising. According to Tarrant and Thiele (2016), “Dewey’s role in the historical development of skills-based pedagogy and, more specifically, his continuing contribution to contemporary practices of sustainability education have yet to be explored.” (p. 56). This action research used Dewey’s theory of Experience and Education to create opportunities for the development of an ecocentric view of students in contraposition to the anthropocentrism that dominates many aspects of our societies. The use of this theory seeks to facilitate experiences for students that hopefully influence them by changing some of their attitudes and behaviors towards sustainability, and much more importantly how they will perceive future experiences. “Every genuine experience has an active side which changes in some degree the objective conditions under which experiences are had” (Dewey, 1938, p. 39)

4. Method

4.1 Type of Method

An action research method using a qualitative methodological approach was used for this thesis. Action research can be traced back to the work of Kurt Lewin in the 1940s, whose work looked to provide a voice and decision-making for disadvantaged and marginalized groups (Cohen, Manion & Morrison, 2007). Today, action research is an approach commonly used in educational research for those who want to reflect on and change their practice. It is about finding a way to improve your practice, and at the same time creating knowledge (McNiff & Whitehead, 2009, p. 7). Elliot (1991, p. 69) proposed the following definition of action research: "the Study of a social situation with a view to improving the quality of action within it". Bassey (1998, as cited in Koshy, 2010, p. 8) described "action research as an inquiry which is carried out in order to understand, to evaluate and then to change, in order to improve educational practice". Kemmis and McTaggart (1988, as cited in Cohen et al., 2007) defined it as:

> … a form of collective selfreflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of the own social or educational practices, as well as their understanding of these practices and the situations in which these practices are carried out. (p. 298)

Using action research at school has multiple benefits for students and teachers. Kember (2002) examined 90 different action research projects supported by the Action Learning Project, and he summarizes their long-term outcomes for teachers as follow: lasting effect on teaching; teaching became more student-centered; learning how to conduct action research; developing capacity to reflect upon their own teaching; developing teamwork skills; and changing the attitude of others. In a similar way, Oolbekkink-Marchand, van der Steen, and Nijveldt (2014) identified some goals, which can also be seen as benefits, for the teacher-researcher involved in action research projects:

> We added three goals of practitioner research, namely: individual professional development of the teacher as researcher, which can lead to change in their own classroom; school development, which includes staff development and school change that go beyond the individual classroom; and knowledge that can be generalized to other populations and contexts. (p. 124)

Lewin (1946;1948) proposed a model for action research that included the following phases: reflecting, planning, acting, and observing. Dewey's model of experiential learning is very similar to Lewin's one; however, in Dewey's model, the developmental nature of learning implied by Lewin is more explicit (Knolb, 1984). In this model, the interconnections between impulse, observation, knowledge, and judgment to achieve a specific purpose through an action are some important aspects to consider. As Knolb (1984) explained: "The impulse of experience gives ideas their moving force, and ideas give direction to impulse. Postponement of immediate action is essential for observation and judgment to intervene, and action is essential for the achievement of purpose." (p. 22). Dewey's model of experiential learning is used for this thesis because the development of an ecocentric view in students through changes in specific actions also requires a deeper reflection and judgment of our relations with nature.

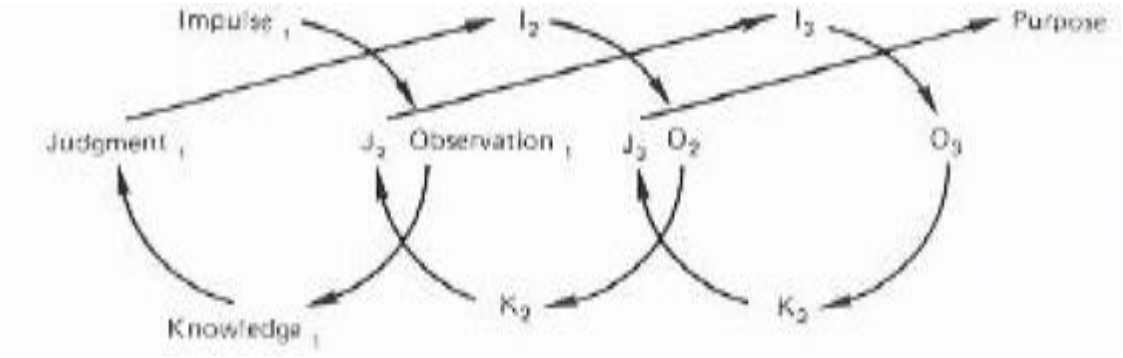

Figure 6: Dewey's model of Experiential Learning (Kolb, 1984)

The action research presented below intends to contribute to the generation of new knowledge when ESD is implemented among elementary school students. It is important to notice that action research is not just conducting planned activities with your students. The expression "action research" has two distinctive words: "action" (what you do) and "research" (how you find out about what you do) (McNiff, 2013, p. 25). An action research method was chosen not only because of the desire to implement different actions in this school setting but most importantly because it sought to create opportunities for students and teachers to participate and learn about sustainability through this action. In this aspect, even though the practice is an important aspect of action research, praxis should also be taken into consideration as McNiff and Whitehead (2009, p. 40) argued: "It is action that is informed, committed and intentional, with a view to generating knowledge of practice for personal and social well-being; these elements turn practice into praxis". In this respect, this action research intends to open up new questions and educational possibilities in applying ESD to elementary school students.

4.2 Study Participants

This study was conducted in an elementary school in Edmonton, Canada. The school has an enrolment of approximately 400 students from kindergarten to grade 6. Like other urban schools in the city, the student population is very diverse, with students from different nationalities and backgrounds. Consequently, many students use a language other than English at home as their first language. The school offers both a regular program and a Spanish Bilingual program, and consequently, there is a considerable number of students from Latin American countries. Students have two periods of recess throughout the day as well as time to have their lunch in their classrooms. During the first recess students usually have their snacks outside; however some classes, especially kindergarten and grades one, usually have their snacks in class before going for recess. Students have lunch in their respective classrooms after the second recess. There is no food served at school, students bring their own food from home in their individual lunchbag. This year the school has started a program where students can have some extra fruit that they can pick up at the office.

Residential and communal waste collection in the city is currently changing to increase the diversion rates from landfills. A new system for single-home collections was introduced this last year in which each house received two carts: food scraps (green) and waste (black). A small bin for food scraps to place in the kitchen was also provided. Recyclables are still collected in an individual blue bag. Communal collection is now being studied and will soon be implemented as well in the city for multi-family homes.

The school site has two waste containers in the parking lot for weekly collection: waste and recycling. The recycling bin accepts all items that will be processed at the recycling facility, such as paper, cardboard, glass, cans, recyclable pastics,... Since there is only one bin for recycling, users do not separate recyclables into different recycling bins. This process is simple to use, however, there is a potential to produce some contamination during the process which could diminish recycling capabilities, if products placed in the bin are not clean or dry.

Two different groups of grade 3 students from the Spanish bilingual program participated in this study. The design activities were integrated within the Social Studies and Art program of studies. All students from those two groups participated in the educational activities, however, only data from children with their consent to participate in the study (see Appendix I) were collected. Consent to collect data was granted by parents or guardians for a total of 24 students, 6 boys and 18 girls from grade 3 (8-9 years old) from two grade three groups. Students who either did not return the consent form or did not want to participate in this study still participated in the activities, however, no data was collected from them.

4.3 Research Role and Collaboration

As mentioned before, two different grade 3 groups from this school participated in the action research. My grade partner and I coteach the two groups separately, with each one of us being responsible for teaching different subjects. For this reason, I was familiar with those students before the initiation of this research.

My role during this action research was diverse during the different phases of the project. I had a period of detailed observation of the way both groups were disposing of waste in the classroom and what type of packaging they were bringing to school for snacks and lunch. I designed and created the educational activities and the accompanying materials used for this study, taking into consideration the age of the students and the actual curriculum. As one of the teachers guiding and providing instruction, I was responsible for conducting the lessons and helping and guiding students during the activities. In the same way, I helped in organizing the groups and presentations to facilitate students' leadership in distributing new recycling bins and sharing some information with the rest of the students at the school. Finally, I guided some conversations in small groups facilitating the participation and engagement of all students.

I collaborated with my grade partner in the design and implementation of the waste plan to apply some of the principles of a circular economy model at our school. We also worked together to teach some waste lessons to both groups and modify our classrooms and school spaces to improve recyclability.

4.4 Research Process

The idea for this study originated from the implementation of a new plan to improve recyclability and reduce waste at our school. This year the school district organized a new group leadership project in which a staff member from each school participated in several meetings throughout the school year to discuss different green initiatives. I volunteered for that group, and at the first meeting, each teacher was encouraged to think about waste at their school site and create some actions to reduce or improve how waste was managed at their schools. Even though we were only asked to think about some small and manageable actions for our schools, I took this idea as an opportunity to create a waste plan for the school that could put into practice a circular economy model to create opportunities for students and teachers to move towards greater sustainability. I had a conversation with the school principal, and I was allowed to present a plan to the school to improve recyclability at our site. I communicated with

other teachers that were also interested in implementing some green initiatives at our school, and an initial plan was presented to the staff members in March. This plan contemplated the incorporation of a circular economy model in reducing the use of materials and improving recyclability. It also included the modification of some spaces in classrooms and other areas of the school. This plan could also be a useful tool for the engagement and participation of the school community. Some of the ideas of this plan included:

- Extra recycling bins would be added to each classroom to separate paper and cardboard from other recyclables (classrooms had only a bin to recycle paper and cardboard)
- We would consider the use of a composting bin for each classroom
- Creation of a reuse center to reuse some materials for different subject areas (Art, Science, Math…)
- A recycling station would be added to a common area, where students could participate in emptying their recycling bins in order to create opportunities for engagement
- We would also consider a recycling station, where we could separate different recyclable items that are not collected for recycling by the municipality, and which are only recycled at certain places.
- We would leave room for students' engagement and collaboration in this process, allowing them to have an active role in creating, maintaining, and supervising how waste is separated, recycled, and disposed of at school.

The study presented in this thesis represents the first efforts among two groups of grade 3 students that started this challenge of reflecting and modifying classroom spaces to improve recyclability and reduce their environmental impact. Although the implementation of this waste plan is still in its first steps, we have started modifying classroom spaces to improve recyclability.

The action research conducted among these groups had the following stages:

a) *Researcher reflection*. Previous informal observations about students' and teachers' attitudes and behaviours towards waste were considered when reflecting on the necessity to create some changes regarding waste management at the school.

b) *Planning of the action research process and educational activities*. During this stage, the design of the action research was planned according to the age of the students, the timeline, learning outcomes, and the resources available for the school. Since some students from the participating groups were not participating in the study, we organized two different groups during the sessions or part of the sessions that were going to be recorded. Activities that did not require recording were conducted with the two groups together and both teachers guiding the lessons. Educational activities were prepared to facilitate conversations and reflection about human relations with nature, but they also sought to create spaces for action.

c) *Initial Observations*. For two weeks some observations were conducted throughout the school day about what type of materials students were disposing of in their classrooms, and if they were doing so in the correct bins. Some pictures were taken of the waste and recycling bins from both classrooms, as well as some littering in the playground.

d) *Educational Activities*. Some of the previous observations were shared with the students to open up the discussion of things that we were doing well and things we could do better at our school.

Students were guided during four lessons of approximately an hour each to reflect and talk about how waste is managed or recycled in our locality and other areas of the world. Throughout the activities, students also reflected on the impacts of using materials and ways to reduce these impacts by applying a circular economy model. They were also exposed to the environmental impacts of landfills and waste released into the environment, and how this was affecting other non-human life. Students were presented with two new recycling bins to be used in our classrooms to improve recyclability, and we also discussed other possible ways we could reduce our impacts on the environment, such as the modification of other spaces or a change in our habits of consumption and disposing of waste. Students worked in small groups to create posters to guide other students and teachers about what frequently used items at school are accepted in the recycling containers as well as some others that are not accepted. Finally, students participated in creating some drawings to be used as posters in both grade three classrooms to encourage others to think about the materials they used and the environments that might be affected.

e) *Second observation*. After changing the recycling spaces in both grade 3 classrooms and conducting the educational activities explained above, students were observed again during a period of two weeks to identify any possible behavioural or attitude changes towards their consumption of materials, the way they were disposing of waste and recycling, and their connections with nature. This was also a phase to reinforce, model and learn about correctly disposing of things in the recycling bins. If students were forgetting or did not know how to recycle something well, they were helped by either their teachers or other students. These observations were documented in writing in a journal.

f) *Student leadership*. Students participated in small groups in providing a short presentation to the rest of the classrooms. During these presentations, the same type of recycling bins that were used for this project were distributed to the rest of the school classrooms. Recycling posters that were created to guide recycling were also handed out. This activity provided an opportunity for students to exercise some leadership within the school, such as by preparing recycling posters, participating in school announcements to incorporate information about waste, conducting short presentations, and distributing recycling bins to the rest of the school's classrooms.

g) *Small group conversations.* Finally, students participated in small groups of six students to discuss their experiences and possible changes after participating in this project. These discussions were guided with some questions prepared in advance; however, they had the format of an open dialogue in which students could ask other questions, ask for clarification, or add any other pertinent information. These conversations were audio recorded.

4.5 Data Collection

Observations were handwritten in a journal for an initial period of two weeks. The two different groups were observed during regular instructional times. Pictures of the waste and recycling bins were taken at the end of each day from both grade 3 classrooms. Littering in the field and playground was recorded as well in several pictures throughout these two weeks.

Figure 7: Classroom waste bin and littering in the field

The educational activities for this action research were conducted during four lessons of about one hour each for two consecutive weeks. Parts of these lessons were audio recorded for later analysis. The lessons were designed to awaken students' awareness of their relationships with nature, consequently, many questions were asked during the process. Students that had opted not to participate in this study were also offered the opportunity to participate in the same lessons with my grade partner teacher, however, no audio or data was collected from this group.

At the end of each of the educational sessions, students were asked to write any thoughts or something that they had learned that day. This was an individual moment for students to reflect on the information provided or any other thoughts that they might have. This is an example of a student's reflection writing:

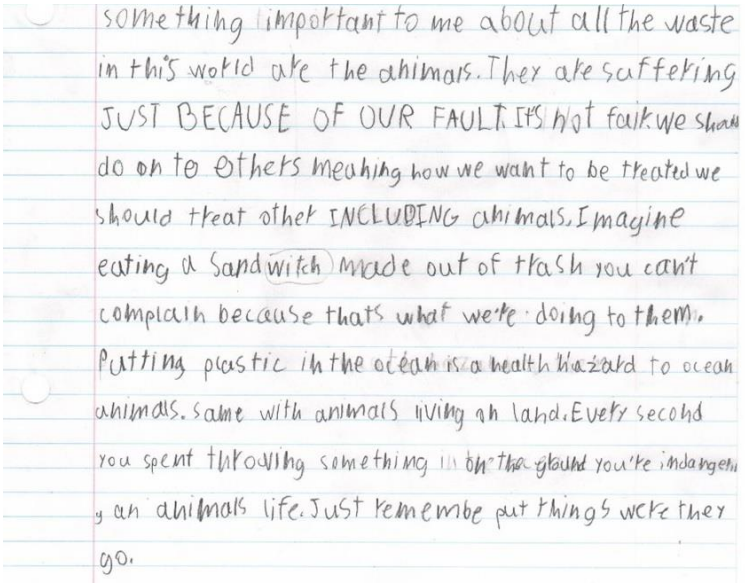
something important to me about all the waste in this world are the animals. They are suffering JUST BECAUSE OF OUR FAULT. It's not fair. We shou do on to others meaning how we want to be treated we should treat other INCLUDING animals. Imagine eating a Sandwitch made out of trash you can't complain because thats what we're doing to them. Putting plastic in the ocean is a health hazard to ocean animals. same with animals living on land. Every second you spent throwing something in on the ground you're indanger y an animals life. Just remembe put things were they go.

Figure 8: Example of a student's reflection

After viewing a short video about how other children in another part of the world were taking actions to improve their respective environments, students were asked to reflect about some actions or changes they would like to see regarding waste. Students had a quiet moment to think individually and write their opinions. Below are the questions and some examples of their answers:

1. What can we do to improve the way we dispose of waste or recycle at school?

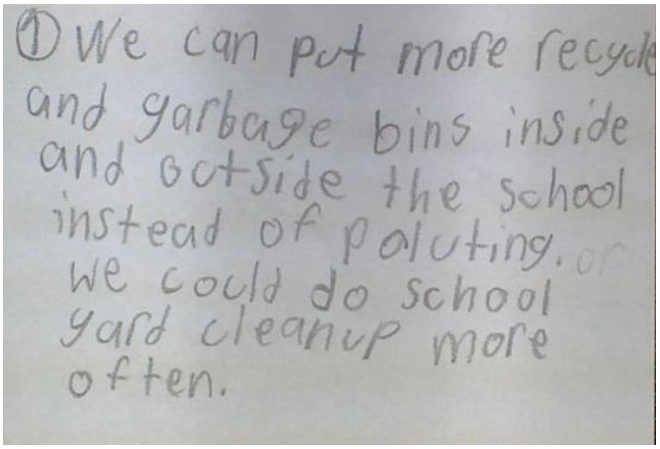
① We can put more recycl and garbage bins inside and outside the school instead of puluting. or we could do school yard cleanup more often.

Figure 9: Example of a student's answer to question 1

2. What do you think we should do to reduce food waste at school and at home?

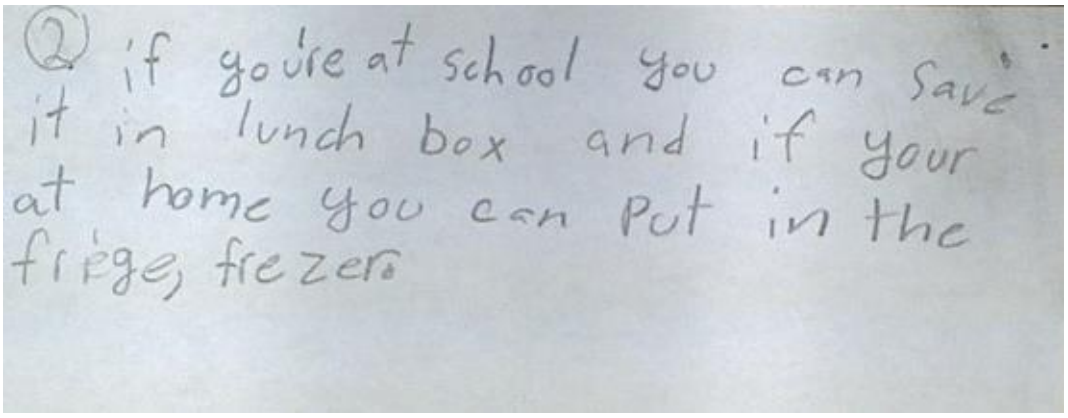

Figure 10: Example of a student's answer to question 2

3. How can we reduce the amount of new materials we use?

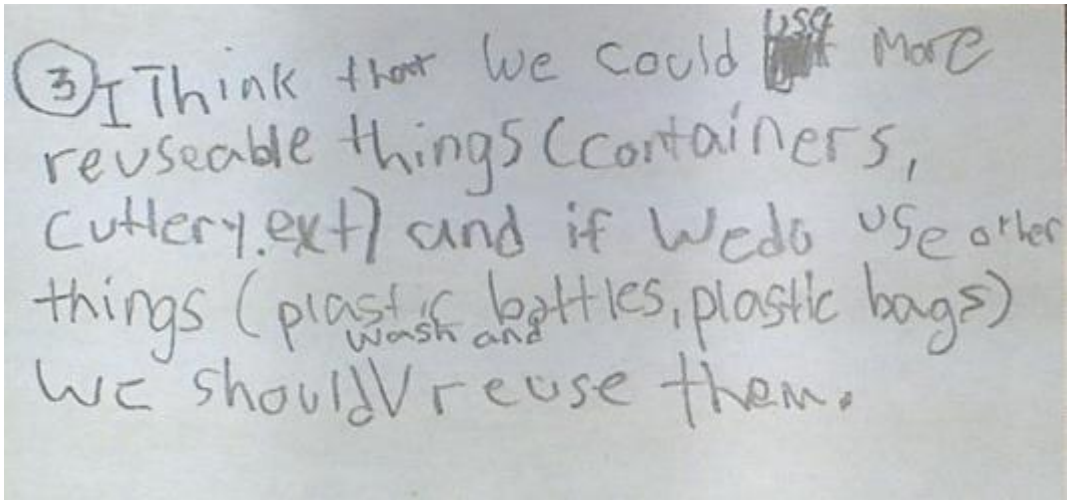

Figure 11: Example of a student's answer to question 3

One of the activities required the creation of posters to connect to the places altered with either the extraction of materials or the disposal of waste. Students were given the choice of creating a positive message (the beauty and value of those places or lifeforms) or a negative impact on those places. These drawings were collected for analysis, but some were also placed next to the waste and recycling bins to serve as a reminder to students each time they were using that area.

Figure 12: Examples of posters created by children to connect to places

Some activities required active student participation, such as creating a recycling poster (Appendix 2) with items commonly used or brought to school. The idea behind these posters was to guide students and teachers about what type of materials can or cannot be recycled in our municipality. During those moments, informal observations of students' participation and observations were also collected.

Once the educational activities were completed, student behaviours and attitudes towards waste and recycling were observed for another period of two weeks. This was an opportunity to see any possible changes in attitudes and behaviours, but it also served as a learning process where other students or teachers were able to help and guide others in recycling at school. These observations were documented in writing in a journal.

After two other weeks, participant students were assigned to small groups where they had the opportunity to express their knowledge, learning, experiences, or any changes after participating in this experience. Four groups of six students were created to facilitate a fluid dialogue in which everyone had the confidence to share their ideas. The different groups participated at different times with the teacher in a school setting outside the classroom. In these conversations, students engaged in a guided, but open dialogue, for around 30 minutes. The conversations of the different groups were audio recorded for later analysis. The following questions served as a guide for these discussions:

1. What have you learned about through this experience?
2. What have you noticed yourself doing differently when recycling or disposing of waste? Why did you make those changes?
3. How do you think other animals and plants are affected by our waste?
4. Have you changed some of the things that you consume at home or at school? Why?
5. What changes do you see at school after these lessons? What about at home?
6. What things do you think we can do better?

All students in the group had an opportunity to answer the previous questions. The small group setting facilitated an increase in students' engagement and participation. Below are some examples of those conversations:

Example answer to question 2:

> Student: *Before we started learning, we never actually understood when my parents washed the bags we use.*
>
> Teacher: *They were washing them, but you did not understand why.*
>
> Student: *Yeah, I'd come home and just find a random bag on the handle of the sink. Yeah, I didn't understand why they did that, but now I understand that that they're just reusing.*

Example answer to question 4:

> Student: *When like we went into… like this like subject, I realized it's not good to litter and it's changed my mind that I should use like cardboard or paper or plastic more and use it to make other things.*

Below is a summary of the data collected during this action research:

Activity	When	Collection Method
First observation	End of March	Photos (by teacher-researcher)
		Teacher-researcher journaling
Waste lessons	Beginning of April	Observations, audio recorded
Written questions	Beginning of April	Photographed student's writing
Drawing posters	Beginning of April	Photographed artwork
Written Reflection	Beginning of April	Photographed student's writing
Second observation	End of April	Photos (by teacher-researcher)
Small group dialogue	End of May	Audio recorded

Table 1: Summary of data collected

4.6 Data Analysis

Children's drawings, writing and recorded discussions were analyzed through narrative analysis. As Braun and Clarke (2006) explain, narrative analysis is "…a method for identifying, analyzing, and interpreting patterns of meaning ("themes") within qualitative data". The reason this type of qualitative analysis was used is not only because the data collected was entirely qualitative, but because it was important to see what patterns were emerging in the children's responses during their participation in the activities.

The framework for narrative analysis proposed by Braun and Clarke (2006) was followed to analyze the data collected which includes the following phases:

- Phase 1: Familiarizing yourself with your data.

  The data collected through the different activities in class were organized, read, and reviewed. Small group conversations were transcribed to facilitate a more detailed analysis.

- Phase 2: Generating initial codes.

  After reading the transcripts and looking at the rest of the data collected from students, initial codes were assigned.

- Phase 3: Searching for themes.

  Once codes were established, they were isolated and organized to facilitate the emergence of themes.

- Phase 4: Reviewing themes.

  Themes were reviewed to check if they were related to the previously identified codes.

- Phase 5: Defining and naming themes.

  A clear expression was created which was not only relevant to the associated codes but was related to the initial purpose of this research as well.

- Phase 6: Producing the report.

  Finally, the identified themes were used to analyze whether the generated data provided significant answers to the initial research questions. Some samples of the data collected from students were used to report the results generated through this action research.

Transcription of the recorded oral conversations facilitated the analysis and the identification of possible patterns. This information was complemented by the other forms of data collected throughout the activities, such as drawings, observations, and written reflections. The narrative responses were later coded through a series of stages. The first stage was to highlight parts of the children's narratives and assign some codes to them (see Table 2). "A code in qualitative inquiry is most often a word or short

phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data." (Saldaña, 2013, p. 3).

Student's response	Code
We have learned new ways to put things in the right place.	[3] New learning about recycling
We also learned that if you litter you know that it will go to animals, and then the animals will eat then they might die or get sick.	[5] Thinking about the consequences of our behaviors to other animal life.
I started picking what I was gonna take to school more carefully like I'm gonna take blueberries or bread. I put it in a container instead of a plastic bag.	[6] Changes in behaviours toward recycling and waste.
It makes you think about the animals all of the time and the landfill.	[12] Connecting to places and animal life.

Table 2: Examples of codes assigned

In a later phase, codes were isolated, reviewed, and grouped if they were referring to similar ideas. As Saldaña (2013, p. 9) explains: "Coding is thus a method that enables you to organize and group similarly coded data into categories or "families" because they share some characteristic – the beginning of a pattern". Once the codes had been grouped and reorganized, different patterns began to emerge from the collected data. Some tentative themes were initially created for each group of codes. Data were read and reviewed several times to look for those elements that were not only recurring in the children's responses, but that were also significant to the relevance of this study. As Braun and Clarke (2006, p. 82) expressed: "A theme might be given considerable space in some data items, and little or none in others, or it might appear in relatively little of the data set. So, researcher judgment is necessary to determine what a theme is".

Below are the themes that were initially identified:

1. Connections with places and other living organisms.
2. The relation of humans with nature.
3. Conversations and changes about the reduction, reuse, recyclability, and disposal of waste
4. Discussions about lifestyles and changes in our consumerist behaviours.

Reviewing the previous themes and considering the aim of this study and the research questions, two distinctive main themes rose to the surface from the data collected: reconsidering our relation to the world and actions. These main themes were used to guide a deeper analysis to determine whether

children's relationships with nature were changed through the modification of their learning spaces to adapt to a circular economy model at school and the proposed lessons in class. The themes were also considered to answer the research questions for this thesis that are presented in the results section.

Main Themes	Subthemes	Examples
Reconsidering our relation to the world	Connections with places and other living organisms	*When my dad drives me home, I start to notice that when I look at the nests, there's little pieces of plastic. And mom birds might be feeding their babies plastic or garbage…instead of what they need, like worms.*
	The relation of humans with nature	*I started doing the other things because I know that a lot of people are just throwing garbage on the floor and stuff. So, I don't want to end being one of those people.*
Actions	Conversations about and changes to the reduction, reuse, recyclability, and disposal of waste	*…before like I threw away the little scraps of fabric that I didn't use anymore, but now I reuse them like for other decorations.*
	Discussions above lifestyles and changes in our consumerist behaviours	*At home we have started to use paper bags instead of plastic bags.*

Table 3: Themes identified from the data collected

4.7 Ethical Considerations

Research in Canada is regulated by a group of agencies that are known as Tri-agency: (The Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council (NSERC), and the Social Sciences and Humanities Research Council (SSHRC). Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (Tri-Council, 2018) was consulted regarding research involving children. This document refers to research involving children, and states that the inclusion of children in research improves our knowledge of their unique characteristics: "…children in research advances the commitment to justice in research by improving our knowledge of, and ability to respond to, the unique needs of children throughout their development." (Tri-Council, 2018). Since children lack their legal capacity for authorize research, parents, or guardians of the

participants for this study were contacted to grant their approval in writing for the study conducted for this thesis.

The school board and the principal of the school were informed about the intended action research for this thesis. Since I was conducting the study for this thesis at the same time as the teacher of both groups of students, the lessons were integrated into my instructional time with them. Students were informed of the purpose of this study, and they had the capacity to reconsider their participation at any time. Parents or guardians of children in the groups participating were also informed, and they had the opportunity to decide if they preferred not to participate in the study (see Appendix 1).

Parents or guardians could decide at any time to withdraw their children from participation in the study by communicating via email. Students were also asked if they wanted to participate, and I confirmed their consent to continue participating during the different phases of the study. Once the action research started, there was no communication from any participant student or parent/guardian indicating that they wanted to withdraw from participating in this study. During the lessons, I ensured that all children felt comfortable continuing to participate.

Data collected from students (observations and audio recordings) were stored on a local drive with no internet access, which was only accessible by me. No data will be shared, published, or used in any other way other than by being incorporated in this thesis. The presentation of the information collected in this study does not include child's names or any other information that might identify any student at any time.

5. Results

The data collected during this action research were organized and classified in accordance with theoretical and methodological criteria explained in the previous parts of this thesis. The results presented below were analyzed attaining two main themes: (1) reconsidering our relation to the world; and (2) actions.

5.1 Reconsidering Our Relation to the World

5.1.1 The Ignorance of the Waste Problem

The word "garbage" is defined in the Cambridge Dictionary (n.d.) as "waste material or unwanted things that you throw away". This process of throwing things away is a common action that we are constantly doing in our daily lives and teaching children how to put things in the correct recycling or garbage container is a common practice in our societies. During the observations before the intervention, it was quite common for students to do a quick walk to the waste bins. Some students dedicated a moment to think where to put the material they were going to dispose of, however, it seemed that it was more a mechanical action about the process of sorting than an actual thinking process about the consequences of either consuming a certain type of product or displacing it in the incorrect bin. It was also observed that students felt disconnected between their actions when disposing of things which suggests that they were unaware of the effects that they might have on other living organisms or nature. After reflecting on the consequences of our waste in class, students were able to feel more connected to their action of throwing things away and the possible consequences it might have:

Student*: So now I watch like in what garbage I put something in. Before I threw it in whatever garbage it landed.*

Teacher*: Now you're thinking about which ones should be, though.*

Student*: Because I know that it can hurt an animal.*

Most of the students did not know what a landfill is, nor had they seen one before; so, when they learned in class about how waste is managed in our city, they were quite concerned about waste. Landfills are for health reasons away from populated areas, but this also helps to contribute to the invisibility and disconnection of our actions and the problems that create. It is difficult to talk or have a position about something you do not know or see, so when students were more knowledgeable about how waste is managed locally, they were able to express their opinions and feelings about it:

Student: *It's horrible because when we used to put it in the garbage it would always go in the landfill…*

Student: *I learned that if we use so many plastic, it can just be burned or thrown into the landfill and contaminate the nature.*

Student: *I wanted to be a veterinarian when I was older and when I heard about this landfill, I just realized about other animals that are dying. So, then I just realized that, like I am throwing away stuff that I just reused, and they are actually very reusable and then it just goes to the landfill and the animals just eat it.*

The visualization in the class of the spaces affected by human waste, such as landfills, animal life, and ocean pollution made a great impact on the students. The images of what a landfill is, and the images of animals eating or being hurt by pieces of plastics or other harmful materials, opened students' eyes to how human waste could affect other life on Earth. The conversations that arose from the exposition of those images contributed to a deeper understanding of the waste problem. It also contributed to the modification of previous thoughts through the reconstruction of knowledge with the new learning acquired, as expressed by some students:

Student: *That littering and pollution is a much bigger problem than I thought it was.*

Student: *I'm more aware when I'm about to throw something into the trash.*

Student: *…Before I was like recycling more plastic instead of making less, so is like we should make less… and find different substances.*

Figure 13: Landfill drawing

When students learned about some of the environmental costs of producing and consuming certain products, they were more willing to reduce their use, look for alternatives, compost or improve their recyclability. They also started to reflect on the recyclability of some of the materials they were using:

> Student: *Before we started learning, we never actually understood when my parents washed the bags we use.*
>
> Teacher: *They were washing them, but you did not understand why.*
>
> Student: *Yeah, I'd come home and just find a random bag on the handle of the sink. Yeah, I didn't understand why they did that, but now I understand that they're just reusing.*

Figure 14: Student drawing depicting the exhaustion of natural resources

Many students reflected during the lessons on different ways they could contribute to reducing materials extracted from the Earth, which helped them to reflect on the unsustainable practice of the current linear model of the economy where many things are easily disposed of and placed in landfills or incinerated. Some of those examples can be seen in Figure 15.

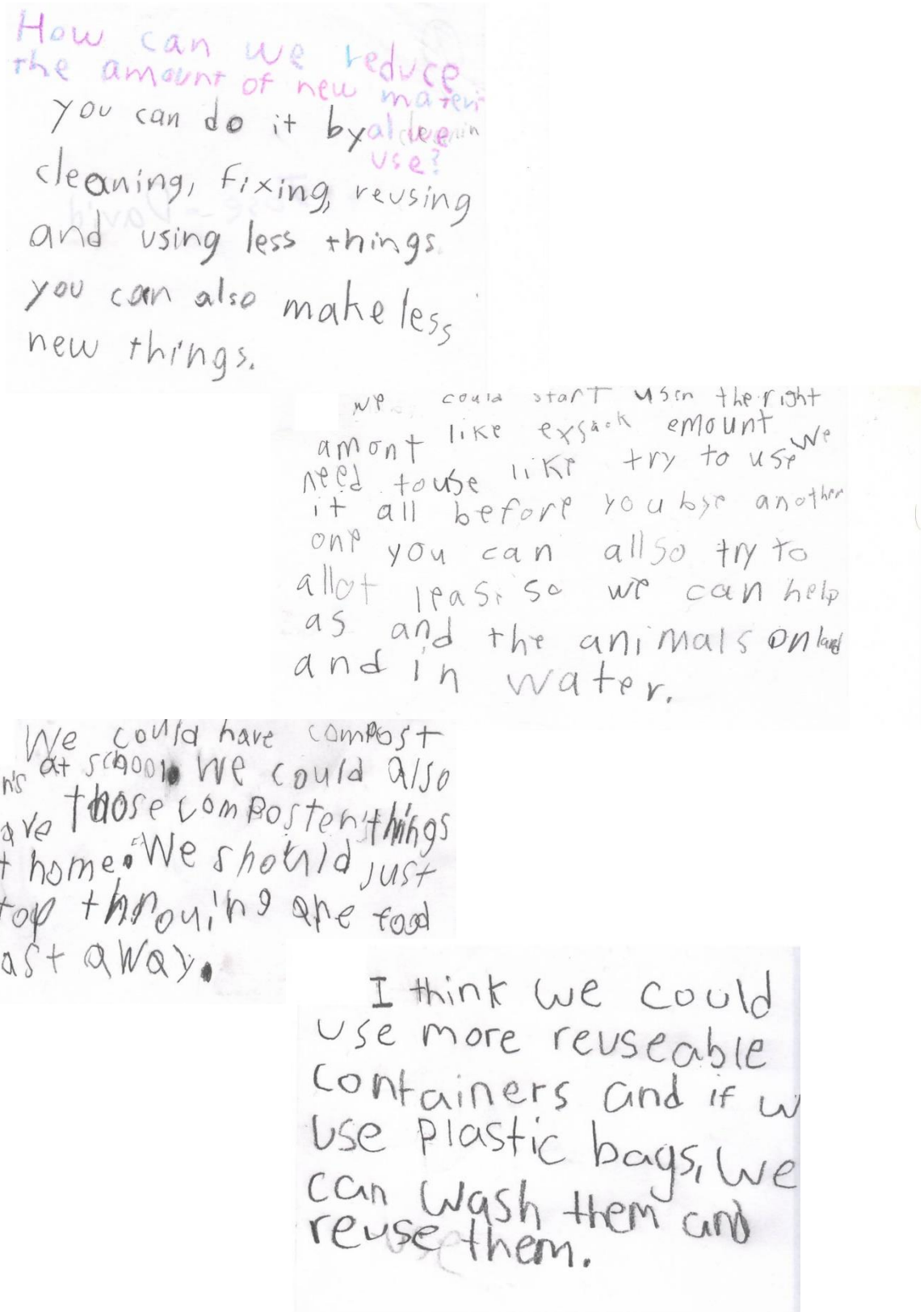

Figure 15: Examples of students' reflections about reducing the use of new materials

5.1.2 Awakening to a Non-anthropocentric View of the World

Words have a primordial role in creating meaning, and the use of the word "garbage" in class was one of the ways children continued being disconnected from the places or life affected by their actions. For this reason, all waste bins in our classrooms were labeled not only to help the correct disposal of things in them but also to facilitate students' connections with the destination of anything placed in those bins. Our classroom bins were named as follow: paper and cardboard, refundables, recyclables, compost, and the landfill (see Figure 21). The word "landfill" was used because it connected better to the place where most likely anything that cannot be either composted or recycled would go in our city. Students were more used to listening to words like garbage, recyclable or refundable, however, the use of the word "landfill" was new to most of them as one student very well expressed:

> Student: *I didn't actually know about landfills, and I didn't know either about how plastic, some of it, get recycled. I didn't know that. …I didn't know the word landfill.*
>
> Teacher: *Where did you think before garbage goes?*
>
> Student: …. *I actually never thought about that.*

If something could not be recycled or composted, we asked students to put it in the "landfill bin" and that simple change in a word created a great impact on many students. It was observed that after learning about landfills and some of their environmental impacts, students were more conscious when putting something in that bin and they tried to diminish their use. Many of them started to bring to school things that could be either reused or recycled to avoid using the landfill bin. Now, when students placed things in the waste bins, they were more engaged in sorting things well to improve recyclability to reduce or avoid placing things in the landfill. The connection that was established between their actions and their impact on other non-human life encouraged many to make those changes.

> Student*: I'm more aware when I'm about to throw something into the trash.*
>
> ---
>
> Student: *I made those changes because I don't want things to go to landfill and animals get sick or mightbe die.*

Introducing students to a deeper understanding of the environmental consequences of the materials we use in our daily lives, facilitated students' connections with other places. Before the educational lessons, students did not express any feelings or thoughts about placing things in the garbage or recycling bins. Some of them recognized during the lessons that before they were not thinking much about where waste went. After learning in a more profound way about waste, most students were reluctant to use the landfill bin and tried to reduce, reuse, or improve recyclability. Even though some students felt bad to use the word landfill because reminded them of the environmental impacts of that place, most students were willing to participate in changing their behaviours to avoid creating harm to other animals. The lessons and conversations in class helped students to create a connection between their actions and their potential impacts on other life:

> Student: *I didn't know that it was affecting animals so much.*
>
> ---
>
> Student: *I learned that I didn't know that animals eat garbage but now I do.*
>
> ---

Student: *It makes you think about the animals all of the time and the landfill.*

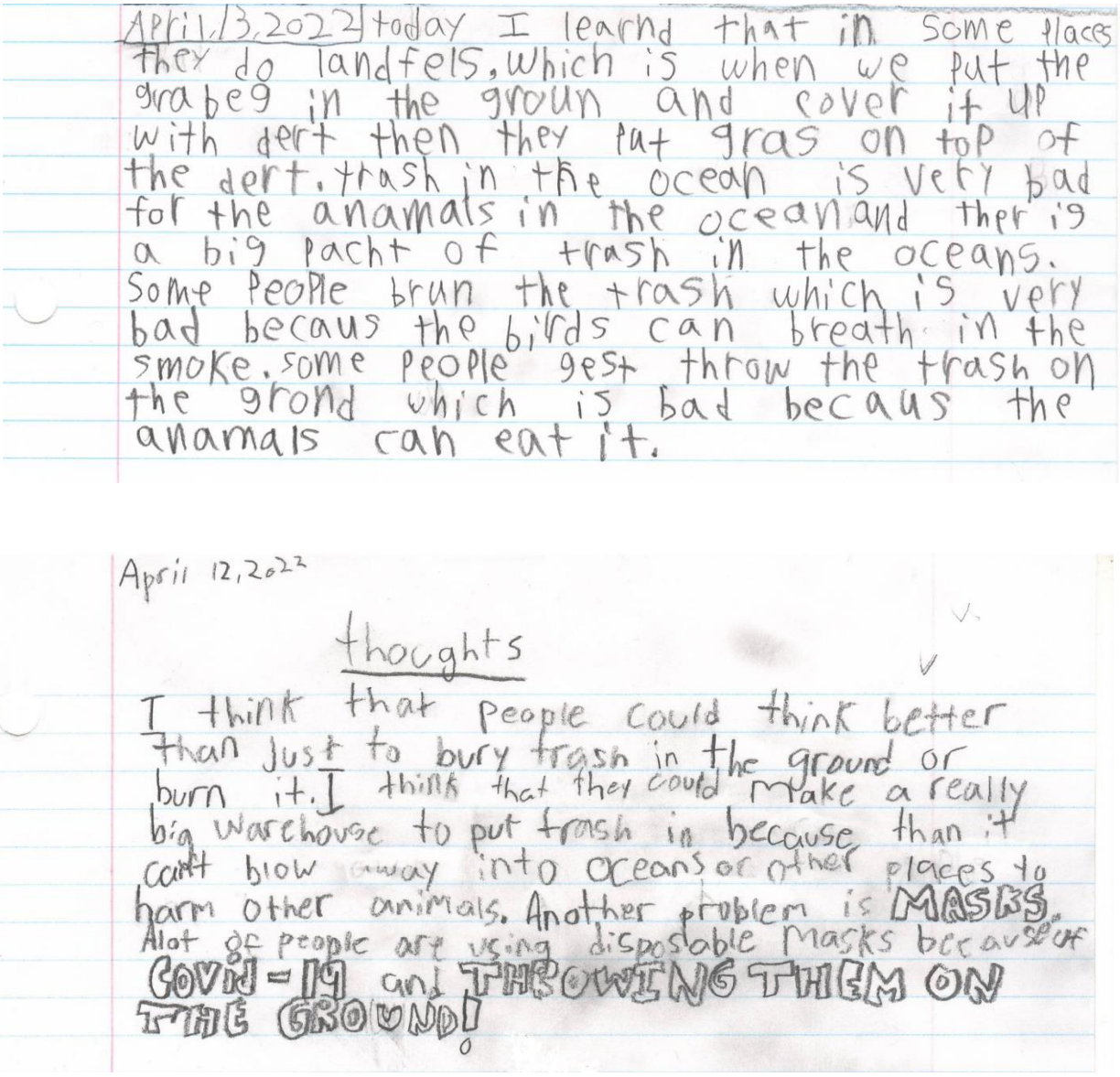

Figure 16: Examples of student's reflection

Some students also started to incorporate the word landfill into their daily use, and this small change seemed to help them move away from an anthropocentric thought process in which waste was just anything that we no longer need. Waste now has other meanings to students: it was connected to the places affected by its disposal and how that affected other living things.

Student: *I made those changes because I don't want things to go to landfill and animals get sick or maybe die.*

The exposition in class about how another non-human life is affected by the waste we generate, facilitated a shift to more ecocentric thinking in class. Many students made connections with animal life and provided some explanation about how they could be impacted by human waste. Some examples of these connections are:

> Student*: It's bad for the animals because if they eat it, they might get sick they might die.*
>
> ---
>
> Student*: Some small animals maybe they get stuck in can container coolers and then they can't lose it, and then they can't find food.*
>
> ---
>
> Student*: Animals, they can confuse it for food in land or in water. And then they eat more of it, and then they think it and they think it fills them up, but it actually doesn't. It's bad for their intestine or like something like that. And it's also bad because they can't…they aren't eating the right thing. And microplastic is even worse because if they're actually eating their actual food, they can even they're also eating microplastic. And since it's so tiny, it can scratch easily, and then something that scratched or like broken and then they die because their body isn't working.*

Figure 17: Student drawing depicting animals impacted by human waste

Most students were greatly impacted by how their actions could hurt life in the ocean. After the lessons, students understood that the natural world is connected, and things are transported around the globe. They started to make connections between their local actions and behaviours, and how those could impact not just local places but also other far away environments such oceans. Some examples are:

> Student: *I learned that the garbage in the ocean actually gets smaller in smaller pieces and crumbles.*
>
> ---
>
> Student: *That most of our garbage ends up in the ocean.*
>
> ---
>
> Student: *I didn't know that microplastics end up in the ocean, I thought it was somewhere else like in grass or other places. But when animals eat the microplastic they get sick.*

Many students were able to emphasize with non-human life, and they were able to reflect on animal suffering and how their lives have been affected by human activities. Some examples can be seen in Figure 1 and Figure 2.

Figure 18: Student drawings depicting waste in the ocean

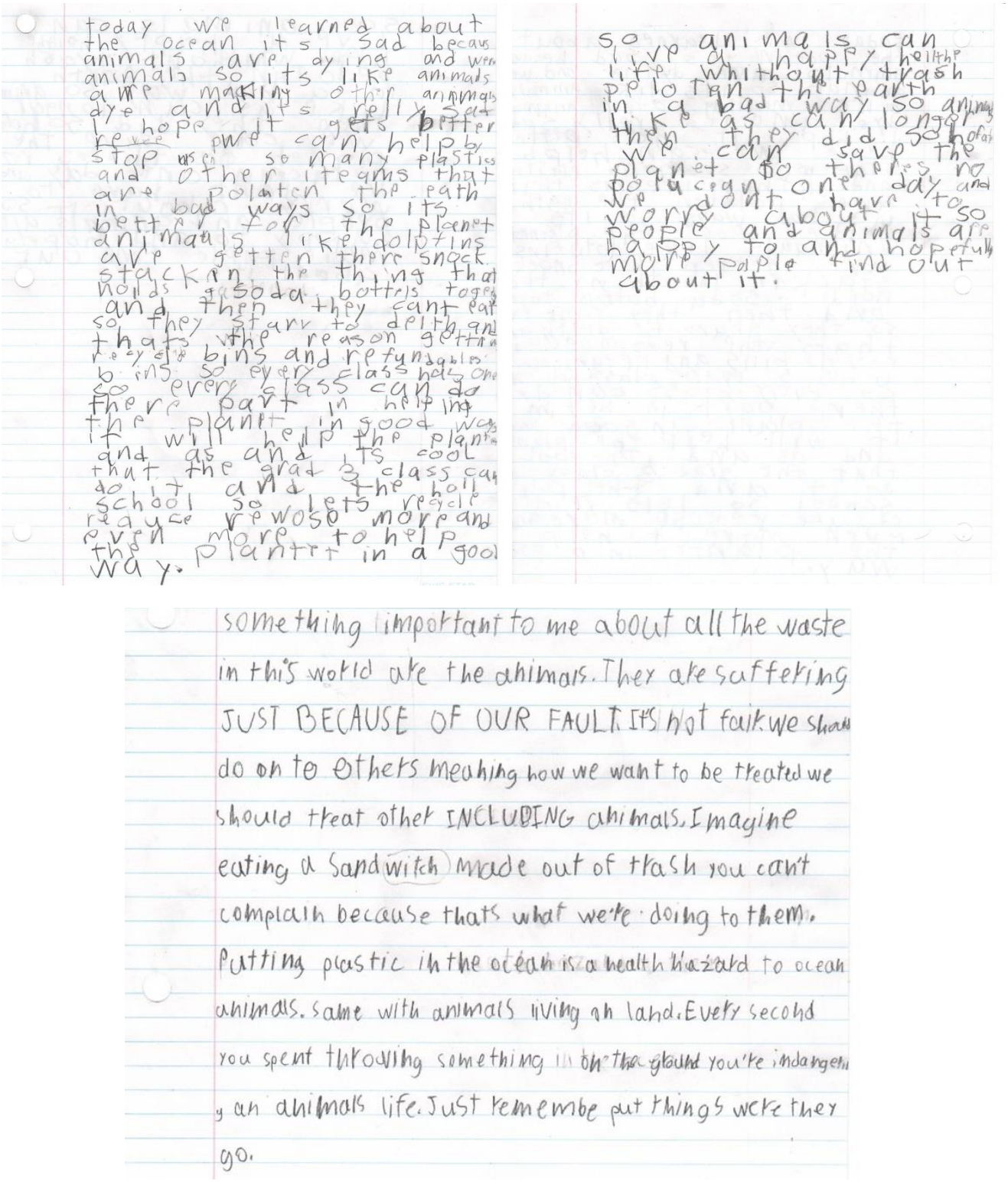

Figure 19: Students' writing about the impacts of waste on animal life

5.2 Actions

5.2.1 The Adoption of the Circular Economy Model at School

As expressed by students during the initial conversations of this action research, recycling at school was confusing for many of them. Each classroom has three different types of containers: a garbage bin, a refundables bin, and paper, and cardboard recycling bin (Figure 21). Because all recyclable items in the city are collected by the same truck, teachers had different ideas about what could be placed in the recyclable bins in their classrooms. Some teachers opted to only recycle paper and cardboard in that bin, while others included some plastics and other recyclables. It was observed that students were hesitant about what things could be recycled, so it was quite frequent to see items placed in the incorrect bin for recycling or not in a recyclable condition, such as plastic containers with food residues. This created a lot of contamination, which would eventually reduce the chances of recyclability after being collected.

> *Student: We used to put everything in the garbage but now we have other containers to help us sort stuff not just in one place.*

Figure 20: Landfill bin before the intervention

Figure 21: Classroom waste bins before the intervention

Figure 22: Classroom waste bins after intervention

Figure 23: Recycling box for markers

The incorporation of extra bins for recycling and composting encouraged students to be more aware of the recycling process and how they could contribute to improving recyclability. The bin to collect refundables that was different for each classroom and was usually placed in the hallway was replaced with the same type of bin for all classrooms and placed inside. An extra bin was added to separate other recyclables such as plastics, glass, and cans to avoid contaminating paper. In this process, students learned how to empty and clean anything placed in the refundables and recyclable bins. In class, we also reviewed which items should be placed in each bin, as well as in what condition they should be. This lesson made the students participate in the recycling process, not just in sorting but also in ensuring items were in a good recyclable condition. Bins were also labeled, and some posters created by students with examples of what could be placed in them were posted as well. This opened up different conversations in class about *what goes where* that contributed to ongoing learning about waste in class. After an initial trial of two weeks in both grade three classes, students distributed the same containers to the rest of the school to improve recyclability. Students participated in explaining the use of those new containers and their importance to improve recyclability at school to other classes. Information was also shared with other teachers and the rest of the school during morning announcements. Many students expressed their thoughts about the changes in recycling through the incorporation of the new containers, some examples are:

> Student: *We have learned new ways to put things in the right place.*
>
> ---
>
> Student: *I noticed that we only had like one garbage in the classroom almost and the other one was outside for like bottles. They were still using those ones but, in the garbage, they used to throw like everything in there like some papers were in there. They were like whatever … this is paper, I am just going to throw it in the garbage, and they don't really care. So, they just throw in the garbage, and they were like whatever. But now that we have those two other bins or three other bins, they're actually like separating things. So, they are not just throwing plastic in the garbage, and the cardboard in there.*
>
> ---
>
> Student: *… since we got like refundables, recyclables and stuff, … I see the class and kids not littering that much and there is not so much garbage in the garbage bins.*

Figure 24: Distribution of bins to other classes

One of the first actions students asked for was to have a compostable bin in our classroom. Initially, we were planning to add this step in a later stage of the waste plan designed for the school since it might require more commitment by other teachers and students. However, since students were willing to make changes, we decided to add a compostable bin to our classrooms. We brought the same green bin that the city of Edmonton provided residential houses for the collection of organics (see Figure 22). At the end of the week, I emptied this bin at home since schools' sites still do not have a regular collection of organics. The practice of separating organic at school was new for some students and some even had conversations at home with their families about composting if they were not doing it before:

> Student: *We learned something about…eh.... it's the green bin, composting, and well you can put a whole bunch of a different things that no one never knew before like Kleenexes or paper straws, or things that you can't put in the recycling bins. So, it's kind of interesting.*

One of the objectives of this action research was to introduce students to a circular economy model in opposition to the current linear one. Recycling has always been part of a circular economy, however, there are also other aspects to consider following the 9R model previously explained: refuse, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, and recover energy. The order of these words is important, with refuse being the best option and recovering energy the least effective one considering their contribution to a circular economy model. As can be noticed, recycling is part of a circular model of the economy, however, there are some other more desirable options before recycling. When students were exposed in class to other ways to move apart from a linear model, they were willing to participate and try options other than just recycling.

Consumption patterns of students changed after they were more knowledgeable about the origin and destination of the products they were consuming. Some students opted to change the way they were packaging some of their snacks or lunch for school, increasing the use of reusable containers and refusing to use non-recyclable ones. For example, some students decided to buy other products that were recyclable, such as buying big yogurt containers instead of small yogurt cups when they learned that the latter were not recyclable in our city.

Student: *I have been starting to like use the bigger yogurt containers instead of like the little cups that you get a lot of plastic stuff.*

Teacher: *And why you make that change?*

Student: *Because I know I like yogurt and so I have yogurt quite often, and so I've been trying to use the big ones more.*

Teacher: *Because big one can be recycled, right?*

Student: *I started picking what I was gonna take to school more carefully like I'm gonna take blueberries or bread. I put it in a container instead of a plastic bag.*

When students understood that the Earth has limitations, they were encouraged to reduce some of the things they were using at school and at home.

Student: *…Before I was like recycling more plastic instead of making less, so is like we should make less… and find different substances.*

Student: *That there is a lot of plastic. I thought that there were not that much… We produce so much per year.*

Even though many students had some prior experience reusing things such as clothing, their awareness of the waste problem encouraged many of them to increase and expand reusing things at school and at home. For example, some students tried to reuse some of the things their parents were packaging them, such as aluminum foil. Others opted to take home some plastic packaging to create art projects. Below are some examples of students' conversations regarding the importance of reusing:

Student: *I started because when I heard about this, like how much they've been littering. Like way before I knew about all this, I used to just my mom, used to pack me like a bag with a sandwich in it and every time I, and I would usually just put in my lunch kit and throw it away at home. Just the plastic bag not even reusing it or anything. And then, once we started learning about that, I like reminding myself how important it is to keep reusing things over. So then as soon as I got home that day, I was like, well, you can keep packing plastic bags, but like can you not throw them in the garbage? Can you just like gently wash them like…?*

Student: *When like we went into… like this like subject, I realized it's not good to litter and it's changed my mind that I should use like cardboard or paper or plastic more and use it to make other things.*

5.2.2 The Contributions of Local Actions in a Global Context

Learning about how waste affects other species and the fact that it might be transported to distant places such as the ocean, encouraged students to pay more attention to littering in the playground. Students usually have their snacks outside during recess time and without proper care, some of the wrappers or containers could be left behind on the ground. Even though the school organized yard clean-ups throughout the year, it was quite common to see littering at the field. After having some conversations in class about the effects of littering on other species locally and in other parts of the world, students understood that their local actions might have an impact globally and they were more diligent in using the outdoor bins or bringing their waste inside the school.

> Student: *Sometimes when I'm chewing gum, I spit it out on the road, but now I spit in the garbage.*
>
> Student: *I started doing the other things because I know that a lot of people are just throwing garbage on the floor and stuff. So, I don't want to end up being one of those people.*
>
> ---
>
> Student: *Why I don't really litter is because maybe if there's like an ocean around and the wind could like … blow it into it if there's like somewhere around that's why I don't litter.*

Figure 25: Pictures of littering at the school field

When students understood that some of their actions might be responsible for the damage created to other animals and their habitat, they were empowered to make some changes locally. Students observed that seagulls usually come to the field looking for food. They were also more aware of how things left on the ground could be transported to distant places. A few students decided to create a sign to remind other students not to litter when they were outside, and they moved around the field holding it in their hands. Some students also asked for recyclable bins for the school field since there were only two garbage bins. Littering in the field and some of its effects were explained during announcements to the rest of the school, and a student even decided to prepare a speech that she wanted to share about some of the effects of littering (see Figure 28). These actions reminded other students about the importance of not littering in the field, which contributed to reducing the amount of littering in the school field.

> Student: *I've noticed around the school that some kids at school have still been littering a little bit 'cause I've been finding garbage like yesterday when I found the piece of garbage on the floor and I picked it up and threw in the garbage. Yeah, they've been still littering, but they some kids even stopped littering and it's getting a little bit better.*
>
> ---
>
> Student: *That the entire school is not littering anymore, there is just a small amount.*
>
> ---
>
> Student: *I see some people not littering. I see some people taking their orange peels and their … banana peels to the green bin. They are littering less, and I actually saw at home that there was like a little bit of a forest chopped down like the corner, but around the tree trunks, there was tiny little trees growing, which means they replanted.*

Figure 26: Drawing about littering

Figure 27: Pictures of waste bins at the school field

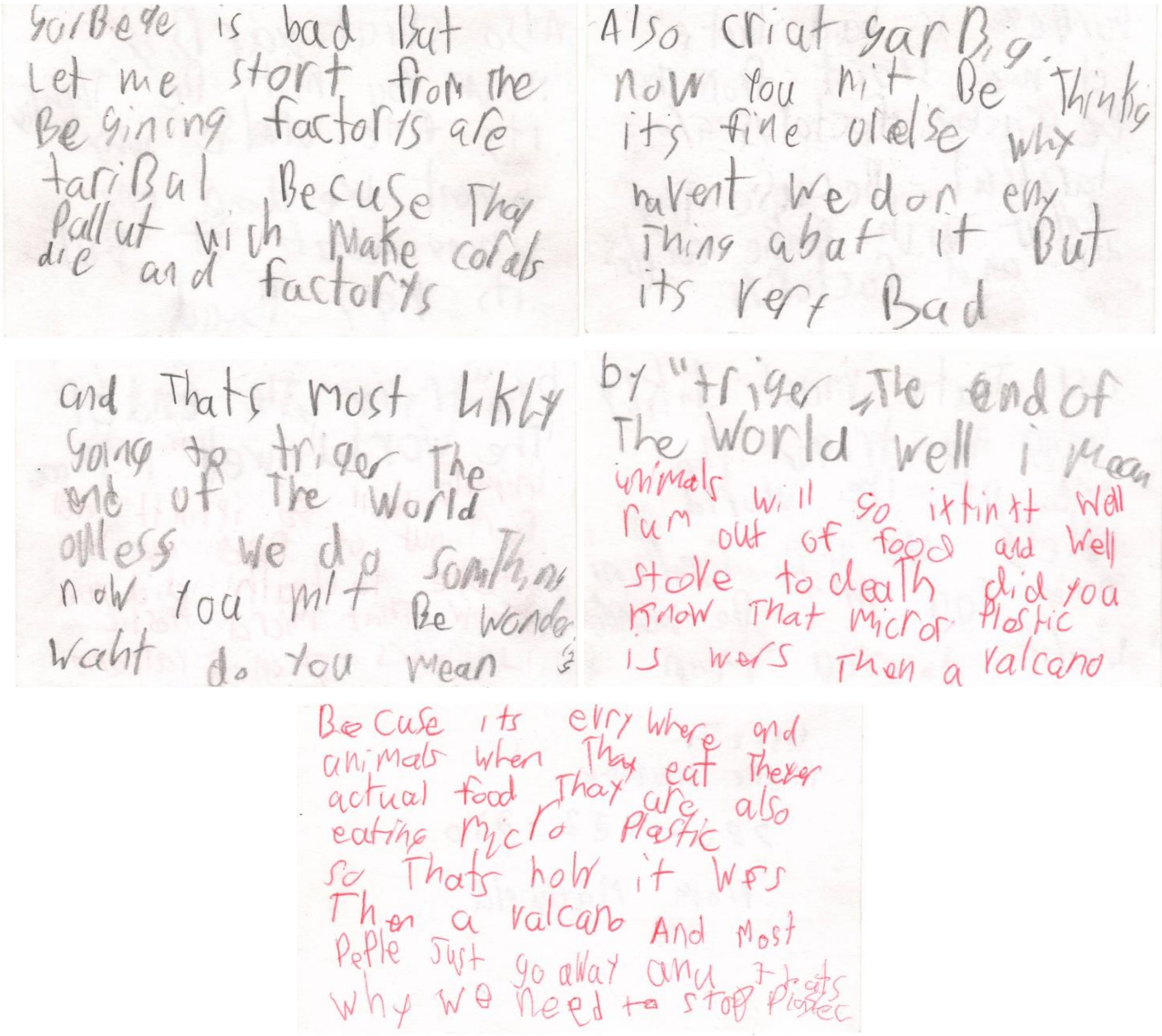

Figure 28: Student's speech about waste and littering

The experiences students acquired regarding waste in class allowed them to analyze their experiences through a different lens. It somehow opened their eyes to pay more attention in their daily lives as well in regards to waste and littering. Their observations about how other people dispose of things interacted with their learning at school allowing them to critically reflect and sometimes act on their own in different situations. Some students were willing to share their stories in class:

> Student: *And I saw someone going around my street that has, uh, he's on his bicycle and he has a back… umm… like a little kind of like a trunk for the bicycle.*

It has like a…yeah, like a basket behind it and he whenever he goes around my neighborhood once in like two times a week and he collects all the plastic and garbage and he throws them in and back, yeah?

Teacher*: Oh, that's interesting. And that's a person that you know?*

Student*: Yeah, he's just like a stranger and he's just kept picking it up. And we set it out a sign the other day saying thank you for cleaning it.*

Student: *One day I was walking my dog and then I saw like some litter everywhere. So, I picked up a little bit and then the next day I saw there was no more litter anymore.*

Student: *I see my dad sometimes throw trash and plastic bottles on the ground. So, and now I keep telling him to put it in the trash and he finally starts doing it.*

Despite their young age, some students thought about how the world today is still living at the expense of degrading the natural environment. Some students expressed their feelings and opinions about some environmental issues, such as the non-recyclability of some materials which will create an environmental impact.

Student: *I actually thought about…, I felt bad for all the kids who wouldn't have Earth to be on when older.*

Student: *I've noticed that with this whole program of helping the environment it makes me noticed how much I really like the environment and how much we really need to stop it because it's really makes me feel bad about it. So now, I think I am going to talk to my parents about it more often and might be my family will be able to do something about it…*

Student: *Did you know that actually electric cars are not good for the environment because of the wires inside of it?*

Student 2: *…the electric cars also have batteries that if you use so many electric cars, where are you going to put the batteries?*

Even though students were sometimes worried about what they had discovered was happening with the world we live in, they were also willing to see changes. Some students expressed some future actions they will take in order to have a more sustainable world, while others were critical about the situation, and they were asking for other ways to relate to the natural world.

Student: *We don't have really the best ways of like to getting rid of garbage and stuff, like for example sometimes we just burned it and then it goes into the air and for example, a bird can go through it and then it gets sick … or like we buried on the ground… We need to think of different options.*

Student: *...And I also think we should stop putting things for the landfill that are not good for the environment like, I think we should bring back chalkboards or like that kind of stuff that used to be older, and that's better for the environment…*

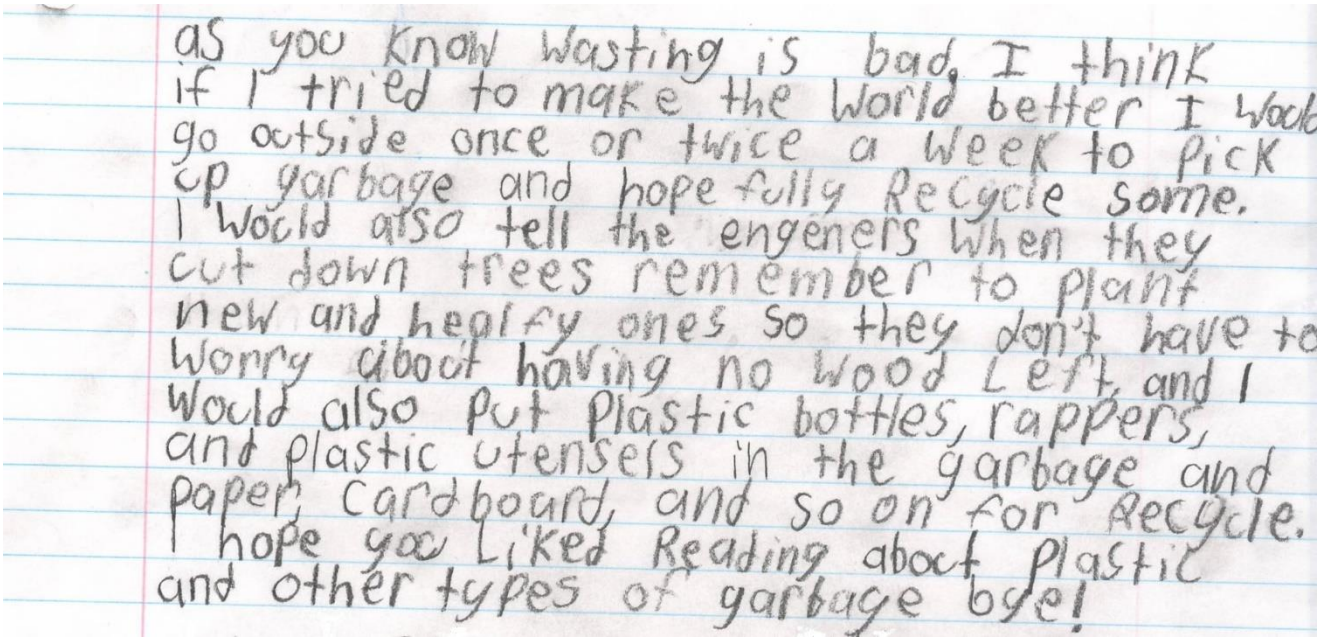

Figure 29: Student's reflection on future actions

4. Discussion

Where does it go? Garbage? This is a question that many students sometimes ask, but are they really thinking about the place where things are going after their use? This is a question that has come to my mind for a long time after observing how easily people put things in the garbage bin without a second thought, even things that could be recycled or composted if they were placed in a different place or taken home. It looks like for many, this action that is performed several times in a day, does not have any other meaning than the mere disappearance of something that is no longer needed without any further thought. Are we thinking about the consequences that might exist in the environment after something is displaced in the garbage? The disconnect between our actions and their consequences on the natural environment that many of us have learned throughout our lives seems like a challenging bond to break. Furthermore, we continue to perpetuate our avoidance to address the waste problem by educating our children in a linear model of the economy that assumes the infinite abundance of resources and simply ignore the consequences on the natural world of our actions.

The aim of this study was to introduce students to an ecocentric point of view when learning and thinking about the materials we use and dispose of at school. Two theories were used during the process and analysis of this action research: Circular Economy and Dewey's Theory of Experience and Education. These theories were considered to answer the proposed questions:

a) How do students talk about recycling and waste?
b) How do students relate to their environment?

c) What patterns of consumption are changed among children after reflecting on waste at school?

a) How do students talk about recycling and waste?

What would your neighbour think if you were cleaning your house by putting your garbage on his property? We all probably agree that this is not a good way of getting rid of our waste, but this is exactly what is happening today when we dispose of our waste in the habitat of other living organisms. The problem is that we just do not see it, or sometimes we don't want to see how affects the environment since it is far away from our homes. What is unfair to do to another human being like our neighbour, seems to be a fair situation to do to other living things.

Results from the narrative analysis suggest that the incorporation of activities to talk about recycling and waste in class opened students' eyes to the invisibility practiced in our society in relation to waste. The conversations and educational activities in class seem to have facilitated students' reflection on the waste problem, as they were able to analyze previous experiences, see current experiences with a different lens, or act differently in future experiences regarding waste and its impacts on a non-anthropocentric world. The results indicate that the experiences around waste in class and the connections created toward a non-anthropocentric world affected students' attitudes and behaviours toward waste. As Dewey (1916) stated:

> When we experience something we act upon it, we do something; then we suffer or undergo the consequences. We do something to the thing and then it does something to us in return: such is the peculiar combination. The connection of these two phases of experience measures the fruitfulness of experience. Mere activity does not constitute experience. (104)

The analysis of students' conversations shows that prior to the intervention, students were not aware of the limitations of the Earth, and some of them even recognized their ignorance about the waste problem. Students discovered that many products we use today are not recyclable. After a deeper understanding of the limits of our linear model of the economy, students were more knowledgeable about the use of materials. Their conversations show that they were more concerned now about how products are produced, and they were willing to choose products in the future that will not damage the environment.

The results of this study also show that having critical conversations about waste in class helped awaken students to a non-anthropocentric view of the world. Many students expressed in their conversations how they were impacted by the damage created to other life, especially animals. The introduction in the class of the expression "landfill bin" to designate the destination of the waste that could not be recycled appears to have challenged many students to recognize and act on their previous blindness to waste. Despite being the same bin as before, the naming of landfill bin, as opposed to garbage or waste bin, facilitated the development of an ecocentric view by students.

The children in this study expressed their thoughts and ideas that could contribute to a more sustainable world. The incorporation of a real-world problem in class such as waste, allowed students to engage in conversations and dialogues not only with their peers, but with their families, friends, and other members of their local communities. The acquisition of knowledge by students through this intervention also appears to have contributed to their critical reflection and discussion about attitudes, behaviours, or actions of themselves or others.

b) How do students relate to their environment?

Children in urban areas have generally fewer opportunities to have meaningful contact with nature. Senses and skills to perceive and participate in the natural world are atrophied in the cities (Narvaez, 2020); so, it is very important to create opportunities for students to restore their relations with the natural world. Learning about recycling is an important habit to teach our students, but I argue that for many of them, the mere learning of this habit does not necessarily mean a full understanding of the waste problem. It is an untold story about how things are made, manufactured, transported, consumed, and so easily disposed of by our consumerist societies. It could also imply, without further learning, a sense of the disappearance of waste from our sight without further thinking about its consequences. Are children aware of the benefits of recycling? Are they thinking about what type of products are being consumed and their impact on ecosystems? Are they conscious of how they could contribute toward a more sustainable world with their own individual actions?

The findings of this study show that reflecting critically on our local environments such as the classroom, playground, neighbourhood, or other local spaces created opportunities for students to reconsider their relations with the natural world both locally and globally. Some students talked about how learning about waste has changed the way they perceived their relations with the natural environment. Taking into consideration a non-anthropocentric view when analyzing their relations with nature, helped them devise other ways to engage with the world. Most students empathized with other living organisms, and they were willing to help them in maintaining a clean habitat by changing their habits of consumption and behaviours. Although students may not have noticed, the changes they were starting to make also changed the way they were perceiving future experiences:

> …learning by experience is a two-way process of engaging with the world. This may be physically or conceptually, trying to change the way things are or how they are perceived to be, and at the same time to 'suffer or undergo' the consequences and therefore be changed by the experience. (Ord, 2012, p. 69)

The numerous actions taken by students to change their relationships with the environment shown by the results indicate that the experiences they had in class during this project produced changes in the students that extended beyond the school walls. Students' actions with the implementation of this action research were quite noticeable at school and outside school. Most students looked for individual actions to do locally and at home which suggests that motivational changes have occurred during this intervention.

The experiences students had in this action research, allowed them to have further experiences that were taking into consideration an ecocentric view. As Dewey expressed: "…every experience affects for better or worse the attitudes which help decide the quality of further experiences, by setting up certain preference and aversion, and making it easier or harder to act for this or that end." (Dewey, 1938, p. 37). The results suggest that students' involvement in local actions made a significant impact on students, and some expressed their desires to continue some other actions in the future. The results also show that some students understood that their behaviours and attitudes could make a significant impact on the solution of the waste problem.

c) What patterns of consumption are changed among students after reflecting on waste at school?

I think that ignorance about the waste problem is practiced when we continue teaching our students, even unintentionally, about how things are made without explaining many of the unsustainable practices that are exercised in today's production and distribution processes. Ecosystems are usually explained to elementary school students by reinforcing their importance to human life, however, little attention is

placed on their own value or the value of other living organisms on their own. Furthermore, there is still a tendency to think about the abundance of natural resources, as if they were unlimited for human exploitation. So, when students participate in our consumerist society, do they consider how a specific product has been produced from the extraction of materials from the Earth? Are they aware of the environmental cost of having a certain kind of product available for us to consume? The omission to teach this part of the story to children is a way to educate them to continue being blind to the waste problem that neoliberal societies perpetuate in a linear model of economy.

This action research promoted a deeper understanding of the waste problem, allowing students to consider the relationships between consumption behaviours and the waste generated. The results indicate that students were able to establish those connections, and most of them were willing to change some of their behaviours after having a better understanding of the recycling and waste management process.

The results also show that most students were in favor of adopting circularity strategies to avoid harming the environment, such as refuse, reduce, reuse, or improve recyclability. The consideration of a circular economy model at school helped students to reconsider some of their habits of consumption. The creation of habits is related to the formation of attitudes, as expressed by Dewey (1938, p. 35): "It covers the formation of attitudes, attitudes that are emotional and intellectual; it covers our basic sensitivities and ways of meeting and responding to all the conditions which we meet in living." The results show attitudinal changes in students, which helped them in modifying some of their habits when recycling and in the choice of products they were willing to consume. As Dewey (1938, p. 35) points out when referring to the relationship between habit and experience: "The basic characteristic of habit is that every experience enacted and undergone modifies the one who acts and undergoes, while this modification affects, whether we wish it or not, the quality of subsequent experiences…"

5. Conclusion

I would like to conclude by citing Dewey's ideas about what education is, since I think they summarize the ideas presented in this thesis quite well:

> *... education is a constant reorganizing or reconstructing of experience. It has all the time an immediate end, and so far as activity is educative, it reaches that end -the direct transformation of the quality of experience.* (Dewey, 1916, pp. 89-90).

Students are frequently exposed to experiences that perpetuate and normalize capitalism as the only viable model of the economy where everything is valued and monetarized, including nature, and which rewards individualism and materialism. In my opinion, capitalism continues positioning humans as ultimate beneficiaries of natural resources and disregards, diminishes, and gives an instrumental value to other living organisms or Nature. Education still tends to continue prioritizing an anthropocentric worldview, and I argue that many times students are exposed to experiences at school that perpetuate this view. I am not saying that the activities designed with this perspective are not educational, what I mean is that they might unintentionally continue to promote an anthropocentric view to the students which will influence and condition future experiences as Dewey expressed (1938, p. 37): "… every experience influences in some degree the objective conditions under which further experiences are had."

Although the consideration of a circular model of the economy was new to students, many embraced some of the principles of circularity that were more manageable at school such as refusing, reusing, reducing, and recycling. Students understood those concepts well and enthusiastically participated in implementing them at school and at home. While some students were worried about the future of Earth after learning about some of the unsustainable practices throughout this intervention, many students

were enthusiastic about making changes on their own, shared the learning acquired at school with others, and had conversations about consumption and waste with their families and friends.

The types of educational experiences to which we expose our students will determine whether we continue educating students to be participants in an unsustainable consumptive society or whether we foster sustainability. Developing an ecocentric view by students requires a compromise to reflect on what types of experiences our students are exposed to: anthropocentric or ecocentric. The educational activities proposed for this thesis and the action research conducted hope to be an example of how an ecocentric view can be introduced to young students. Learning from the way we were managing waste at our school was a starting point to open students up to a non-anthropocentric view of the world that will allow them to reconstruct previous, present experiences, and hopefully influences their future experiences. However, the results presented in this work cannot be generalized to all children population, since this work represents a qualitative analysis of the data collected from the participants of this study.

The learning occurred from the reflection and modification of our school spaces to manage waste more efficiently, allowed students to participate in meaningful experiences which considered a non-anthropocentric world. Thinking about how to diminish our impact on the environment requires a thinking process of displacing ourselves from the self-proclaim-centeredness of the world; however, the domination of the anthropocentrism discourse in our societies is a barrier to sustainability in this world. Exposing students to an ecocentric world that considers and gives an intrinsic value to other species and the natural world is not an easy task, but it is crucial in my opinion to advance to a more sustainable world. Further research about shifting from an anthropocentric to an ecocentric view might be needed in both formal and informal education if we want to educate future generations in moving away from the accelerated degradation of the Earth.

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Appendices

Appendix 1 Consent Form

Parental Consent Form

Dear Parent or Guardian:

I am Pablo Ramírez Pedraza, and I am currently studying a master's degree in education for Sustainable Development at the University of Gothenburg in Sweden. As part of these studies, I would like to request permission for your child's participation in the following study and learning activity.

Purpose
This study is intended to reflect about students' perception about waste and its relationships to consumption. Specifically, the purpose of this study is to find out how is responsible consumption affected among students after the implementation of a waste plan that includes the modification of spaces in the classroom to improve recyclability and an educational activity that includes reflections about waste.

Study Procedures
Student's attitudes and behaviors towards waste will be observed in the classroom, and I will have a conversation about my observations in class. Students will participate in an educational activity that considers reflecting about the use and disposal of renewable and non-renewable resources. Some discussions might take place as a whole group while others will be in small group settings. Some of those conversations will be audio recorded for a later analysis.

Benefits
Waste is an increasing problem in many parts of the world due to the great amounts of resources that we use in our daily lives. This study will be beneficial for your child to reflect about the relationship between consumption and waste. It will also create opportunities for empowerment, creating opportunities for student's participation in waste reduction, reuse, and recyclability.

Risk
There are no foreseeable risks to your students from participation in the study.

Participation:
Since this study will be conducted by the teacher/s of the students, the educational activities will be integrated in different subject areas. However, the students are under no obligation to participate in this study, participation is completely voluntary. You may choose to not have your child take part in the study by informing me that you wish to not participate at anytime during the process. If you wish your child not to participate, he/she will continue taking part of

the educational activities as part of the curricular lessons, but he/she will no be audio recorded or any sample of his/her work will be incorporated as part of this study.

Confidentiality:
This study is part of a research training course at the University of Gothenburg. The data collected will only be read by me as teacher in charge and will not be storage online. It will not be distributed, published, or used in any other way that being incorporated in this thesis. I will not use your child's name or any other personal information that might identify him/her. Master thesis might be published by University of Gothenburg.

If you have more questions, please contact me at gusramirpa@student.gu.se

Agreement
The nature and purpose of this research have been sufficiently explained and I understand that I am free to withdraw my child from this study at any time. Please mark the appropriate statement below to confirm your child's participation.

____ I consent to my child's participation in this study.

____ I do not consent to my child's participation in this study.

Child's name: _____

Parent/Guardian name: _____

Parent/Guardian signature: _____

Date: _____

Appendix 2 Recycling Posters

Paper and Cardboard

Accepted	Not accepted
Clean and dry paper Construction paper Cardboard Greeting cards Photocopies Tissue box (remove plastic) Sticky notes	Crumpled paper Dirty paper Gift cards Paper cup Paper napkins Paper plate Paper straw Paper wrappers Playing cards Shredded paper Stickers Used tissue paper Wax paper

Updated April 2022

Recyclables

Accepted	Not accepted
Bakery container Glass jar Plastic bottle (non-beverage) Stretchy plastic bag Tin can Salad container Ziploc bag	Aluminum foil Bottle cup Chip bags Fruit cup Lunchable containers Markers (put in marker's box to recycle) Stickers Pencil sharpener Plastic cutlery (forks, spoons,...) Plastic packaging Plastic straw Small individual yogurt cup Styrofoam Yogurt tube

Updated April 2022

Refundables

Accepted	Not accepted
Beverage can Drink pouch Juice box Liquid yogurt bottle Milk carton Plastic bottle (beverage) Water bottle *It is now recommended to leave the cup on to recycle	Straw from juice box Yogurt cup

Updated April 2022