# Climate Change and Sustainability Education in Canada: A Critical Discourse Analysis of Curricula in Three Provinces

by

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# Abstract

Climate Change and Education in New Brunswick, Ontario, and Saskatchewan: A Critical Discourse Analysis

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Climate change (CC) is considered a pressing existential threat to the health of the planet and quality of life on Earth (IPCC, 2023). Education is seen as a potential mitigation factor. Using multiple case studies of tertiary data of nine curricula from three provinces (New Brunswick, Ontario, Saskatchewan), this study used critical discourse analysis to analyze the ideological underpinnings by which CC is taught according to Nisbet's (2014) typology of public intellectual's responses to CC, while by default identifying to what extent CC is present as a theme of study within these courses. This study found that while matters related to climate change and sustainability are often mentioned within these curricula, they lack essential problem framing and pathways to solutions and are generally not taught in a manner congruent with what UNESCO and the Government of Canada suggest: the pedagogical framework of sustainability education (UNESCO, 2022; Government of Canada, 2005).

Keywords: Education, sustainability education, climate change, discourse analysis

## Dedication

This thesis is dedicated to my parents, Cliff and Karen Cohen, with gratitude for their support and belief in me and whatever crazy venture I've tumbled down.

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# Table of Contents

# List of Tables

# List of Figures

## List of Abbreviations

CC……. Climate change

CDA….. Critical discourse analysis

EA…….. Ecological Activists

EE…….. Environmnetal education

ESD…... Education for sustainable development

ESE…... Environmental sustainbility education

ESF…… Education for sustainable futures

EM…….. Ecomodernists

GCO….. General curriculum outcome

GDP……Gross domestic product

NBPO…. New Brunswick prescribed curriculum

OE…….. Overall expectation

PEB…… Pro environmental behaviors

PST…… Pre-service teacher

SCO…... Specific curriculum outcome

SE…….. Sustainability education

SE2…… Specific expectation

SGR…... Smart Growth Reformers

TL……... Transformational learning

# List of Appendices

# 1 Research Proposal

## 1.1 Introduction

Anthropogenic climate change is now understood as one of the most pressing existential threats to humanity and the scientific consensus is that if we do not act now, humanity will have an extremely hard time sustaining life on this planet according to the penultimate global convention of scientific experts known as the Intergovernmental Panel on Climate Change (IPCC), (IPCC, 2022). The Anthropocene, though not an official geological epoch, is considered by many scientists as that which has succeeded the Holocene and expresses the reality that human activity has been the dominant cause of global warming since the mid 20$^{th}$ century, or more specifically since the period known as the “Great Acceleration” in the 1950s (IPCC, 2022; Lewis and Maslin, 2015). As the IPCC Special Report stressed (2022), it is the poorest and most vulnerable populations in low- and middle- income countries, often in the global South, that experience the greater effects of droughts, floods, sea level rise, biodiversity loss, and extreme weather. The relatively wealthier nations of the global North are also experiencing the repercussions of climate change. The scientific community stresses that we keep warming to 1.5°C relative to pre-industrial times with higher temperature increases having potentially catastrophic outcomes (IPCC, 2022; Mutter, 2020).

There is an urgent need for all sectors of society to be prepared to engage with the new reality of climate change and for mitigation efforts to be strengthened to ensure a 1.5°C warming as well as sufficient adaptation measures be innovated. As Scoffham and Rawlinson (2022) point out, “it is through education, in the broadest sense of the term, that a culture perpetuates itself” (p. 55), thereby demanding we explore education and climate change if we are to confront our greatest existential threat. Irwin (2019) asserts that contemporary education reflects the values and practices of what the author calls fossil fuel-based modernity in which consumption and consumerism are the epistemological framing of how to engage with the world. Debates in education center

around the need to shift our pedagogy towards a more eco-centric orientation to create global citizens who can facilitate a healthier planet (Stevenson et al., 2014; Irwin, 2020).

Many pedagogists emphasize the need for a more holistic education that would provide students not just with the tools to understand climate change and its implications, but to transform our relationship to the Earth. This type of education is commonly but not exclusively known as Sustainability Education (SE) (Scoffham, 2020). Sterling (2001) and Scoffham (2020) offer a definition of SE as education which stresses ecological intelligence with a participative worldview which draws on qualities such as creativity, self-reliance, self-realization, wholeness, and resilience.

## 1.2 Positionality Statement

While occupying the position of researcher, I have a personal interest in the subject being explored. For the past seven years I have worked in education as a primary and secondary school teacher in Mexico City, Mexico. I taught and teach English Language Arts and English as a Second Language and have noticed that my students respond best when the content we study is relatable to what is going on in the world around them and in their own communities. As a classroom teacher, Sustainability Education makes a lot of sense and I see how it has great potential to impact students and their relationships to the Earth.

My positionality as a white, part Jewish, middle-class, metropolitan female has informed my views on the climate crisis and continues to inform them as I seek to analyze the relationship between education and climate change. I came to understand the urgency of the climate crisis first from an intellectual perspective and a curiosity, but this has since turned into a much deeper understanding of the issue that is now modifying my worldview and demands that I evaluate my own actions and choices and suggests that my relationship to the nature which we are all embedded in is changing. I would best categorize my approach to planetary health as an aspirational ecological activist. I am aware that there are many epistemological approaches to planetary health such as Indigenous perspectives that I will never fully comprehend, but that it is

necessary to approach the subject and attempt to advocate for the genuine integration of Indigenous perspectives in Canadian education.

## 1.3 Problem Statement

Some research and analysis has been done on climate change and education in Canada, in particular regarding pre-service teacher's knowledge of climate change, what type of information is available in textbooks, and gaps and opportunities for more climate change education within the country (Nazir et al., 2011; Wynes and Nicholas, 2019; Beiler, et al. 2017; Demant-Poort and Berger, 2021; Field et al. 2023). There remains, however, a gap in the research regarding the ideological approach from which Canadian institutions teach climate change. There is no research done in the form of discourse analysis that investigates the political positionality of the text that the curriculum of the provincial and/or territorial governments use to construct the expectations of educational systems. A lack of clear comprehension on the ideological positioning of climate change and education in Canada exists.

## 1.4 Research Goal

This research investigated the underlying ideological positions found in curricula and therefore education towards climate change.

## 1.5 Research Objective

The objectives of this research were to:

1. Identify the underlying ideological positions towards climate change within the curricula of three provincial governments (Ontario, Saskatchewan, New Brunswick).
2. Determine the different ideological positions of the curricula from the three sample provinces with the intention of analyzing how they represent Canada's approach to climate change and education.

3. Compare the ideological positions found in the nine case studies and three provinces with the leading pedagogical framework of sustainability education to determine if education within Canada could be assumed to support adaptation and mitigation strategies and a healthier planet.

## 1.6 Significance

Education is often seen as having a powerful role in bringing about social change (Scoffham and Rawlinson, 2022), and curricula that maintain the status quo, neoliberal model of education or uphold fossil fuel-based modernity do not respond to the needs of our society now. A critical analysis of the discourse used in the curricula of the chosen provincial governments will allow for a deeper understanding of what kind of culture our education is perpetuating or challenging, and how it is or is not responding to the climate crisis.

## 1.7 Limitations and Assumptions

As in any project, this research operated under some assumptions. Firstly, there was the assumption that the curriculum and documents chosen will use similar language or language that expresses similar ideas, and therefore ideological trends will emerge in the course of the discourse analysis. There was also the general assumption that exists within discourse analysis that language never neutrally reflects our world, identities, and social relations but instead plays an active role in constructing, changing, and reinforcing them (Jørgensen and Phillips, 2002). Equally, as the author and researcher I come with my own assumptions in the form of personal bias generated from my identity and positionality which I reflected upon and mitigated while conducting this research, I recognize that I am investigating the reality that is constituted and constructed by the discourse of the texts, as my understanding of it was also constituted and constructed by my positionality.

One limitation to the research was the parameters of the project as a master's thesis which limited the scope of the study due to a lack of time and resources. Ideally, each province and territory's curriculum and educational documents would be analyzed to determine the educational culture of Canada towards climate change but unfortunately time and resources do not permit such a vast study. Extrapolation from three provinces with very different cultures and economies will have to suffice to gain some insight into the ideological positioning of their individual governments and the federal government. Another distinct limitation was a lack of training in discourse analysis, therefore as the author I had to be vigorous in my learning and implementation of the technique and methodology to produce an analysis of high quality.

## 1.8 Thesis Organization

This chapter will be followed by: chapter two, the literature review; chapter three, methodology; chapter four, findings; and chapter five, discussion.

# 2 Canada, climate change, and education

## 2.1 The potential of education as culture to mitigate the climate crisis

Education is one sector of society where we can begin to engage with the necessary paradigm shifts in how we view our relationship to our planet (Panos & Sherry, 2023; Boon, 2016). One way to explore the significance of schools and education on our collective consciousness and way of thinking is to explore their relationship to ideology, particularly because of the long history that continues to this day of influential thinkers exploring the relationship between ideology and education (Apple, 2018). Ideology as political and/or philosophical analysis is relevant in this study since identifying what ideology is present within educational structures permits the investigation of power and what power structures and enactors are maintained by educational systems.

## 2.2 Ideology and Education

Ideology, as Freeden (2003) defines it is a thought-practice which is “a recurring pattern of (political) thinking, one for which there is evidence in the concrete world” (p. 21). Freeden (2003) goes on to explain that “our thought-practices intermesh with, and inform, material and observable practices and acts” (p. 21) meaning they have real impact on our physical world. The relationship of ideology and education is often explored in the literature as the dissemination of ideas and enaction of power given over by consent. Apple (2018) asserts that schools are important sites to explore cultural distribution of ideology because, as explained in the verbiage of the Italian Marxist Antonio Gramsci, “a critical element in enhancing the ideological dominance of certain classes is the control of the knowledge preserving and producing institutions of a particular society” (p. 26). Institutions of education are an essential part of socialization and knowledge distribution (Apple, 2018). The French Marxist philosopher Louis Althusser, a major influence on the study of the role of ideology in society contested the Marxist idea that official apparatuses (the state, the church, the military) were the only

apparatuses that disseminated dominant ideologies (Freeden, 2003). Althusser claimed that ideology developed a life of its own and argued that it was present in legal and cultural structures, in mass media, in family life, and especially in the educational system (Freeden, 2003). Williams (1961) identifies that “the form and content of education are affected, and in some cases determined, by the actual systems of [political] decision and [economic] maintenance” (p. 119), introducing the link between political and economic culture and what is or is not taught in schools. Ideology or the variety of ideologies, a major aspect of the culture of a place and its people, is understood as both the invisible and visible guide for the thought-process that determines what will be taught and what will not be taught in schools, thereby socializing individuals into their society (Williams, 1961). Emile Durkheim, the French sociologist who helped to originate the discipline, examined education’s role in society in depth, acknowledging that education constitutes an essential prerequisite for the reproduction of society (Durkheim, 1956).

The relationship of ideology and education or culture therefore provides opportunity for positive change. In the essay *Harnessing Cultural Power* (2021) activist and artist Favianna Rodriguez argues that culture is a power that we must utilize, creating opportunity to use institutions and the essential apparatus of schools and education to reimagine our relation to the Earth. Rodriguez (2021) does not use the language of critical theory but constructs an argument that engages with ideas discussed above. She argues that “culture is in a constant battle for our imagination” (Rodriquez, 2021, p. 121) and is a tool to inspire social change. She voices that we must do more than discuss what is best for the planet when she writes that “we must build a cultural strategy for the climate movement” (Rodriquez, 2021, p. 121). This argument is echoed by many in the pedagogical and environmental sphere. For example, Beckford (2021) argues that education “must play a vital role in resolving these issues by providing citizens with the requisite knowledge and skill for action and this requires a reorientation of education” (p 94).

Reinforcing the importance of education in both ideology and culture (a symbiotic relationship), UNESCO makes clear their view on the subject. UNESCO (n.d.) identifies education as an aspect of culture stating that education, being influenced by its environment, history, and identity, is cultural at its core. When utilized positively "culture enhances the plurality and richness of learning processes, pedagogical spaces and approaches, and ensures comprehensive education that is contextually relevant" (UNESCO, n.d., para 6). Because education is embedded in and reinforced by culture, it has a major impact on curriculum and pedagogy. This relationship between culture and education implies that education has great potential to foster change as utilizing the connection between culture and education prepares societies to create more agile and resilient environments (UNESCO, n.d.). Irwin (2020) poses a question that suggests we have moved beyond the debate of whether or not education is a matter of cultural reproduction, and asks if it is better now to question if education should take a lead role in cultural transformation.

Beckford's (2021) argument that we must reorientate education to prepares us for climate change relates directly to the conversation on ideology. This reorientation is described as moving formal education that is widely considered to uphold neo-liberal values that prepares students to participate in the global economy to one that promotes ecological literacy (Scoffham and Rawlinson, 2022), which stresses that teaching "knowledge about the environment is necessary for informed decision-making" (McBride et al., 2013). Like Beckford (2021), Irwin (2020) argues that curriculum is firmly enmeshed in values and practices of an ideology that upholds fossil fuel-based modernity, creating students that reflect the very type of modernity that birthed our current climate crisis. This makes the overarching neo-liberal system difficult to change or even regulate as we produce and reproduce the same ideologies within individuals that maintains fossil-fuel economies (Irwin, 2020). Further discussion on ideology, education, and climate change can be found below.

## 2.3 Sustainability Education and Climate Change

What many educators, academics, and the United Nations are promoting now as an alternative to the traditional education that dominates classrooms around the globe is sustainability education (SE) (UNESCO, 2020; UNESCO, 2022; Scoffham, 2020; Jensen, 2002; National Roundtable on Environmental Sustainability Education in Teacher Education [NRESE-TE], 2016). SE is considered uniquely prepared to teach students in K-12 educational settings and higher education a different way to interact with the world that allows for a healthier relationship to nature and for a deeper and more comprehensive understanding of CC and how to confront it (UNESCO, 2020; UNESCO, 2022; Scoffham, 2020; Jensen, 2002).

SE is the term used in this paper, but there is considerable conceptual overlap in the frameworks of environmental education (EE), environmental sustainability education (ESE), education for sustainable development (ESD), and education for sustainable futures (ESF) to the point that these terms are conceptualized and operationalized as interchangeable (Beckford, 2021; Chew Hung, 2022).

There is no one definition of what SE is but there are many interpretations that share core ideas. SE can be traced as far back as the 1950s but it first gained global prominence in the 1970s because of the Tbilisi Declaration of 1977, the first intergovernmental conference on environmental education (Beckford, 2021). The declaration set guidelines, goals, and principles which have since been built on. In essence, the Tbilisi Declaration outlined an education that

> "promote(s) attitudes which would encourage individuals to discipline themselves in order not to impair the quality of the environment and to play a positive role in improving it. It should also help to develop in the members of every community a body of knowledge and a critical sense making them well-informed participants in the preservation and improvement of the environment" (UNESCO, 1978, p. 6).

The declaration outlined objectives for environmental education that were categorized as (1) awareness, (2) knowledge, (3) skills, (4) attitudes, and (5) participation (UNESCO, 1978). Environmental education, as the declaration labeled it, should be interdisciplinary in its approach, consider the environment in its totality, utilize diverse learning environments, and emphasize experiential learning, to name just a few objectives.

In the present day, SE is perhaps best understood as a multidimensional conceptual framework (Scoffham, 2020). SE under the acronym ESD is a main education goal of UNESCO (2022) as outlined in the document *Education for Sustainable Development: A Roadmap.* This document positions education as a key aspect of a) achieving the Sustainable Development Goals and b) educating on climate change. As UNESCO (2020) explains it, “climate change education is the main thematic focus of ESD as it helps people understand and address the impacts of the climate crisis, empowering them with the knowledge, skills, values and attitudes needed to act as agents of change” (para. 1).

Beckford (2021) posits that SE is a combination of educational activities related to ecological, economic, and social dimensions. Scoffham (2020) suggests that a more holistic understanding of the approach might mean looking at the pillars of SE as the “process of reconnecting with (a) the environment, (b) other people, and (c) ourselves” (p. 17) and prefers this definition because it emphasizes our relationships to other humans, other life forms, and encourages self-awareness. The National Roundtable on Environmental Sustainability Education in Pre-service Teacher Education that took place in Peterborough, Ontario in 2016 states that SE (or ESE as they call it)

> is underpinned by principles that support sustainable living, respect for all life, and human wellbeing. Environmental protection and restoration, natural resource conservation and sustainable use, addressing unsustainable production and consumption patterns, and the creation of just and peaceful societies are also important principles underpinning ESE (Beckford, 2021, p. 102)

We can summarize that from an eagle-eye perspective, SE is focused on educating people so that they respect the planet we live on and the environments we inhabit through protection of the lands and a focus on a concept of sustainability that stresses that we live within our means and do not exceed them. There is however a psychologically internal element to SE that demands that educators and pedagogists explore and modify within their classrooms “how we think about ourselves and the narratives which underpin our mindset” (Scoffham and Rawlinson, 2022, p. 2). This is no small task and thus complications to providing SE arise quite quickly when trying to implement it. An institution cannot simply implement SE in writing but must commit to exploring the very ideas and ideologies that underpin our society.

## 2.4 Implementing sustainability education in curriculum

Regarding how SE is practically integrated in a curriculum, it is difficult to place it within a contemporary curriculum structure because of its definitively trans-disciplinary and cross-curricular approach which contrasts with the single-subject-at-a-time fragmented approach that dominates contemporary curriculums, Canada being no exception. In discussing how to integrate SE into curricula, Scoffham and Rawlinson (2022) mention two approaches: theme-based and synthesis. In the theme-based approach, “pupils explore a place, artefact, process or issue related to sustainability using the perspectives of several different subject disciplines” (Scoffham and Rawlinson, 2022, p. 68). Students might apply “the language, skills and attitudes of science, geography and English to an area of marsh or woodland near the school” (Scoffham and Rawlinson, 2022, p. 68) so that they understand the concept of sustainability deeper, in a trans-disciplinary manner that is relevant to where they live. In a synthesis approach, learning begins “from a powerful learning experience that engages pupils both socially and emotionally” (Scoffham and Rawlinson, 2022, p. 68), combines subjects, and ends in a presentation, performance, or exhibition on a theme related not just to sustainability but again to the students’ own community and/or environment. Whether studying how to restore a habitat, monitoring the health of a local

ecosystem, or lobbying for more accessible garbage bins, students learn more when their actions have meaning and matter inside and outside of the classroom, teaching not just abstractly what an ecosystem is but teaching its relevance in a trans-disciplinary manner, and teaching that how we interact with ecosystems (as an example) is integral; it is what makes us citizens of the Earth and our communities, and is what will give us the understanding that we are all a part of a much larger ecosystem we must care for (Scoffham and Rawlinson, 2022; Scoffham 2020; Sterling, 2021).

The strongest aspects of SE emerge as its focus on our relationship to our physical and social environments, the need for harmonious relationships to both, and the creation of a generation of engaged learners. In much of the literature, SE is discussed as developing a mindset and the ability to make informed decisions. Building capacity for critical thinking is integral. Thus, SE is a pedagogy that is in contrast to the didactic forms of learning such as the 'banking model' of transferring knowledge to students through lectures and demonstrations and is interactive and discursive with the goal of building capacity for sustainability (Evans and Ferreira, 2020). UNESCO (2021) states that SE "empowers learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society... while respecting cultural diversity" (para 6). Since SE is not contained to just one classroom or a discrete body of knowledge, its potential impact is great in its ability to transform how we think about ourselves and our environments.

## 2.5 Sustainability education in Canada

Canada is a very large country (almost 10 million square kilometers) with sparse population density (3.3 people per square kilometer, one of the lowest population densities in the world) (Hopkins, 2013). It is comprised of 10 provinces and three territories. There is no integrated national education system and instead each of the 13 jurisdictions are responsible for the construction of their education policy. Ministries of education are responsible for the organization, delivery, and assessment of education at the elementary and secondary levels. This also means that education is uniquely

shaped by the jurisdiction that it is taught in, influenced by culture, history, geography, economics, and the special needs of the place. For this reason, an observer cannot describe Canada's education system as a monolith but must look at each jurisdiction to gain insight into how it is teaching SE or any discipline.

Canada was quick to adopt Education for Sustainability since its inception in the international movement following the publication of the Brundtland Declaration in 1987 (Hopkins, 2013). It was an active member of the Preparatory Committee meetings between the years of 1988 and 1991 which met to organize the work program that would emerge from the United Nation's Earth Summit meeting in Rio de Janeiro in 1992. The work program, later known as Agenda 21, was tasked with moving sustainable development from an idea to a reality, education being a key part of this. Later, in October of 1992, the first international conference on ESD was held in Toronto: The World Congress for Education and Communication on Environment and Development (ECO-ED) (Hopkins, 2013). The Congress drew 4,000 participants from approximately 100 countries, the heads of seven of the UN agencies, 300 indigenous leaders, representatives of the public and private sector, and teachers from around the world (Hopkins, 2013).

Despite the obvious enthusiasm for SE that Canada displayed early in the movement, it was not implemented in Canada's education systems for numerous reasons. To start, SE was not well defined as a distinct process separate from other types of education. As well, federal leadership for SE was delegated to the Ministry of Environment, thereby taking it out of the hands of the Ministry of Education and perpetuating the idea that SE was an aspect of informal environmental education (Hopkins, 2013). Thirdly, this happened around the same time as a financial recession, causing the government to turn its focus away from discussions on sustainability. Lastly, Canada's fragmented curriculum development made it difficult to implement, but this is a persistent problem not unique to this period.

By all accounts, Canada and its individual jurisdictions are not fairing much better now, despite UNESCO's urging that it guide contemporary pedagogy. As previously discussed, the reality still stands that multiple understandings of SE and how it should be operationalized in formal education persist. Beyond that, when mentioned SE is still often subsumed into the science curriculum in documents prepared by the Government of Canada, or is incoherently divorced from its foundationally transformational aspirations. The 2005 report *Education for sustainable development in Canada: The work of the federal government* states that:

> The Government of Canada believes that as a result of education for sustainable development, Canadians will come to understand that sustainable development contributes to their health and well-being, sense of place, social cohesion, equity, and heritage, and supports sustainable communities… They will recognize the vital role of science and technology in sustainable development, value investment in research and development, and support the further building of knowledge and capacity upon which sustainable development is built. (Government of Canada, 2005, p. 4)

This suggests that the Government of Canada has previously been interested in the importance and potential of SE, yet it is currently far from being integrated into a national education agenda.

## 2.6 Current challenges to teaching about climate change

SE is not the only option for teaching about climate change. Teaching CC in an adequate manner to confront the undergoing climate crisis faces many obstacles. First and foremost, teaching a subject requires that our teachers are adequately prepared to do so, which is not often the case in Canada (Demant-Poort, & Berger, 2021). Contemporary teachers were presumably taught in a very similar K-12 system to the one that is currently in need of a change, or perhaps a system that was even less aware of CC and the factors that contribute to it. In a 2021 study of pre-service teacher's (PST's) attitudes and knowledge of CC in Canada, Greenland Demant-Poort and Berger (2021) found that some PSTs lack knowledge or have incorrect beliefs about CC and its causes. For example, while 98% of climate scientists agree that climate change

is anthropogenic, a 2019 study showed that in Canada 60% of a representative sample of educators and 78% of a convenience sample believed that CC is anthropogenic (Field et al., 2019). When questioned about the causes of an average global temperature increase of 1 °C since the 1880s, 71% of the total 45 participants that responded to Demant-Poort and Berger's (2021) survey correctly indicated the emission of CO2 and other greenhouse gas emissions caused the warming, while 24% indicated ozone depletion, and two percent responded a change in Earth's orbit and an equal amount of responses claimed a change in solar activity, three responses that have nothing to do with CC. A survey of Novia Scotia's pre-service and in-service teachers found even more alarming results. Teachers frequently linked incorrect causes of CC such as the ozone layer depleting or nuclear waste as primary causes of climate change and incorrectly identified major outcomes of CC as, for example, more earthquakes (Climate Change Novia Scotia, 2013).

Some scholars that pre-service teacher (PST) education is an area that must be targeted in order to create environmentally literate citizens in part because SE and/or adequate climate change education is assumed to need more than didactic banking models of education and teachers must be able to provide more interactive and potentially transformational classes (Demant-Poort, L. & Berger, 2021; Evans & Ferreira, 2020, Boon, 2016). This means engaging in new pedological methodologies which pre-service teachers must learn. Adequate PST education is also needed to avoid the common misconceptions discussed above. Proper SE or climate change education for PSTs would develop teachers "capable of providing learning experiences to students that emphasize the global nature of environmental problems and their individual and collective responsibility to sustainable behaviors as global citizens" (Beckford, 2021 p. 105).

There are of course challenges to fostering a deep and meaningful understanding of CC in students that are more complicated than a lack of teacher training. One fundamental obstacle to overcome is that of worldviews that are in opposition to seeing anthropogenic CC as a reality (Stevenson et al., 2014). This is

especially complicated in our contemporary post-truth times where misinformation runs rampantly through social media (Chew Hung, 2022; IPCC, 2023). It is of course reason even more so for proper education in the K-12 period. Stevenson et al. (2014) suggest that increased climate literacy will have little impact on risk perception among adults because political ideology and worldviews have a larger influence over climate change risk perceptions than climate change knowledge. K-12 education, particularly in early adolescents, is when worldviews are still forming and is a unique time to educate about the realities of climate change and have the message perceived. From a neurological point of view, the brain during adolescence is at a peak in neuroplasticity which is “its ability to transform its structures and functions as a result of environmental influences” (Armstrong, 2016, p.18). Between the ages of 11-18, the brain is still wiring itself according to an adolescent’s experiences and atmosphere and it will become more or less ‘fixed’ afterwards (although we still possess neuroplasticity after 18 years of age, if not we would never be able to learn anything new again) (Armstrong, 2016). It is in these years that the brain is most open and capable of learning from a neurological standpoint.

Take for example a study done by Stevenson et al. (2014). The study (2104) examined middle school students in North Carolina on a scale of communitarian to individualist and found that as climate change knowledge increased, acceptance levels of the individualist students approached those of communitarian. This suggests that in younger people, worldview can still be circumspect to allow scientific knowledge to inform their understanding of the world at large. The authors add in their discussion that “without education specific to climate change, adults may be unable to ‘connect the dots’ provided through general science education” (Stevenson et al., 2014, p. 300), which speaks to the need for a learning that is comprehensive and interdisciplinary, or as SE provides, helps to build a new mindset altogether towards our environment.

Stevenson et al. (2014) also identified that demographics plays a large role in one’s understanding of the risks associated with anthropogenic climate change, a factor which is confirmed in other studies as well (Ortega-Egea et al., 2014; Boon, 2016). They

found that non-White students were more likely to accept anthropogenic climate change than White students, and girls perceived climate change as higher risk than boys (Stevenson et al., 2014). This is a demographic difference that teachers should be aware of and must take into consideration if they wish to engage with all students on discussions of climate change. It is an important aspect to integrate into pre-service teacher education so proper strategies can be developed.

Another complication is to educate without doom mongering thereby causing more climate anxiety within students. As Irwin (2020) points out, “frightening children with Armageddon type consequences was terrifying for my generation, as we were raised with the spectre of the Atomic bomb” (p. 494). We do not want children raised with the spectre of ecological collapse, and it is not the responsibility of children to carry that burden. Irwin (2020) posits that it is sufficient that they learn to highly value their environment and to understand the interconnectedness of all things. Scoffham and Rawlinson (2022) warn against proselytizing by overzealous teachers in the classroom who are liable to use shock tactics to teach students, whereas the desired reality of SE is students who can make their own conclusions based off critical and informed thinking. In Wray’s (2022) opus on climate anxiety, *Generation Dread*, she cites a survey conducted by her and some colleagues that looked at climate anxiety in 10,000 children and young people aged sixteen to twenty-five in ten countries around the world. 45 percent of the respondents said that “their feelings about climate change negatively affect their daily life and functioning” (Wray, 2022, p.25), and over half said they think humanity is doomed, they won’t have access to the same opportunities their parents had, and the thing they value most will be destroyed. These sentiments are representative of global dread. Defined by Albrecht and cited by Wray (2022), global dread is “the anticipation of an apocalyptic future state of the world that produces a mixture of terror and sadness in the sufferer for those who will exist in such a state” (p.22).

Thus, teaching from a position of hope is an essential aspect to impactful education on CC. Paolo Freire wrote on the need for hope in great depth (Freire, 2018;

Scoffham and Rawlinson, 2022). Freire (2018) sees hope as an ontological need, something that is essential for our existence (Scoffham and Rawlinson, 2022). Freire (2018) concludes that one of the tasks of the progressive educator is to unveil opportunities for hope regardless of the situation. Hope balances out fear and dread: humans need both sides of the coin to confront a wicked problem intelligently.

For Freire, dialogue is as well an essential concept and an integral part of education and a space to express hope (Freire, 2018). In dialoguing, we are using our words to name the world, so we are able to transform it. We engage in dialogue in an exchange of naming and expression, no one person naming or speaking for another person, nor one person depositing their ideas into the other person. This is counter to the banking method of education in which the teacher deposits information into the students as one would deposit money into a bank account (Freire, 2018). The banking method for Freire and within the framework of sustainability education is not considered a valuable form of education because it does not teach people to think critically or giving them the skills to advocate for themselves or the planet. Dialogue, where people exchange ideas and experiences, is an important democratization of the education process. It is also an area where hope is expressed as “dialogue further requires an intense faith in humankind, faith in their power to make and remake, to create and re-create, faith in their vocation to be more fully human” (Freire, 2018, p. 90). The act of real dialogue in an educational setting is an expression of hope because it innately requires that we believe humankind can do better (Freire, 2018).

While there are many challenges to overcome to provide students with adequate SE or climate change education they are not insurmountable but must be confronted in each aspect of teaching about CC. Integrating SE into pre-service teacher education must be approached in the post-secondary educational spaces (Demant-Poort, 2014, Boon, 2016). As explored above, avoiding doom mongering and dialoguing from a place of hope are part of the ideal delivery of SE, and creating engaged learners, critical thinkers, and ecologically minded students who can change their behavior is a main goal of using education as mitigation.

## 2.7 Case studies: Success in teaching about climate change

At its best, successfully teaching about CC or using SE as a pedagogical framework provides students with a transformational learning experience (Taylor, 2012). While pedagogists argue over the true meaning of transformational learning (TL), the general assumption is that a transformational learning experience involves fundamental changes in the way an individual thinks at a very basic level (Bryant et al., 2021). At best, TL challenges our ideologies and hegemonic structures allowing for a new viewpoint to emerge within the learning on a topic or issue that is then integrated into the learner's actions and beliefs. At its most basic some suggest that TL is just "good teaching" (Taylor et al., 2012, p. 11). Those who tout TL as a goal of education acknowledge its foundations lie in a humanist approach to framing learning and an embrace of critical social theory. From the humanist approach, TL embraces (among other ideas) the concept that reality is defined by each person, and that individuals have an urge toward self-actualization, suggesting that individuals are inspired to learn and that their experiences and identities inform their knowledge (Bryant et al., 2021). From critical social theory, TL is informed by the concept that our ideologies are taught to us by society at large and that a good educational experience provides us with the tools and insights to critique it thereby challenging power dynamics and oppressive structures.

The case study literature discussed below suggests success can be achieved in teaching about climate change. They found that the student's behaviors and/or beliefs were changed by their educational experiences. It is debatable if these are transformational learning experiences since the concept itself is not concretely defined, but the following case studies do suggest fundamental changes in the way the individuals, or perhaps we could suggest that their ideological understandings of climate change or their ways-of-treating the Earth were challenged and a transformation occurred (Kolenatý et al., 2022; Cordero et al., 2020; Harmon, 2017).

The first case study is from a well-known after-school program in the Czech Republic that began in 2015. Created by the Ecological Institute Veronica, the program is known as the CO2 League and is funded by the Ministry of Environment of the Czech Republic (Kolenatý et al., 2022). In their 2022 analysis of the effectiveness of the program in creating more climate literate students, the authors Kolenatý et al. use the framework of climate change education (CCE) to measure the success of the program. The authors define climate literacy (CL) as the merging of climate science and environmental education. It has been conceptualized in three dimensions: knowledge, competencies (skills), and attitude or values (Kolenatý et al., 2022). In recent years, it has been proposed that climate literacy be integrated into the Czech school curricula, a concept supported by the Ministry of the Environment's panel of experts (Kolenatý et al., 2022).

CCE is not so far off from SE in its conceptualization: it is understood as complex, multidimensional, and dynamic. CCE must foster knowledge about the effects, root causes, strategies for change, and alternative visions for CC (Jenson, 2002). Additionally, a review of the literature by Kolenatý et al. (2022) suggests that three domains of knowledge are often cited as necessary in CCE: system knowledge, an understanding of the drivers and impacts of CC, action knowledge, understanding mitigation actions and behaviors, and effectiveness knowledge, the ability to analyze mitigation efforts. The study of the CO2 League project, in which small groups of students work with a teacher in project-based learning and inquiry-based methods to help foster climate literacy is evaluated by its ability to foster the three domains of knowledge within the students. It also assesses the program's efficacy in closing the knowledge-to-action gap which is the gap that much of society suffers from: knowing that CC is real and anthropogenic but not doing anything or doing very little personally or collectively to mitigate the effects.

The study found that after the year-long program the students had generally improved in the three categories (Kolenatý et al., 2022). The students (and teachers) unanimously confirmed the positive impact of the program and shared the variety of

ways the program increased their climate literacy (Kolenatý et al., 2022). Students and teachers acknowledged learning about carbon footprints and the ways in which one can decrease their own carbon footprint, and perhaps most importantly, respondents shared that the program motivated them to partake in more pro-climatic actions with one respondent sharing that “Our whole family has become more environmentally friendly – for example, we have started eating less meat or driving less” (Kolenatý et al., 2022, p. 9). The students also left the program knowing that larger-scale CC mitigation and adaptation measures were necessary, inspired in part by the projects they completed in the program, in particular understanding that participating in school and municipal planning was an option to influence CC factors on a larger scale. As one student voiced “I learned that there are not only solutions for individuals, but that much more can be done at the community level” (Kolenatý et al., 2022, p. 10). In general, the study showed that because of the extra-curricular program, CC knowledge was improved within the students in all 3 dimensions, and the knowledge-to-action gap shrank as students learned methods to engage in mitigation efforts at the personal and community level.

Another study from 2020 focused specifically on the effects that a year-long climate change course at San José State University had on the carbon-emissions of its students (Cordero et al., 2020). Five years of graduates from the course were surveyed at least five years after they took the course, which was then followed up by focus group discussions, after which the authors quantified the reduction in annual carbon emissions using the CoolCarbonCalculator and compared the results to the average person in California (Cordero et al., 2020). The course focused on three areas of expertise (climate science, climate mitigation, and environmental communication) and had a consistent curriculum throughout the five years. The authors acknowledge that other experiences may have attributed to changes in more pro-environment behaviors (PEBs) (PEBs are defined by Kollmuss and Agyeman (2022) as behaviors “that consciously seeks to minimize the negative impact of one’s actions on the natural and built world (e.g. minimize resource and energy consumption, use of non-toxic substances, reduce

waste production)" (p. 240) but found their results suggest the course played a key or leading role in increasing what we may also identify as climate literate individuals. The course was designed, among other goals, to help students create an empathetic perspective towards nature and to develop an in-depth knowledge of CC and a personal connection to it in order to combat the knowledge-to-action gap that often prevents PEBs (Cordero et al., 2020). Two tools were developed to support the goals, the first being a set of activities where students explored their personal and professional lives in relation to CC, and the second in which the students worked in teams and created a project to help reduce carbon emissions in the community of their choosing.

A large percentage of respondents described participating in some actions to reduce waste or energy use within their own house and attributed these changes to the course. For example, 95% responded they recycle more often, 86% had changed to using more energy efficient light bulbs, and 64% stated they buy products that use less packaging (Cordero et al., 2020). Regarding transportation, 35% of respondents stated they used public transit more while 31% shared that they had purchased a more gas-efficient car, and 26% use a bicycle instead of a car, and they attributed these changes as well to the course (Cordero et al., 2020). The results showed that the average reduction in carbon emission by respondents based on the survey responses was 3.54 tons of CO2/year (Cordero et al., 2020). Only about 5% of respondents reported almost no change (0-1 CO2/year), while 10% reported a larger change of anywhere from 8-10 CO2/year less (Cordero et al., 2020). Calculations showed that transportation related changes had the biggest effects and were responsible for about 40% of the emission reductions "while waste reduction, food choices and home energy contributed 33%, 13% and 12% respectively of the achieved total carbon emission reductions" (Cordero et al., 2020, p. 10).

One last example of a relevant case study was reported in a New York Times article (Harmon, 2017). The story takes place in the district of Wellston, Ohio, a former coal and manufacturing town that was populated by Trump supporters who often denied CC was real and anthropogenic. James Sutter, a science professional with a graduate

degree and a job previously assessing environmental risk for corporations was hired to teach at the financially challenged high school in exchange for a degree in science education. He entered a classroom full of skeptics. The article quotes Dan Kahan, a Yale researcher who studies political polarization, saying '"What people 'believe' about global warming doesn't reflect what they know"' (Harmon, 2017, para. 20), again expressing the persistent knowledge-to-action gap that permeates all corners of society and emphasizing that our identities help to shape our knowledge.

Sutter challenged the student's ideas on CC and provided dynamic lessons that made the impacts of CC personal for the students. He took them on nature walks in the woods behind the school, showed them the unusual presence of emerald ash borers in the area (an invasive insect species that normally would have died off by that time but persisted because of the abnormally warm temperatures), and had them test the pH levels of the local stream (as acidic as store-bought vinegar) which had turned neon orange thanks to a nearby mine. While Sutter did not succeed in changing all the students' minds on the matter, he did succeed at changing some (Harmon, 2017). The article speaks of two juniors who were non-believers at the beginning of the course: Jacynda and her classmate Gwen, the latter consistently and passionately challenging their teacher. By the end of the year Jacynda had done "a 180" and shared with Gwen on the topic of CC that "This is happening, and we have to fix it" (Harmon, 2017, para. 50). The article shares that the boys they had invited to prom now believed the same thing. Gwen however remained a skeptic.

These case studies are intended to provide examples of where educational courses helped to shift the mindsets of the individuals who took them, and where the author's tried to gauge how much effect these mindset shifts had on the PEBs of the students. There are of course limitations to these studies or the powerful anecdotal evidence of the last example. It is impossible to say how long the students who switched to more PEBs maintained these practices or even maintained the new mindset they possessed towards their understanding of CC as our environment and our political, social, and economic situations play a large part in our behaviors and beliefs. In the last

example, while a captivating narrative that exhibits the power of education to alter our perception of CC, we do not know how this affected the PEBs of the students in Mr. Sutter's class. One of the main issues with understanding the influence of adequate CC education or SE is that lack of studies done on the long-term effects of this type of education, in part because it is an emerging concern of education and pedagogists. This lack of long-term study does not however negate the importance of pursuing the creation and use of educational frameworks that have the potential to change our relationship to the Earth and works to be a powerful mitigation factor towards CC.

## 2.8 Summary

As UNESCO (2020) states, "climate change education is the main thematic focus of ESD as it helps people understand and address the impacts of the climate crisis, empowering them with the knowledge, skills, values and attitudes needed to act as agents of change" (para 1). The case studies above suggest that poignantly teaching about climate change in a manner that is interactive, dynamic, and reconnects individuals with their environment through projects and programs can have major effects on worldviews and, importantly, behaviors. The relationship between education, ideology, and power that is explored in this chapter is meant to introduce the concept that what we teach in our schools is understood to have a great influence in how we are-in-the-world in an epistemological sense. So, while the case studies mentioned do not necessarily give us a definitive answer on how to teach about CC to change people's being-in-the-world, if we look at the discussion of ideology's role in education and compare the behaviors and mindsets of the participants of the case studies before and after their participation in courses or programs that focus on CCE, we see that education has a great effect on how we are-in-the-world and how we act in the world, which is an optimistic outcome for those looking to shift education away from teaching neoliberal values that focus on education as a path to employment and not much else (Klees, 2020).

To summarize, this chapter is intended to lay the groundwork for the analysis of the curriculum that is to follow. The claim that we need education that teaches about CC so we can have a climate literate society because CC will and does affect all aspects of society is both the genesis and nucleus of the arguments laid out in this thesis. To create climate literacy and to mitigate the effects and acceleration of CC, education must evolve into a space where students learn a new way to interact and see themselves within the world. The framework of SE is available to us to use but it requires a great change in how education is undertaken. To explore where education can go, it is first necessary to explore where it sits ideologically and what we are or are not learning about the planet and its changing climate.

# 3 Chapter 3: Methodology

## 3.1 Introduction

This thesis used multiple case studies in tandem with critical discourse analysis to investigate to what extent climate change is taught within the selected curricula, from what ideological standpoint (ecological activist, smart growth reformer, ecomodernist) and to what extent sustainability education is present. Once that was completed, the goal was to compare the findings with what UNESCO, the Government of Canada, and pedagogists suggest are the best methods for teaching climate change so education can be utilized as a mitigation method towards climate change (UNESCO, 2022; UNESCO, 2015; Ministry of Education, 2017; Government of Canada, 2005; Hopkins, 2013; Scoffham, 2020).

This study used multiple case studies of tertiary data to draw individual conclusions for each curriculum but also to draw “cross case” conclusions about the presence of climate change education and the ideologies present within them in the province when possible (Yin, 2014, p. 18). Multiple case studies are used here because they provide the opportunity to “present a method of learning about a complex instance through description and contextual analysis” (Corcoran et al., 2004, p. 10), leading the result to be both descriptive and theoretical. Additionally, this method’s ability to elicit common findings from different documents is one of its design strengths, which made it appropriate in this study and worked to counter a common critique of case studies which is the inability to generalize from one; here, patterns emerged through the use of multiple curricula (Halkias et al., 2022; Yin, 2014). Another major critique of using multiple case studies is the possibility for a lack of rigor caused by sloppiness in the process, however as Yin (2014) explains, this issue is less likely to occur when mixing methods. Hence, multiple case-study analysis coupled with critical discourse analysis were the chosen methodologies because of their complimentary goals of describing what is present in the text and theorizing what that represents. Nisbet’s (2014) rigorous framework of public intellectual’s response to climate change was used to inform the

critical discourse analysis process and the coding of information into predefined ideological positions (Nisbet, 2014; Bieler et al., 2018).

After the case studies were chosen, they were read once. The case studies were read line by line and coded into the category that they corresponded with by their use of phraseology and the content presented. This first reading suggested that throughout the curricula, subjects related to coding frameworks were mentioned but they lacked points of view strong enough to fit into the deductive categories. Therefore, an inductive set of codes, the general category of codes, was generated based off this area. After that, the case studies were read for a second time and coded. A third reading occurred while writing the findings from this, and a fourth in the editing process. After that, Fairclough's three-dimensional model was completed.

## 3.2 Overview of case stud(ies) and data sources

Tertiary data was used in this study in the form of nine curricula from three provinces: three curricula were analyzed from each of the three provinces, Saskatchewan, Ontario, and New Brunswick. These provinces were selected based on three criteria: diversity in geography, variation in population size, and differentiation in dominant industries and economy size.

Ontario is Canada's most populous province at 15,109,416 people as of 2022 yet is the 5$^{th}$ largest province or territory within the country (Ontario, n.d.-c). Its GDP in 2021 is quoted at $956 billion (nominal) and is estimated to have grown to $1,047 billion in 2022 (Ontario, n.d.-b). While Ontario is a manufacturing powerhouse, the largest part of Ontario's economy according to GDP is the service sector which includes "business and financial services, professional and scientific technical services, and arts and culture" (Ontario, n.d.-a, para. 13).

Saskatchewan is geographically Canada's 7$^{th}$ largest territory or province with a population, as of April 2023, of 1,221,439 people (Saskatchewan, n.d.-b). The province estimates the GDP of 2021 as $81.8 billion with growth in the proceeding years (Saskatchewan, n.d.-a). While Saskatchewan is known for its agricultural sector, its

largest industry according to GDP is mining and petroleum with much of its population engaged in practices related to this industry (Saskatchewan, n.d.-a).

New Brunswick is geographically the 11th largest province or territory within the country. As of 2022, New Brunswick's population had reached 800,000 people according to Statistics Canada (Government of New Brunswick, 2022) with a GDP in chained dollars as of 2022 quoted at $32,522.7 billion (Statistics Canada, 2023). Interestingly, its main industry according to GDP is real estate, rental, and leasing (Statistics Canada, 2023-b).

Three curriculum subjects were selected to be studied within each province, and equivalent or similar courses were purposively selected so a fair comparison could be made in the analytical process. The three chosen subjects were: the required civics or social studies course, the required grade nine or ten science course, and the optional environmental science course. These courses were chosen because there is great opportunity to interact with themes related to climate change in all of them. There is also much opportunity to utilize the pedagogy of sustainability education, especially given that SE is transdisciplinary and in its ideal form is integrated into all subjects. It is reasonable to assume that either climate change and/or SE would be present within these civically and scientifically minded subjects given the urgency of the climate crisis.

Six of the nine courses that were chosen are required courses within the provinces. For each of the 3 provinces, the required grade nine or grade ten science course were analyzed as well as the civics or social studies (where applicable) were chosen (Table 1).

**Table 1: Required courses**

| Course | Province | Grade level | # of pages | Year published |
|---|---|---|---|---|
| Civics and Citizenship (CHV20) | Ontario | Grade 10 | 17 | Revised 2022 |
| Science, De-streamed (SNC1W) | Ontario | Grade 9 | 54 | 2022 |
| Civics (no course code) | New Brunswick | Grade 10 | 52 | 2023 |

| | | | | |
|---|---|---|---|---|
| Science 9- Ecosystem Dynamics | New Brunswick | Grade 9 | 41 | 2020 |
| Science 10 | Saskatchewan | Grade 10 | 43 | 2015 |
| Social Studies, Social Organizations | Saskatchewan | Grade 9 | 225 | 1992 |

The last 3 curriculum are the provinces' equivalents in Environmental Science and are elective courses (Table 2).

**Table 2: Elective courses**

| Course | Province | Grade | # of pages | Year |
|---|---|---|---|---|
| Environmental Science | Ontario | Grade 11 | 14 | 2009 |
| Introduction to Environmental Science 120 | New Brunswick | Grade 12 | 43 | 2012 |
| Environmental Science 20 | Saskatchewan | Grade 11 | 45 | 2016 |

## 3.3 Analytical Approach

This project used critical discourse analysis in the tradition of Norman Fairclough (Woodside-Jiron, 2011). Critical discourse analysis (CDA) is both a theory and a methodology which explores how spoken and written language enacts social and cultural perspectives and identities and allows for the analyst to determine how power is enacted in discourse (Jørgensen and Phillips, 2002; Gee, 2005). A general underpinning to CDA is that it sees discourse as a social practice and seeing it as such is dialectic in nature. Understanding discourse as social practice "implies a dialectical relationship between a particular discursive event and the situation(s), institution(s), and social structure(s) which frame it: the discursive event is shaped by them, but it also shapes them" (Wodak, 2014, p. 303). Thus, the discourse around us helps to sustain and reproduce the status quo while at the same time molding and transforming it (Wodak, 2014).

Fairclough's model contains a range of different concepts that are interconnected in a complex three-dimensional model (Jørgensen and Phillips, 2002). Fairclough's model explores spoken or written language (*text*), the production and interpretation of text (*discursive practice*), and what is happening in a particular sociocultural framework (*social practice)* (Fairclough, 2013, p. 94). For Fairclough (2013), this is a comprehensive and methodical way to explore linkages in discursive events with the wider picture and interrogate the production of power and the maintenance or dissemination of ideology through the production of texts. The connection between text and social practice is mediated by discourse practice; "processes of text production and interpretation are shaped by (and help shape) the nature of the social practice. On the other hand, the production process shapes (and leaves 'traces' in) the text, and the interpretative process operates upon 'cues' in the text" (Fairclough, 2013, p. 94). The focus of the analysis of the text in this project is on a) the vocabulary and phraseology (lexicon) (in text) b) the genre (in discursive practice), and c) ideology (in social practice).

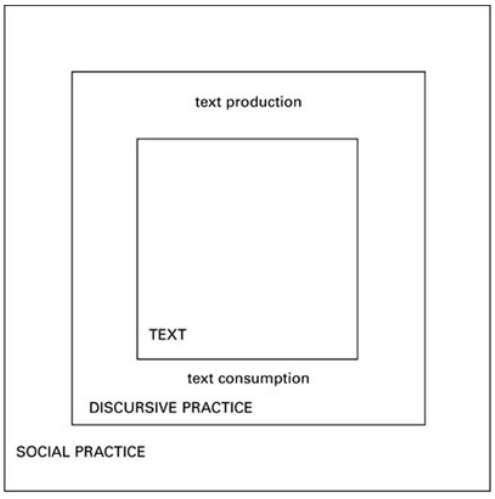


**Figure 1: Fairclough's model**

Exploring the lexicon has long been an aspect of discourse analysis. In the 1960s, French linguist Jean Dubois introduced the working assumption that the

proposition was the basic unit of discourse, and therefore the phrase should be considered the point of entry for analysis (Née and Veniard, 2012). Since the 90s, the analysis of lexicon within discourse has undergone a revival with the added understanding that a word's "use value" is present within discourse, in that the discursive function of the repetition of a word or a group of words creates an associative meaning discernible in recurrences or co-occurrences which lends itself to the investigation of the creation of ideology (Née and Veniard, 2012).

Genre is described by Fairclough as the "use of language associated with a particular social activity" (Fairclough, 2013, p. 96). Here, the genre will be considered the curriculum documents and they will be explored as part of the discursive practice ("the production, distribution and consumption of texts" (Fairclough, 2013, p. 95)). Curricula are imbued with great authority and investigating the role this plays in shaping ideology is an integral aspect of Fairclough's methodology (Apple, 2018).

## 3.4 Data analysis: coding framework

This project utilized both deductive and inductive coding processes, undertaken manually using Microsoft Word. First, deductive coding was completed utilizing Nisbet's (2014) framework. Nisbet (2014) outlines three categories of response to CC as these public intellectuals have helped to take complex ideas and create a commonly shared vocabulary. The three categories are: Ecological Activists, Smart Growth Reformers, and Ecomodernists (Nisbet, 2014). What these categories represent are sets of shared assumptions on a complex problem, which "serve as the frameworks that influence the ways numerous specific public and private policies are received and evaluated" (Etzioni, 2006, p. 6). These groups have their own set of shared assumptions (although of course an individual may exist within more than one group) that have become common sense for them, and it is challenging to break out of such a set of assumptions (Nisbet, 2014). Each of the three categories of public intellectual's responses to CC was divided into codes and then themes defined by aspects of their response to climate change as defined by Nisbet (2014) (problem framing, outlook on nature, outlook on technology,

policy proposals, model of social change), and themes were generated within the codes. Each curriculum was read and coded by hand with portions of text taken from the curriculum and added to a document organized by category and code.

After a primary reading of the curriculum documents it became apparent that a fourth category needed to be created with its own codes and themes. Much of what was found in the curriculums was often unable to be placed within one of the three categories above, so the general set of code was created inductively to categorize themes that emerged (climate change, sustainability education, employment, good citizenship, human-nature relationship, Indigenous general, sustainability, and Anthropocene).

Once all the categories were established, a second coding of each curriculum occurred to verify that the text fit correctly into the themes and codes, and in the process of writing the findings, a third round of revision occurred.

## 3.5 Research design limitations

This study faced several methodological limitations. Firstly, as previously mentioned, Canada's curriculum offerings at the secondary school level are vast and it is far beyond the scope of this study to analyze all the curriculum hence three provinces were chosen with three curricula from each province.

Another limitation is that while these examples are what is mandated to be taught within the classroom, that does not mean that the mandated content is what is delivered in the classroom. A classroom is a lived-in space where the different personalities, interests, and biases of the teachers and the needs of the classroom and the communities will potentially inform the design of the courses despite what is written in the curriculum documents. Observation would be required to assess the learning practices. Therefore it must be stressed that this analysis is based on the curriculum documents and does not portend to understand what is being said or taught within the classroom.

Another limitation is shared by all attempts at CDA which is that the interpretation of the data is subjective and relies on the ability and perspective of the author to draw conclusions. This means that there is much room for the analyst's biases to shape the outcome of the analysis. This is why this analysis includes Nisbet's system of categorization; it is an attempt to utilize an outside framework for coding to inject objectivity into this particular project. CDA, like most qualitative research methodologies, does not exist without some level of subjectivity influencing the process and the result, therefore it will always be a limitation that is expected.

# 4 Chapter 4: Findings

## 4.1 Introduction

This chapter presents the findings from the discourse analysis process. Three sections (one for each province: New Brunswick, Ontario, and Saskatchewan) are divided into 3 sub-sections: first the civics or social studies course for that province followed by the grade 9 or 10 science curriculum, and last the environmental science curriculum. Each section provides a breakdown of what categories, codes, and themes were found within the curriculum review and then provides an analysis of the most pertinent codes.

### 4.1.1 New Brunswick

#### 4.1.1.1 **New Brunswick – Civics 10**

Civics 10 is taught in grade 10 in New Brunswick in the Anglophone Sector of education (as a bilingual English/French province, there is a full French curriculum). This curriculum was published in January 2022, piloted in September 2022, and implemented in September 2023 (Department of Education and Early Childhood Development, 2021, 2nd page of document (page number not provided) making it by all accounts a contemporary example of a curriculum. Civics 10 is a mandatory course that replaced Ancient and Medieval History as the required Grade 10 Social Studies course (Department of Education and Early Childhood Development, 2022). As the course description states, the main intent is that “by the end of this course, students will be able to articulate personal rights and responsibilities and interplay among authority systems, citizens, and public policy,” as well as “they will be able to articulate the origins, functions, and sources of government power and how the roles played by individuals and groups is critical to informed citizenship and decision-making” (Department of Education and Early Childhood Development, 2022, p. 10). The Civics 10 curriculum is sectioned off into six general curriculum outcomes (GCOs) and 11 specific curriculum outcomes (SCOs) that are divided into the GCOs. Each SCO is broken down into

‘concepts and content’ and ‘exemplars’; the exemplars are in the form if “I can” statements that are suggested but not required to be met.

Civics 10 from New Brunswick expresses two codes strongly from the general category, with 90 of the 91 words or phrases fitting into either the codes *good citizenship* or *Indigenous general*, and only two coded datum in another section, *sustainability* in the general section of codes. The curriculum never references climate change and because of its complete lack of engagement with the topic fails to fall into the category of Ecological Activists, Smart Growth Reformers, or Ecomodernists. Below is a table of the codes that the curriculum engages with and following that an analysis of the codes.

**Table 3: NB, Civics 10**

| Main Category | Major Code | # of datum examples |
|---|---|---|
| GEN | Good citizenship | 57 |
| GEN | Indigenous general | 33 |
| GEN | Sustainability | 2 |
| Total | | 92 |

4.1.1.1.1 Good Citizenship – General category

Of the 92 coded datum from this curriculum, it is unsurprising that *good citizenship* dominated with 57 examples of coded datum that fit into the sub-categories of *civic engagement, informed citizenship, or civic skills.* Each of the six GCOs and 11 SCOs from the curriculum are centered around concepts directly derived from or related to the concept of good citizenship. For example, GCO 1 “Students will investigate civic engagement” (Department of Education and Early Childhood Development, 2022, p. 18) with its follow up SCOs stated as: “Students will explore the four domains of civic engagement; students will examine what civic engagement looks like; students will research how civic engagement changes over time“ (Department of Education and Early Childhood Development, 2022, p. 18).

The following three GCOs are: “Students will explore what it means to belong”, “Students will explore decision-making and representation”, and “Students will analyze how human rights are established and upheld” (Department of Education and Early

Childhood Development, 2022, p. 18), and many of the follow-up SCOs are also coded in the good citizenship category.

#### 4.1.1.1.2 Indigenous general - General category

The second most prevalent code (33 of the 92 examples fit in this code) within the course is *Indigenous general*. This code is most represented by two of its themes: 1) Indigenous perspectives are different than Western, and 2) Indigenous issues. The code is represented early on in the introductory pages of the curriculum as a part of the curriculum organizers. The document states that:

> The Indigenous Principles of Learning and Indigenous Ways of Knowing infographics are important frameworks for Social Studies educators to read and incorporate into their teaching. Understanding and respecting the differences and commonalities between Indigenous and Western perspectives on teaching and learning affirms all learners and educators in public schools (Department of Education and Early Childhood Development, 2022, p. 13)

This is followed up by many examples within the curriculum in the SCO sections that require that students can describe or examine Indigenous issues within the context of the course. For example, in SCO 1.3: Students will research how civic engagement changes over time, topics that demonstrate how civic engagement has changed over time "may include" "Indigenous activism in Canada over time" with examples such as Northwest and Red River Resistance or Kanesatake Resistance (Department of Education and Early Childhood Development, 2022, p. 23). Curiously, in the accompanying exemplars ('I can' statements) that are suggested but not required, there is no exemplar that addresses Indigenous issues to reinforce the importance of the issues or express a method the students can use to explore the issue.

The examples of the code Indigenous general that follow within the text echo the above example with Indigenous issues listed in the 'topics may include..' sections that are listed in the SCOs, mostly utilizing language such as discuss, illustrate, and examine.

#### 4.1.1.1.3 Sustainability – General category

The theme *sustainability* in the general code section is mentioned once within the curriculum. Number five of the six GCOs is “Interdependence: Students will be expected to demonstrate an understanding of the interdependent relationship among individuals, societies, and the environment – locally, nationally, and globally – and the implications for a sustainable future” (Department of Education and Early Childhood Development, 2022, p. 12). While this organizer states that students will be expected to demonstrate an understanding of the relationship of society with the environment at the micro and macro scale and what this means for a sustainable future, none of the SCO nor the exemplars ever mention the topic again, suggesting that while this is a desired outcome, it is not properly supported within the curriculum. Sustainability is again mentioned in the curriculum, however it appears after the bibliography in the appendices section within a diagram for New Brunswick’s Global Competencies.

#### 4.1.1.1.4 Conclusion

While a concept related to climate change like environmental sustainability is expressed as a GCO within the curriculum, it is never reinforced within the actual content of the curriculum. In regard to its relationship to sustainability education, the curriculum fails to be trans- or inter-disciplinary in its exclusion of interaction with other courses and with the issue of climate change. Its exclusion of the topic of climate change in general shows its complete lack of interaction with the topic.

### 4.1.1.2 **New Brunswick – Science 9: Ecosystem Dynamics**

Science 9, Ecosystem Dynamics is a required grade nine course which was published in February 2020, released in May 2021, and implemented in September 2022. It is introduced as “an important preparatory year that provide students with opportunities to identify scientific and technological areas of personal interest. Students explore the concept of ecosystem dynamics by investigating a system which they are inextricably connected to –Earth’s biosphere” (The Department of Education and Early Childhood Development of New Brunswick, 2022, p. 15).

The curriculum is organized into two units, with the first (The Nature of Science) featuring one general curriculum outcome (GCP) and four specific curriculum organizers (SCOs) and the second unit (Learning and Living Sustainably) featuring one GCO and just two SCOs (The Department of Education and Early Childhood Development of New Brunswick, 2022). Each SCO outlines 'achievement indicators' and is followed up by Core Ideas and Concepts. In comparison to other curriculums, the actual content of this course is diminutive, with just seven of the total 37 pages dedicated to actual course content in comparison to New Brunswick Environmental Science which features 27 pages on course content.

Below is a table of the categories and codes that the curriculum engages with and following that is an exploration of the findings from the analysis. The strongest code to emerge is *sustainability* from the general set of codes. The curriculum also engages with the categories of SGR and EM as we shall see.

**Table 4: New Brunswick – Science 9: Ecosystem Dynamics**

| Main Category | Major Code | # of datum examples |
|---|---|---|
| GEN | Sustainability | 19 |
| GEN | Human-Nature relationship | 6 |
| GEN | Indigenous general | 5 |
| EM | We must innovate | 2 |
| GEN | Good citizenship | 2 |
| SGR | Sustainable growth | 1 |
| GEN | Sustainability education | 1 |
| GEN | Climate change | 1 |
| GEN | Employment | 1 |
| TOTAL | | 40 |

4.1.1.2.1 Sustainability – General Category

*Sustainability* from the general category of codes is the most prevalent code to emerge, with a total of 19 coded datum fitting into this code and the theme of the same name. The majority of these coded datum, 12 of the 19 examples, come from introductory part of the curriculum, and one from the appendices section, meaning sustainability as a code only appears within the course content six times, despite it being in the name of one of the two units (unit 2, Learning and Living Sustainably).

Within the introduction the curriculum states that “Students will deepen their understanding of the origins of matter, diversity of life, heredity and ecology, as well as the main principles of environmental stewardship and conservation” (The Department of Education and Early Childhood Development of New Brunswick, 2020, p. 15). The course content’s engagement with sustainability is quite limited however, with SCO 2.1 being “Students will consider factors that support responsible application of scientific and technological knowledge and demonstrate an understanding of sustainable practices” (The Department of Education and Early Childhood Development of New Brunswick, 2020, p. 24) but without achievement indicators that suggest this learning has taken place. SCO 2.2 is “Students will identify a community-based challenge connected to at least two of sustainable development goals; three, 13, 14 and 15, then apply an iterative process to design a solution” (The Department of Education and Early Childhood Development of New Brunswick, 2020, p. 25), but only one of ten achievement indicators could potentially reinforce this concept. The Core Ideas and Context section for unit 2 does mention sustainability again, however it is quite limited, with one of the two examples being: “-Conservation and Stewardship, - Change in environments e.g., biodiversity loss, invasive species, - Risks and benefits of a scientific or technological development” (The Department of Education and Early Childhood Development of New Brunswick, 2020, p. 26)

#### 4.1.1.2.2 We must innovate – Ecomodernists

The code *we must innovate* includes the theme of *technology for change* which expresses the concept that technology will be what saves humanity. This theme appears twice in the curriculum. The first time is in section 1.4 Education for Sustainable Development (ESD) (this is also the one coded datum for the *sustainability education* theme), which introduces the pedagogy of the course as such:

> Science, Technology, and Innovation (STI) are recognized as the key drivers behind economic growth and prosperity. STI plays a central role for achieving sustainable development. To become sustainability changemakers learners must engage with sustainability issues. Science education therefore is vital

> for the achievement of sustainable development (The Department of Education and Early Childhood Development of New Brunswick, 2020, p. 8)

This confusing passage emphasizes the need for sustainability education for economic growth and prosperity but does not reference in the text any other justification for fostering ‘sustainability changemakers’, and therefore falls into the *technology for change* theme as the ideas of technology, economic growth and prosperity, and sustainability are married together.

Further on in the curriculum in unit two, Learning and Living Sustainably, SCO 2.1 is explained as “Students will consider factors that support responsible application of scientific and technological knowledge and demonstrate an understanding of sustainable practices” (The Department of Education and Early Childhood Development of New Brunswick, 2020, p. 24). Again, the connection between technological knowledge and sustainable practices is grouped together in a confusing manner that suggests they are related topics.

#### 4.1.1.2.3 Other significant codes

The two other significant codes that emerge from the curriculum are *Indigenous general* and *human-nature relationship* from the general category of codes. These appear six and five times respectively. All of the *Indigenous general* coded datum are in the introductory pages of the curriculum and are never mentioned within the course content. The *human-nature relationship* coded datum is expressed in shallow ways. For example, a Core Idea and Concept of unit 1 is declared simply as “Biodiversity and Humans” (The Department of Education and Early Childhood Development of New Brunswick, 2020 p. 23), yet unit one never again mentions biodiversity or a synonym for it.

#### 4.1.1.2.4 Conclusion

The actual directives for content in this curriculum are very limited and mostly focus on general methodology within the sciences. The codes and themes that are present in this curriculum suggest a shallow interaction with the concept of

sustainability, what one might term ‘paying lip-service’ to the concept, and instead seem to focus on the strengths of technology.

#### 4.1.1.3 **New Brunswick – Introduction to Environmental Science 120**

Implemented in September 2012, Introduction to Environmental Science 120 (ES120) is an elective course within the New Brunswick curriculum that possesses the prerequisite of Science 10 (Government of New Brunswick, 2012). As it states in the summary of the course, its overall objective is “for students to develop the knowledge base and skills for investigating and analyzing environmental issues and for communicating their knowledge and analysis to others” (New Brunswick Department of Education and Early Childhood Development, 2012, p. 1).

The curriculum contains three units that each possess sub-units: unit 1, An Overview of Environmental Science (sub-units: the Issues, Population Growth and Resource Limitation, Researching Current Environmental Issues); unit 2, Sustainable Development (Ecology, Environmental Awareness, Sustainable Ecosystems and Communities); and unit 3, Investigating Environmental Issues (sub-units which are optional topics for study: Agriculture, Forests, Fresh Water Use, Ocean Fisheries, Energy Resources, Climate Change, Air and Water Pollution) (Government of New Brunswick, 2012). Each sub-unit has New Brunswick prescribed outcomes (NBPOs) to follow and elaborations on the NBPOs. Unit 3 is designed to help support the project that students are required to complete which must fulfill three requirements:

> 1) independent research and report on an environmental issue 2) collaborative work towards a group presentation on an environmental issue, and 3) completion of a choice of optional activities to demonstrate: personal appreciation of the environment, environmental stewardship through action, advocacy for the environment, and engagement of others in environmental inquiry (Government of New Brunswick, 2012, p. 1).

The sub-units are not required, and it is at the discretion of the teacher to choose which to teach to support the students’ choice of project. This study analyzed two of the most relevant sub-units, climate change and energy resources, and chose a third subject at random, forestry, to mimic what a course might potentially look like.

Below is a table of the categories and codes that the curriculum engages with and following that is an exploration of the findings from the analysis. As we can see from table 5, *sustainability education* from the general set of codes is the code that is coded the most within the curriculum, and the general set of codes is the most prevalent category, however examples from the *Smart Growth Reformer* category and the *Eco-Activist* category are present.

**Table 5: NB, Environmental Science**

| Main Category | Major Code | # of datum examples |
|---|---|---|
| GEN | Sustainability education | 38 |
| GEN | Human-nature relationship | 22 |
| GEN | Sustainability | 17 |
| SGR | Sustainable growth | 14 |
| GEN | Indigenous general | 14 |
| GEN | Climate change | 13 |
| EA | New ways of thinking | 12 |
| GEN | Good citizenship | 6 |
| SGR | Invisible hand tech developments | 2 |
| SGR | Large agreements | 2 |
| EM | Extractive innovation | 1 |
| GEN | Employment | 1 |
| TOTAL | | 142 |

4.1.1.3.1 Sustainability education – General category

Of the curriculums analyzed for the purpose of this project, ES120 engages most with the code of *sustainability education* with 38 of its 142 coded datum fitting into this code in the general category of codes. The curriculum does not directly reference SE or any of its synonyms within the text. Instead, the excerpts fit within three of the themes of the code: *place-based learning and the environment*, *learning from personal experience and environment,* and *sustainability education pedagogy and practices*.

In the initial summary of unit three: Investigating Environmental Issues, the document directs that the year-long project be on “environmental issues of concern to them” (Government of New Brunswick, 2012, p. 2) with the theme and concept of

*learning from personal experience and environment* echoed throughout the document. In another example from unit one, An Overview of Environmental Science, the document states as an elaboration of the NBPOs “Students should be encouraged to culture a sense of personal and community responsibility for environmentally sustainable behaviors as part of responsible citizenship” (Government of New Brunswick, 2012, p. 9). In total, the theme *learning from personal experience and environment* is coded 15 times within the curriculum.

The theme of *place-based learning and the environment* is coded 12 times within the document. When discussing the choices the educator makes for unit three, Investigating Environmental Issues, the curriculum states that “Choices should also reflect current issues and events, and connections should be made to local and regional concerns” (Government of New Brunswick, 2012, p. 2), and it reiterates this exact quotation later on page 21 in reference to the expectations for the project. Many of the suggested activities that the students can do for the project also fit into this theme. For example, “Create a field guide to the flora and fauna *in an area with which you are familiar*” or “*Organize a nature walk to share your knowledge* of the plants and animals with your classmates” (Government of New Brunswick, 2012, p. 37) (emphasis by author).

The curriculum has 23 phrases that fit within the theme of *sustainability education pedagogy and practices.* Unit 1, An Overview of Environmental Science states that “Students should be encouraged to culture a sense of personal and community responsibility for environmentally sustainable behaviors as part of responsible citizenship” (Government of New Brunswick, 2012, p. 9), creating a connection with the subject of environmental science and the concept of fostering a sense of responsibility towards connection to- and stewardship of- the environment (a major goal of SE). Many of the suggested activities for the major project fit in this category as well, including the examples shared above. In total, 14 of the 28 suggested activities fit into the theme of *SE pedagogy and practices,* with interdisciplinary and experiential examples such as “Share your work experiences on a farm with the class, and describe ways in which

sustainability for future generations is ensured" (Government of New Brunswick, 2012, p. 37).

#### 4.1.1.3.2 Human-Nature Relationship – General Category

This theme is coded a total of 22 times throughout the curriculum. The first performance objective stated at the beginning of the curriculum is: "outline the ecological processes inherent in natural ecosystems and how these can be impacted by human activity" (Government of New Brunswick, 2012, p. 1). Statements on the connection between humans and the environment are echoed many times throughout the document. For example, in the NBPOs in the sub-unit of Population Growth and Resource Limitation it states, "evaluate Earth's carrying capacity, human population growth and its demands on natural capital, and consumer culture" (Government of New Brunswick, 2012, p. 11).

#### 4.1.1.3.3 Sustainable Growth – Smart Growth Reformer (SGR)

ES120 has 14 passages that are coded into the *sustainable growth* code from the SGR category. Many of the coded datum that fit within this code fall within the *principles of sustainability, ecological limits*, and *sustainable growth* themes. A summary of unit 2, Sustainable Development states that:

> Sustainable development… is offered as a way to approach our responsibilities to the natural world, as we explore ways to minimize stress on the natural environment to ensure the maintenance of dynamic healthy ecosystems. This approach considers the environment in the context of peoples 'social, economic and cultural perspectives and concerns' (Government of New Brunswick, 2012, p. 2)

In this passage, sustainable development is touted as the guiding concept towards minimizing stress on the environment and is linked to social, economic, and cultural perspectives, recalling the three pillars of sustainability (environmental, social, and economic (Rodríguez-Serrano et al., 2017) and voicing a traditional approach of sustainability (*principles of sustainability)* as the solution to environmental issues.

In unit 3 in the sub-unit of Forestry, the elaboration of the topic states, “maintaining a healthy forest ecosystem will ensure the sustainability of the supply of wood and other forest products, and of employment in forestry and eco-tourism” (Government of New Brunswick, 2012, p. 24), which is coded into the *ecological limits* theme for its focus on the health of an ecosystem for the purpose of supplying products and employment.

#### 4.1.1.3.4 New Ways of Thinking – Ecological Activists (EAs)

The ES120 curriculum has 12 coded datum that fit within the code of *new ways of thinking* in the category of EAs. All these coded data fit into the theme of the same name which is characterized by its approach to ecological health that differs from the concept of sustainability in that it asks for a new consciousnesses or a “a fundamental reconsideration of our worldviews, aspirations, and life goals” (Nisbet, 2014, p. 815). In the introduction to the course, an alternative to solely Western thinking regarding science is presented as an aspect of the course in the form of Two-Eyed Seeing. Two-Eyed Seeing is explained as referring to “learning to see with one eye the strengths of Indigenous knowledge and ways of knowing, and with the other eye the strengths of western knowledges and ways of knowing, and to learn to use both eyes together to gain a clearer understanding of the world” (Government of New Brunswick, 2012, p. 5). An example of this type of thinking that appears in the ES120 curriculum is in unit two, Sustainable Development, sub-unit two, Environmental Awareness, where it states that:

> A scientific worldview is one way of understanding the natural world. It tends to be reductionist – studying the parts at one point in time and as separate parts of the whole. It also seeks to separate the physical world from human influence. An Indigenous perspective tends to be more holistic, both at a given point in time and over long periods, complementing an ecological and sustainable development worldview (Government of New Brunswick, 2012, p. 17)

This passage is relevant because it contains a direct critique of Western worldviews, stating that it “tends to be reductionist” (Government of New Brunswick, 2012, p. 17), while praising Indigenous worldviews. Although it does ultimately return to the concept of sustainable development, this does not negate the critique that is offered and the

alternative that is praised, but instead displays how deeply the language of sustainability is embedded in this particular curriculum.

Another example of *new ways of thinking* present within the curriculum appears in the first sub-unit of unit two, Ecology, which elaborates that “A western science approach builds understanding from the cell to the biosphere and explores relationships between organisms…. An Indigenous approach begins with the whole to understand each part of the ecosystem” (Government of New Brunswick, 2012, p. 15) and states on the same page that an NBPO is that students “explore Indigenous ways of knowing organisms beginning with the whole”. At times therefore, the curriculum stresses the differences of Indigenous and Western worldviews and the need for both, while also asking that students are able to understand a specific concept and apply it. In unit three, Investigating Environmental Issues, the introduction detailing that teachers will choose which sub-unit to focus on explains that a specific learning outcome for whichever unit they choose is that students “develop an understanding of the ecosystem of the environment affected, both from a western scientific view and from an Indigenous worldview” (Government of New Brunswick, 2012, p. 21), reinforcing that fostering Two-Eyed Seeing is a goal of the course.

#### 4.1.1.3.5 Conclusion

While the majority of coded datum fit into the general category of codes (*sustainability education*, *human-nature relationship*), the categories of Smart Growth Reformers and Ecological Activists are also present within the curriculum, embracing traditional concepts of sustainability while also praising the alternative knowledge system of Two-Eyed Seeing. ES120 is the curriculum that engages the most with concepts related to sustainability education.

### 4.1.2 Ontario

#### 4.1.2.1 **Ontario – Civics and Citizenship**

As of September 2022, the Civics and Citizenship curriculum was implemented in all Ontario secondary schools as the mandatory grade ten Civics and Citizenship course (Ontario, 2022-a). The overall objectives for this course are “for students to explore the four elements of the citizenship education framework: identity, attributes, structures, and active participation” (Ontario, 2022-a, p. 5), while also applying “the concepts of political thinking and the political inquiry process to investigate, and express informed opinions about, a range of political issues and developments that are both of significance in today’s world and of personal interest to them” (Ontario, 2022-a, p. 8).

The course is structured into three strands, with the lessons from strand A (Political Inquiry and Skill Development) expected to be woven into strands B (Civic Awareness) and C (Civic Engagement, Service, and Action). Each of the strands articulates two to three overall expectations (OEs) and 8-14 specific expectations (SE2s). Strands B and C are also broken down into ‘big ideas’ and ‘framing questions’. There is no instruction towards assessment types or expectations within the curriculum.

Below is a table of the categories and codes that the curriculum engages with and following that is an exploration of the significant findings from the analysis. As we can see from table six, coded datum only fit into the general category of codes, with the theme *employment* coded twice, *Indigenous general* coded nine times, and *good citizenship* coded a total of 69 times. Concepts related to climate change or the environment are never mentioned within the curriculum document and therefore it does not interact with any of the other categories of codes.

**Table 6: Ont, Civics and Citizenship Example of a caption for a table.**

| Main Category | Major Code | # of datum examples |
|---|---|---|
| GEN | Good Citizenship | 69 |
| GEN | Indigenous General | 9 |
| GEN | Employment | 2 |

| | | |
|---|---|---|
| Total | | 80 |

4.1.2.1.1 Good Citizenship – General category

Much like its New Brunswick counterpart, Civics 10 (see section 4.1 *New Brunswick – Civics*), this curriculum is dominated by coded datum that fit in the *good citizenship* code in the general category of codes. All three strands of the curriculum, each of the seven OEs and the 33 of the 36 SE2s engage with the idea of good citizenship, often fitting into one or multiple of the themes *civic engagement*, *active and informed citizens*, and *contributing to community*. For example, the first OE from strand B Civic Awareness, B1. Civic Issues, Democratic Values states the expectation is that students "describe beliefs and values associated with democratic citizenship in Canada, and explain how they are related to civic action and to one's position on civic issues" (Ontario, 2022-a, p.11), fulfilling all three sub-themes mentioned above. While there are many examples that fall within the *good citizenship* theme, the lack of engagement in themes related to climate change suggest that it is not worthwhile to mention more since the curriculum's homogeneity limits its relevance to questions asked in this project.

4.1.2.1.2 Indigenous general – General category

Each of the nine coded datum fall into the Indigenous general code because they reference Indigenous governance systems. Six of the nine coded datum are also found in the *good citizenship* code meaning that they are not exclusive to *Indigenous general*. An example of this overlap can be found on page six of the curriculum in which one of the 'big ideas' of strands B and C are articulated as "An understanding of how the different orders of government, as well as territorial, municipal, and Indigenous governments, function and make decisions enables people to effectively engage in the political process" (Ontario, 2022-a, p. 6). This 'big idea' focuses on the decision-making processes of different levels of government and the effects they have on people and

includes Indigenous government systems but does not focus on them. Each of the nine coded datum follow this line of thought and do not isolate Indigenous governance systems or Indigenous issues but subsume them as simply an aspect of Canadian governance, ignoring the differential treatment that exploring an issue from the lens of Indigenous governance demands.

#### 4.1.2.1.3 Conclusion

The Civics and Citizenship grade 10 curriculum is clearly dominated by the *good citizenship* theme within the general the category of codes. Even the majority of coded datum that fit within the *Indigenous general* theme of codes fall also into the *good citizenship* theme, and they fail to isolate an Indigenous lens or put it into context, suggesting that the mention of Indigenous worldviews is simply given lip service instead of genuinely integrated into the curriculum. The lack of mention of issues related to the climate or the environment confine this curriculum's scope to the point of exclusion regarding its engagement with climate change or SE.

### 4.1.2.2 **Ontario – Science 9**

This curriculum is the compulsory grade 9 science course in Ontario, Science grade 9, de-streamed (SNC1W). As of September 2022, all science programs for grade 9 are based on the expectations laid out in this curriculum document. The Government of Ontario updated this course as "part of the government's plan to align curriculum changes with the province's economic needs and place an emphasis on critical life and job skills, including the fast-growing skilled trades" (Ontario Newsroom, n.d., para 2). As the curriculum states, one main objective for this course is that "It supports students in making connections between skills and concepts and the practical applications of science in their lives, and in learning about biology, chemistry, physics, and Earth and space science" (Ontario, 2022 -b, p.4). The curriculum also states that:

> The three main goals of the Grade 9 science course are for students:
>
> 1. to develop the skills and make the connections needed for scientific investigation

2. to relate science to our changing world, including technology, society, the economy, and the environment

3. to investigate and understand scientific concepts (Ontario, 2022-b, p. 6)

The course is structured into five strands. The first, strand A: STEM Skills, Careers, and Connections focuses on investigation skills and is meant to frame learning for the other four strands; strand B: Biology; strand C: Chemistry; strand D, Physics; and strand E, Earth and Space Science. Much like the Ontario Civics and Citizenship course, this curriculum has two sets of expectations, overall expectations (OEs) and specific expectations (SE2s), that are listed for each strand of the curriculum. The introduction to the course also features a list of 'fundamental concepts' (e.g. matter, energy) that should be integrated into the course, and 'big ideas' for strands B-E (e.g., a 'big idea' in biology is that "Environmental sustainability depends on the dynamic equilibrium of ecosystems") (Ontario, 2022-b, p.17).

Below is a table of the categories and codes that the curriculum engages with and following that is an exploration of the significant findings from the analysis. As we can see from table 7, coded datum only fit within the general category of codes, despite the presence of the concepts of sustainability or climate change.

**Table 7: Ont, Science 9**

| Main Category | Major Code | # of datum examples |
|---|---|---|
| GEN | Sustainability | 31 |
| GEN | Employment | 19 |
| GEN | Climate change | 12 |
| GEN | Human-nature relationship | 8 |
| GEN | Indigenous general | 7 |
| GEN | Sustainability education | 2 |
| GEN | Good citizenship | 1 |
| Total | | 80 |

#### 4.1.2.2.1 Sustainability - general

*Sustainability* is coded 31 times from the curriculum document, each time fitting easily into the code because of the direct use of the word sustainability. An orthodox definition is provided in the 'fundamental concepts' section of the introduction on the course where sustainability is defined as "the concept of meeting the needs of the present without compromising the ability of future generations to meet their needs" (Ontario, 2022-b, p. 15). Sustainability is articulated to be a key concept in the course as students are expected "to build the skills and knowledge that serve as the foundation for deep understanding about complex and interconnected issues […] such as sustainability" (Ontario, 2022-b, p. 5).

Within the actual OEs or SE2s of the five strands of the course, sustainability is mentioned 13 times but the use of the term is shallow at best and the directives of the expectations do not go into detail on what is expected of the students beyond the use of the term. Perhaps a strong example of this is in strand B, Biology, which is sub-titled Sustainable Ecosystems and Climate Change. The first of two OEs for this section is B1, "Relating Science to Our Changing World" which directs that students "assess impacts of climate change on ecosystem sustainability and on various communities, and describe ways to mitigate these impacts" (Ontario, 2022-b, p. 47). The first of three SE2s for this OE is B1.1: "assess impacts of climate change on the sustainability of local and global ecosystems, describe local or global initiatives for combatting climate change, and identify solutions to address some of the impacts" (Ontario, 2022-b, p. 47), which leaves a reader to wonder what type of sustainability the authors are referring to. Considering the orthodox definition provided of sustainability, the language around the term is so vague that an educator reading this document is left to interpret what is meant by this, while focusing on both the local and the global level and directing students to find solutions to these problems. While there is a dedication to the concept of sustainability within the curriculum, there is no framing of the problem or direction towards any kinds of solutions, therefore the usage of the term is sufficiently shallow and cannot fit into the SGR or EM categories.

#### 4.1.2.2.2 Employment - general

*Employment* is coded a total of 19 times within the curriculum, at different times fitting into the sub-themes of *professional lives*, *careers*, *employment*, or *skilled trades*. Strand A, STEM Skills, Careers, and Connections which is intended to frame the remaining strands within the course is the first strand to be taught according to the curriculum, thereby setting a strong undercurrent of employment to the rest of the curriculum. The introductory section on program planning has a part devoted to the importance of skilled trades within the curriculum and states that “The secondary technological education curriculum includes broad-based areas of learning that relate to many skilled trades, and it is important that students become aware of and exposed to the skilled trades and apprenticeship as a potential pathway” (Ontario, 2022-b, p. 36). Employment is also found within the OEs and SE2s. The first OE of strand A is:

> This strand focuses on science, technology, engineering, and mathematics (STEM) investigation skills, practical applications of science, connections between science and various careers, and contributions to the development of science from people with diverse lived experiences. The learning related to this strand takes place in the context of learning in the Biology, Chemistry, Physics, and Earth and Space Science strands (Ontario, 2022-b, p. 45)

The focus on potential careers or the entry into skilled trades is stressed throughout the curriculum.

#### 4.1.2.2.3 Indigenous general - general

Indigenous general is coded only seven times within the curriculum but is of interest because five of the seven codes are in the introductory part of the document, and only two times is it coded within the OEs or SE2s. In the introduction, the document states that in the course “Students explore Indigenous knowledges, which can broaden their understanding of and appreciation for Indigenous cultures and practices, and also provide them with valuable ways in which to investigate how diverse perspectives enrich scientific practices” (Ontario, 2022-b, p. 5), yet within the section that details the scientific research approach, an Indigenous perspective, method, or approach is never mentioned. *Indigenous issues* is coded twice within the SE2s of the OE B.1 Relating

Science to Our Changing World, but not in a manner that asks students to explore Indigenous knowledge systems in a way that would provide how these views can enrich scientific practices, but instead in a descriptive way. The two SE2s that are coded into *Indigenous general* are:

> B1.2 assess impacts of climate change on communities in Canada, including First Nations, Métis, and Inuit communities
>
> B1.3 investigate and explain how sustainable practices used by various communities, including First Nations, Métis, and Inuit communities, reflect an understanding of the importance of the dynamic equilibrium of ecosystems (Ontario, 2022-b, p. 47).

As we can see, students are asked to 'assess' and 'explain', not to practice or enact a methodology or approach.

#### 4.1.2.2.4 Sustainability education – general codes

*Sustainability education* is coded two times in the curriculum although the document refers to it as environmental education, but only in the introductory section of the curriculum, and SE pedagogical practices are never present within the curriculum. The document states that:

> concepts and skills related to environmental education appear throughout the curriculum, providing students with opportunities to investigate the world around them and to build the skills and knowledge that serve as the foundation for deep understanding about complex and interconnected issues such as dynamic equilibrium, biodiversity, sustainability, and climate change (Ontario, 2022-b, p.5)

yet a close reading of the document does not find any fundamental concepts, big ideas, scientific approaches, OEs, or SE2s that suggest environmental education is integrated into the curriculum.

#### 4.1.2.2.5 Conclusion

*Climate change* and *human-nature relationship* as codes were not expanded upon in this section because much like their counterparts *sustainability* or *Indigenous*

*general*, they are presented in a shallow manner which provides little to no detail on their significance. The Science 9 curriculum seems to have lofty ideas outlined in the introduction regarding what is provided in the course (re: *sustainability education, Indigenous general*), yet fails to deliver substance when the document details the OEs and SE2s of the course. Perhaps because there is no framing of the problem of climate change or direction towards solutions, the curriculum also lacks a strong point of view and can be characterized by a superficial engagement with concepts related to climate change, despite its attempts to integrate the issues within the document. This lack of engagement with SE as a pedogeological framework is perhaps reinforced by the province's stated purpose for the new curriculum: "To ensure students have critical life and job skills" and the "foundational, transferable and entrepreneurial skills they need to compete in a rapidly changing world" (Ontario Newsroom, n.d., para 1; para 4).

#### 4.1.2.3 **Ontario – Environmental Science (University/College Preparation), grade 11**

Environmental Science (University/College Preparation) is an elective grade 11 course that requires that students complete grade 10 Science beforehand. While Ontario's grade 10 curriculum was updated in 2022, Environmental Science has remained the same since it was written in 2007 and published in 2008 (Ontario Newsroom, n.d.). The curriculum is very similar or shares many elements (at times worded differently) to the Environmental Science Grade 11 (University/College Preparation) course that is found in Ontario's document *Environmental Education: Scope and Sequence of Expectations* document, which outlines how sustainability education has supposedly been integrated into curriculums in the province. As *Environmental Education: Scope and Sequence of Expectations* states, to ensure that young people become environmentally literate "the Ministry of Education has ensured that environmental education is included, as appropriate, in all grades and in all subjects or disciplines of the Ontario curriculum. Expectations that relate directly to environmental education as well as expectations that encompass opportunities for learning about the environment are now embedded in the curriculum" (Ministry of

Education, 2017, p. 3), which is curious because as we shall see, this curriculum does not engage with SE.

The stated goal of the course is that students acquire “the fundamental knowledge of and skills relating to environmental science that will help them succeed in life after secondary school” and “increase their scientific and environmental literacy and examine the interrelationships between science, the environment, and society in a variety of areas” (Ontario, 2008, p. 150). The course is structured into six units: unit A, Scientific Investigation Skills and Career Exploration; unit B, Scientific Solutions to Contemporary Environmental Challenges; unit C, Human Health and the Environment; unit D, Sustainable Agriculture and Forestry; unit E, Reducing and Managing Waste; and unit F, Conservation of Energy. Each unit has two to three OEs and 12-15 SE2s, with sample questions to inform the line of inquiry.

Below is a table of the categories and codes that the curriculum engages with and following that is an exploration of the significant findings from the analysis. As we can see from table 8, this curriculum engages the most of any curriculums analyzed in this project with the SGR category of codes, but also has aspects of EM and the general category of codes.

**Table 8: Ont, Environmental Science**

| Main Category | Major Code | # of datum examples |
|---|---|---|
| GEN | Human-Nature Relationship | 23 |
| GEN | Sustainability | 15 |
| GEN | Climate change | 8 |
| SGR | Invisible hand tech developments | 6 |
| SGR | ‘Green’ living | 6 |
| SGR | Large agreements | 5 |
| EM | We must innovate | 4 |
| GEN | Employment | 3 |
| GEN | Indigenous General | 3 |
| EM | Extractive innovation | 2 |
| TOTAL | | 75 |

#### 4.1.2.3.1 Human-nature relationship – General category

What is most significant about this theme is that it is the most represented within the curriculum, and that of the 23 codes that acknowledge there is a relationship between humans and the environment are due to unit C, Human Health and the Environment, which houses 17 of the coded datum. The approach to the theme is limited to lifestyle choices and descriptions of pollution and contaminants. Three of the coded datum focus on lifestyle choices that reduce the impact of environmental factors. As the curriculum states "it is possible to minimize some of the negative health effects of environmental factors by making informed lifestyle choices and taking other precautions", which are expanded upon as, for example, "wearing protective clothing or sunscreen" (Ontario, 2008, p. 150; 157). Twelve of the 23 codes focus on descriptive language surrounding the relationship of pollution and health, such as "identify the main pollutants and environmental contaminants that can affect human health", or "describe a way in which a variety of environmental contaminants… can enter the human body" (Ontario, 2008, p. 157), with no exploration of the changes necessary to prevent these issues or to discuss solutions.

#### 4.1.2.3.2 Climate change – General category

What is most significant in this code is that while *climate change* is coded eight times within the curriculum, the term climate change is only used three times. The remaining five codes fit within what could be considered concepts synonymous to climate change, which fall into the themes of *human-caused carbon emissions* (two coded datum), *human-caused global warming* (two coded datum), and *human-caused greenhouse gasses* (one coded datum). For example, a specific expectation of unit B, Scientific Solutions to Contemporary Environmental Challenges states that by the end of course, students will be able to "B3.1 identify some major contemporary environmental challenges (e.g., global warming, acid precipitation), and explain their causes (e.g., deforestation, carbon and sulfur emissions) and effects (e.g., desertification, the creation of environmental refugees, the destruction of aquatic and

terrestrial habitats)" (Ontario, 2008, p. 155). This example would be an appropriate time to use the term climate change given that it is the most pressing contemporary environmental challenge, yet it is almost as though the curriculum goes out of its way to use other verbiage to name the issue.

#### 4.1.2.3.3 Invisible hand technology developments – SGR category

Six of the 17 coded datum that fit into the SGR category fall into the code of *invisible hand technology developments*, with three of the coded datum falling into the theme *invisible hand energy market* as they stress the role the public plays in the adoption of renewables and alternative methods. Take for example, SE2 B1.2 in unit B, Scientific Solutions to Contemporary Environmental Challenges:

> *analyse ways in which societal needs or demands have influenced scientific endeavours related to the environment* (e.g., the development of drought- and pest-resistant crops to address the rising global need for food; *research into alternative energy sources in response to demands to address the impact on climate change of burning fossil fuels*) (Ontario, 2008, p. 154, emphasis by author)

Other examples within this code focus on arguments for utilizing both renewable and non-renewable energy sources, as students are instructed to "evaluate the impact on the environment of renewable and non-renewable energy sources, and propose an environmentally friendly solution to reduce non-renewable energy consumption, (e.g., a plan for broader use of hybrid cars or solar panels)" (Ontario, 2008, p. 162), embracing the SGR perspective that modifications to our use of technology and energy can have big impacts.

#### 4.1.2.3.4 'Green' living – SGR category

Similarly, many coded datum fall into the code of *'green' living* which embraces the idea that markets drive change as the model of social change. All five of the examples fall into the theme of *market-driven change*. Perhaps most emblematic of this train of thought that persists within the curriculum is a sample question from unit B, Scientific Solutions to Contemporary Environmental Challenges which asks:

> How and why do demands by environmentally conscious consumers affect the types of products developed by corporations? What impact have the energy needs of remote communities had on innovations in the development of off-grid energy sources? What types of products have been developed in response to the health threats resulting from ozone depletion? (Ontario, 2008, p. 154)

This unit focuses on scientific solutions to environmental problems, yet the persistence of the presence of the market suggests it focuses instead on the market's role in solutions to environmental problems instead of any focus on how to go about creating environmental solutions.

#### 4.1.2.3.5 Large Agreements – SGR category

The curriculum does not promote any genuine engagement in grassroots movements or activism although it does use the term 'grassroot' three times, and overall follows the SGR perspective that a mix of international agreements and local actions is the best approach to policy towards climate change. For example, the curriculum asks that students "analyse grassroots initiatives" like "class action lawsuits against major pollutors" (Ontario, 2008, p. 156), limiting grassroots movements to class action lawsuits instead of, for example, political participation in other arenas. It also asks that students "evaluate the effectiveness of government initiatives that are intended to reduce the impact of environmental factors on human health (e.g., Ontario Ministry of the Environment smog advisories" (Ontario, 2008, 156), and embraces the idea of large, government regulatory bodies as necessary policy in three coded datum.

#### 4.1.2.3.6 Extractive innovation – EM category

Both of the coded datum in this code are characterized by the theme *renewables are insufficient,* as they state authoritatively "some alternative sources, such as wind and solar power, are less reliable, and their unit costs are much higher" while also posing the sample question "Why are wind and solar power less reliable than fossil fuel sources?" in unit F, Conservation of Energy (Ontario, 2008, p. 162).

#### 4.1.2.3.7 We must innovate – EM category

The four coded datum that fit within this category follow the EM logic that "public forums that challenge assumptions create conditions for cooperation and innovation" (Nisbet, 2014, p. 814) as they make statements or pose questions such as "analyse ways in which societal needs or demands have influenced scientific endeavours related to the environment (e.g.,… research into alternative energy sources in response to demands to address the impact on climate change of burning fossil fuels)" or "explain how an environmental challenge has led to advances in science or technology (e.g.,… hybrid cars)" (Ontario, 2008, p. 154; 155) stressing that people innovate as a response to environmental issues as a model of social change.

#### 4.1.2.3.8 Indigenous general – General category

While this theme is only coded three times it stands out because of its lack of the use of the word Indigenous or its representation of Indigenous perspectives. In fact, the science curriculums for grades 11 and 12 are all grouped together in the curriculum guide that this particular curriculum is a part of, and a quick search of the 264-page document reveals that the word Indigenous appears only two times in the document and only within the glossary explaining ecological definitions (invasive species, native species) (Ontario 2008), and is therefore excluded from the 14 courses that are featured in the curriculum document. In these three examples, the names of Indigenous communities are used but are not acknowledged as being Indigenous. For example, the curriculum gives a sample issue in unit C, Human Health and the Environment that shares:

> People from the Grassy Narrows Reserve in Northern Ontario were experiencing chronic health problems. They commissioned a study, which found that many animals and fish that were part of a traditional diet were contaminated with mercury and heavy metals. Guidelines were proposed to limit consumption of the affected animals, and thereby improve people's health (Ontario, 2008, p. 156)

Not only does this framing not acknowledge the severity of the poisoning of the river in the Grassy Narrows Reserve, it fails to directly acknowledge the context of the issue as

one which occurred in a vulnerable Indigenous community, and it, like the rest of the curriculum, does not bring any Indigenous perspective or knowledge to the issue. The other coded datum are similar in their representation (or lack of) of Indigenous people.

#### 4.1.2.3.9 Conclusion

This course is characterized by its conservative use of language regarding issues related to Indigenous communities as well as concepts related to climate change. Its focus on the role the public plays on the adoption of renewable, its interest in having students discuss large agreements and some forms of grassroots movement, and on the role public forums play in creating the conditions for innovation position it somewhere between the SGR and EM in its teachings.

## 4.1.3 Saskatchewan

### 4.1.3.1 **Saskatchewan – Social Studies 10**

Social Studies 10 was published in 1992 and is described as a “social studies and history course” (Saskatchewan Education, 1992, p. 26) that was designed as a precursor to either course (social studies or history) for grade 11. Its main goals are explained as helping “students understand the basic organizations of industrialized, democratic societies. The social studies program outlines the basic organization of Canadian society and then provides some other examples to give students a basis for comparison” (Saskatchewan Education, 1992, p.26).

The curriculum is the longest of any studied in this analysis at 228 pages total, although the page numbers on the PDF are confusing and range from i-525. It is comprised of five units: unit 1, Political Decision Making; unit 2, Economic Decision Making; unit 3, Ideology and the Decision-Making Process; unit 4, International Economic Relations; and unit 5, International Public Relations. The overall organization of the document is broken down into general objectives, teaching strategies, and activity guides.

This curriculum does not discuss climate change or environmental issues and thus does not interact with any of the themes that this project is looking for, aside from its inclusion of themes related to Indigenous issues. It should be noted that the document never uses the term Indigenous, but instead uses the term Aboriginal, Metis, Mohawk, or the outdated and offensive term Indian. Table 9 shows the total count.

**Table 9: Sask, Social Studies 10**

| Main Category | Major Code | # of datum examples |
|---|---|---|
| GEN | Indigenous General | 80 |
| TOTAL | | 80 |

4.1.3.1.1 Indigenous General – General category

It is out of the purview of this project to analyze the sub-themes within this category, although the author did analyze for interactions with themes related to climate change or the physical environment and none were present. It is of note, however, that much of the coded datum are incredibly patronizing or colonial in their approach to the subject. For example, one core concept from unit 2, Economic Decision Making is "Know that attempts by Aboriginal communities to integrate Indian culture with a western market economy are still in the beginning stages, and much trial and error will be required" (Saskatchewan Education, 1992, p. 228), while a suggested teaching activity from unit 3, Ideology and the Decision Making Process is to review a historic crisis and then act out a scene in which "Once the crisis is "over" suggest to the students that they should carefully consider what the long term solutions should be to the question of what role the Aboriginal Peoples should play in Canadian society" (Saskatchewan Education, 1992, p. 341).

4.1.3.1.2 Conclusion

The curriculum does not engage with lessons or concepts related to climate change, sustainability, or the environment. It is in general an outdated document that needs to be redesigned. Its engagement on the topic of Indigenous issues is alarming in its often patronizing and at times colonial nature. Its engagement in other topics, although also out of the scope of this paper, are also outdated (for example, it does

nothing to hide its bias towards the benefits of free trade in unit 4, International Economic Relations, where it repeatedly makes comments like “Know that those who trade will have a higher standard of living because they will have more and better products to choose from” (Saskatchewan Education, 1992, p. 414). This curriculum requires a rewrite or a study of its own.

#### 4.1.3.2 **Saskatchewan – Science 10**

Science 10 is a required course in the Saskatchewan curriculum. Published in 2015, this “renewed curriculum reflects current science education research, updated technology and recently developed resources, and is responsive to changing demographics within the province” (Ministry of Education, 2015, p.1). As part of the core curriculum, this course is intended to, alongside the other core courses, “provide all Saskatchewan students with an education that will serve them well regardless of their choices after leaving school” (Ministry of Education, 2015, p.1).

The course is structured to include outcomes, defined as “statements of what students are expected to know and be able to do by the end of a grade or secondary level course in a particular area of study” and indicators, which “are representative of what students need to know and/or be able to do in order to achieve an outcome” (Ministry of Education, 2015, p.2). The curriculum document is 44 pages in length, but only 9 of the pages are specifically focused on the content of the course, while the other pages are general introductory topics or general conclusion topics (Ministry of Education, 2015). The course features four units: unit 1, Career Investigation; unit 2, Climate and Ecosystem Dynamics; unit 3, Chemical Reactions; and unit 4, Force and Motion in Our World, each featuring one to four outcomes and anywhere between nine - 40 indicators (Ministry of Education, 2015).

Below is a table of the categories and codes that the curriculum engages with and following that is an exploration of the significant findings from the analysis. As we can see from table 10, coded datum only fit within the general category of codes, despite the presence of the concepts of sustainability or climate change.

**Table 10: Sask, Science 10**

| Main Category | Major Code | # of datum examples |
|---|---|---|
| GEN | Indigenous general | 23 |
| GEN | Human-nature relationship | 14 |
| GEN | Sustainability | 14 |
| GEN | Climate change | 12 |
| GEN | Employment | 11 |
| GEN | Anthropocene | 3 |
| GEN | Good citizenship | 2 |
| GEN | Sustainability education | 1 |
| Total | | 80 |

4.1.3.2.1 Indigenous General – General category

Sixteen of the 23 coded datum found in the *Indigenous general* code are from the introductory pages of the curriculum, and therefore are not present within the course content. Each of the 16 coded datum from this section fit within the theme *Indigenous perspectives are different than Western*. In the introductory pages under the sub-heading Foundation 2: Scientific Knowledge, the document details that “A strong science program recognizes that modern science is not the only form of empirical knowledge about nature and aims to broaden student understanding of traditional and local knowledge systems” (Ministry of Education, 2015, p. 14) and goes on to compare and contrast Indigenous knowledge with scientific knowledge. Later in the document under the sub-heading Cultural Perspectives, it states that “Two knowledge systems which are emphasized in this curriculum are First Nations and Métis cultures (Indigenous knowledge) and EuroCanadian cultures (science)” (Ministry of Education, 2015, p. 19) suggesting they are of equal importance. In the next paragraph, the curriculum states that “Cultural perspectives on science can also be taught in activities that explicitly explore Indigenous knowledge or knowledge from other cultures” (Ministry of Education, 2015, p. 19). Teaching about perspectives is far different than teaching methods, so while the Ministry of Education claims to place equal importance on teaching both, as we will see below in an analysis of the coded datum in the content of the course, Indigenous knowledge is to be studied as a cultural perspective while scientific knowledge is to be enacted as a methodology.

There are seven instances in the content of the course that the curriculum asks students to engage with Indigenous ways of knowing. They are found in the indicators of the outcomes and are descriptive or investigative instead of enacting a methodology. For example, one indicator for unit 2, Climate and Ecosystem Dynamics is “c. Research how people from Aboriginal and other cultures view relationships between living organisms and their ecosystems, and the role of humans in those relationships (STSE)” (Ministry of Education, 2015, p. 27) while another demands students “Explore Indigenous ways of understanding the role of matter and energy in the environment (STSE, K)” (Ministry of Education, 2015, p. 30). To contrast, another indicator from the same unit is “f. Design and carry out an investigation to determine the effect of carbon dioxide levels on photosynthesis and/or to determine the effect of nitrogenous-based fertilizer on plant or algal growth (S, A)” (Ministry of Education, 2015, p. 30) exhibiting that students are meant to practice Western scientific methodologies while studying Indigenous ways of knowing.

#### 4.1.3.2.2 Human-nature relationship – general category

*Human-nature relationship* is coded 14 times within the curriculum. This theme is coded when the document acknowledges simply that human activity impacts the environment (*human impact on environment)*. Thirteen of the 14 coded datum within this theme are indicators from unit 2, Climate and Ecosystem Dynamics. The first 2 indicators are: a. “Pose questions or problems relating to the effects of human actions on global climate change and the sustainability of ecosystems that arise from personal research. (A, S, STSE)” and b, “b. Reflect upon your personal view of humanity’s relationship with the environment. (STSE, A)” (Ministry of Education, 2015, p. 27). The other examples are similar, in which the student is asked to examine human impact on a certain aspect of the environment.

#### 4.1.3.2.3 Sustainability and Climate change – general category

*Sustainability* is coded 14 times from the curriculum. Of note, five of the 14 coded datum also fall within the *human-nature relationship* code. One of the fundamental

concepts from the introductory pages of the course is Sustainability and Stewardship which the documents defines in an orthodox manner as:

> Sustainability refers to the ability to meet our present needs without compromising the ability of future generations to meet their needs. Stewardship refers to the personal responsibility to take action in order to participate in the responsible management of natural resources. By developing their understanding of ideas related to sustainability, students are able to take increasing responsibility for making choices that reflect those ideas (Ministry of Education, 2015, p. 15)

Much like the definition provided, language around the use of the term sustainability is often vague. For example, students are asked to “f. Discuss why it is important to consider economic, social justice and environmental perspectives when examining sustainability” or “Assess the implications of human actions on the local and global climate and the sustainability of ecosystems” (Ministry of Education, 2015, p. 26; p.28). Together with the definition provided, much is left open to interpretation on what sustainability implies in these indicators.

Climate change is coded 12 times within the curriculum, and 10 of the 12 times are also within unit 2, Climate and Ecosystem Dynamics.

#### 4.1.3.2.4 Anthropocene – general codes

Two indicators for unit 2, Climate and Ecosystem Dynamics use the term ‘anthropogenic’ and ask that students “provide examples of human actions that have contributed to the anthropogenic greenhouse effect” and “reflect upon individual and societal behavioral and lifestyle choices that can help to minimize anthropogenic sources of global climate change” (Ministry of Education, 2015, p. 28). The inclusion of this language is interesting given the curriculum’s usually general and vague choice of vocabulary, and suggests acknowledgement that humans are a major force in climate change, but at no point does it ask that educators elaborate for the students on what the Anthropocene is or its implications.

#### 4.1.3.2.5 Sustainability education – general codes

Sustainability education is coded one time as an indicator for unit 2, Climate and Ecosystem Dynamics asks that students “Select, integrate and analyze the validity of information from various human, print and electronic sources (e.g., government publications, community resources and personally collected data), with respect to sustainability, sustainable development and education for sustainable development” (Ministry of Education, 2015, p. 28). Of note here is that education for sustainable development is not mentioned elsewhere in the curriculum, including the introductory pages, so it is reasonable to assume that an educator following this curriculum would not know what that meant, compounded by the confusing language used in this indicator whether you are an educator or not.

#### 4.1.3.2.6 Conclusion

The Saskatchewan Science 10 curriculum engages with themes related to climate change, but in mostly vague terms and entirely in unit of the course, unit 2, Climate and Ecosystem Dynamics, or in the introductory pages or glossary of the course. The exclusion from the other units which explore careers, chemical reactions, and force and motion in our world suggests a lack of interdisciplinary approach even within the sciences, and that issues related to climate change or sustainability are siloed into one unit.

### 4.1.3.3 **Saskatchewan – Environmental Science 20**

Environmental Science 20 is an elective course within the Saskatchewan curriculum and necessitates the pre-requisite of Science 10 (see section 4.7). Published in 2016, this “renewed curriculum reflects current science education research and updated technology and is responsive to changing demographics within the province” (Ministry of Education, 2016, p. 1).

This curriculum is structured in the same way as its Science 10 in multiple ways. The introductory pages from pages 1-25 are almost identical in content (Ministry of

Education, 2015; Ministry of Education, 2016). This curriculum is also structured by outcomes and indicators. It has 7 units: unit 1, Career Exploration; unit 2, Student-Directed Study; unit 3, The Nature of Environmental Science; unit 4, Atmosphere and Human Health; unit 5, Human Population and Pollution; unit 6, Aquatic Systems; and unit 7, Terrestrial Ecosystems (Ministry of Education, 2016, p. 26). Each unit has anywhere from one to three outcomes, and anywhere between eight -32 indicators.

Below is a table of the categories and codes that the curriculum engages with and following that is an exploration of the significant findings from the analysis. As we can see from table 11, coded datum fit within each of the categories, with Smart Growth Reformers and the General category of codes dominating.

**Table 11: Sask, Environmental Science 20**

| Main Category | Major Code | # of datum examples |
|---|---|---|
| GEN | Human-Nature Relationship | 30 |
| GEN | Indigenous General | 25 |
| GEN | Climate change | 18 |
| GEN | Sustainability | 12 |
| GEN | Employment | 11 |
| EM | Innovation can solve it | 10 |
| SGR | Sustainable Growth | 8 |
| SGR | Some Regulation Necessary | 6 |
| GEN | Anthropocene | 4 |
| GEN | Good Citizenship | 3 |
| SGR | Invisible Hand Tech Developments | 1 |
| EA | Environmental Fragility | 1 |
| EA | Grassroots Development | 1 |
| TOTAL | | 130 |

4.1.3.3.1 Human-Nature Relationship – General category

Human-Nature Relationship is coded 30 times within the document. This theme is populated mostly because of the presence of units 4 and 5, Atmosphere and Human Health, and Human Population and Pollution respectively, in which human health being affected by the environment is coded nine times and waste management is coded eight times. However, the relationship is mentioned in other units as well. Unit 7, Terrestrial Ecosystems lists one indicator with the instructions that student should be able to “f.

Correlate the range and habitat of various animals with Saskatchewan's ecozones and ecoregions and identify changes to an animal's range and habitat due to human activities such as agriculture, mining, oil and gas development, forestry, urbanization and recreation" (Ministry of Education, 2016, p. 36). It is also pertinent to mention that six of the coded datum here fit within other categories as well. For example, indicator k. from unit 2, Self-Directed Study instructs that students "Analyze an issue or case study where humans have greatly affected their environment, including a cost-benefit analysis and ethical implications" (Ministry of Education, 2016, p. 28) is also found within the code *sustainable growth* in the SGR category for its economical approach to ecological limits.

#### 4.1.3.3.2 Indigenous General – General category

Since the introductory pages are almost identical to that of the Saskatchewan Science 10 curriculum, the discussion on how Indigenous Knowledge is framed within this curriculum as equally as important as scientific knowledge, however, is in actuality used as a system to study and not practice is the same (see discussion above in section 4.7 Saskatchewan – Science 10).

Nine of the 25 coded datum are found within the course content. Like its Saskatchewan Science 10 counterpart, the language used here is descriptive or investigative, but does not enact a methodology. For example, the outcome for unit 2, Student-Directed Study is "Create and carry out a plan to explore one or more topics of personal interest relevant to Environmental Science 20 in depth" (Ministry of Education, 2016, p. 28), and the 15 indicators are examples of projects the students could choose from, but none of them ask students to integrate Indigenous knowledge into their study. It does, however, ask that students "Design a scientific investigation", "Carry out an experiment following established scientific protocols", "Develop a policy", "Design, construct and evaluate the effectiveness of a device", etc. (Ministry of Education, 2016, p. 28). Meanwhile, the language used in indicators that fall into the code of *Indigenous general* because they use the word Indigenous or the name of an Indigenous group of people, use language such as "Recognize essential characteristics of First Nations and

Métis worldviews regarding the environment, including the importance of the four elements (i.e., earth, water, wind and fire)" (Ministry of Education, 2016, p. 29), or "Discuss how First Nations and Métis people value soil as an integral component of Mother Earth, including traditional ways of looking after soil" (Ministry of Education, 2016, p. 34). These expressions are far more descriptive and do not require students integrate Indigenous knowledge into their worldviews, but study them as cultural perspectives.

#### 4.1.3.3.3 Climate Change – General codes

Climate change is coded 18 times within this curriculum which is the most of any of the nine curriculums analyzed in this project. The curriculum does not shy away from using the term: 17 of the 18 coded data use the term climate change directly, while only one references greenhouse gases which lead to warming. In unit 4, Atmosphere and Human Health for example, the curriculum indicates that students should "c. Investigate the Arctic as an indicator region of climate change, including the impact on traditional lifestyles of northern peoples, given the general vulnerability to climate change effects at northern versus equatorial latitudes" (Ministry of Education, 2016, p. 31). Sixteen of the 17 coded datum that mention climate change are akin to this example: they acknowledge that climate is changing and that there are different methods and issues that we must study related to this. One example from the same unit, however, asks that students "f. Examine the degree to which the scientific community has achieved consensus regarding the reality of anthropogenic climate change", (Ministry of Education, 2016, p. 31) suggesting that there is area for debate on the topic despite recent findings that over 99% of scientists agree that modern climate change is human caused (Lynas et al., 2021).

#### 4.1.3.3.4 Innovation Can Solve It – EM category

*Innovation can solve it* is the code that responds the problem-framing of the issue of climate change for the Ecomodernist category. Nine of the ten coded datum in this code represent the theme *societal resilience* for their focus on technologies and strategies that mitigate the effects of a changing climate. For example, students are

asked to “Research advances in technologies such as desalinization plants, water treatment plants and home water filtrations systems, which are designed to maintain and improve water quality” or to “Investigate the adaptation and mitigation strategies developed to minimize the potential impacts of climate change on the agriculture, energy, forestry, transportation and/or tourism sectors in Saskatchewan” (Ministry of Education, 2016, p. 34; p. 31), focusing on technologies that help us to adapt to environmental issues instead of address their root causes. One of the coded datum is that which we’ve seen before: “f. Examine the degree to which the scientific community has achieved consensus regarding the reality of anthropogenic climate change” (Ministory of Education, 2016, p. 31) fits within this theme as well because in its doubt it expresses the sentiment that the issue of climate change is potentially misdiagnosed, and that perhaps the climate is changing as part of the natural phenomena of climate patterns.

#### 4.1.3.3.5 Some Regulation Necessary – SGR category

Each of the six coded datum in this theme fit within the eponymous code of *some regulation necessary*, and all fall within curriculum content indicators. An indicator for unit 2, Atmosphere and Human Health, for example is “Assess the impact of human activities on indoor and outdoor air quality and the need for regulations and mitigating technologies to minimize risks to human health” (Ministry of Education, 2016, p. 26), or in the same unit, an indicator asks that students “Analyze the role of various government regulations… in minimizing the risk to human health” (Ministry of Education, 2016, p. 30).

#### 4.1.3.3.6 Sustainable Growth – SGR category

Five of the eight coded datum in this code fall into the theme of *smart policy* and are all within the course indicators for the curriculum. Students are asked, for example, to “Develop a policy, grounded in environmental science, which addresses an issue of concern to society and/or for the environment” (Ministry of Education, 2016, p. 28), or to “Debate the benefits and consequences of public policies (e.g., municipal, provincial or federal) regarding the handling, storage, transportation, treatment and disposal of

hazardous waste" (Ministry of Education, 2016, p. 32). Two of the coded datum fall within the theme of *principles of sustainability* and ask for example that students "Examine how principles of sustainability (i.e., environmental, economic and social justice) are integral to environmental science" (Ministry of Education, 2016, p. 33). One of the coded datum falls within the theme of *ecological limits* and ask that students "Analyze an issue or case study where humans have greatly affected their environment, including a cost-benefit analysis and ethical implications" (Ministry of Education, 2016, p. 28).

#### 4.1.3.3.7 Anthropocene – General category

The term Anthropocene is coded 4 times in the curriculum, two of which are because of definitions provided in the glossary (Anthropocentric and Anthropogenic climate change) (Ministry of Education, 2016). The first example mentions anthropocentric worldviews in a short list of worldviews and requires that students analyze how the different worldviews are expressed in policy, and the second example is the previously mentioned example in the above section on the theme *Climate Change,* where students are asked to debate whether modern climate-change is human caused despite scientific consensus that is anthropogenic.

#### 4.1.3.3.8 Ecological Activists

Since there are only two coded datum that fit within this category, they will be discussed in one section. The first code is *environmental fragility,* which is expressed in the indicator in unit 7, Terrestrial Systems, with the coded datum "a. Justify the need for habitat protection and restoration in terms of biodiversity (e.g., genetic diversity, species diversity and habitat diversity) and resilience within ecosystems both locally and globally" (Ministry of Education, p. 36). The second code is *grassroots developments* and is expressed in the indicator "k. Investigate how various small- and large-scale composting systems such as composting toilets, trench composting, vermicomposting, windrow composting, anaerobic digestion and mechanical biological treatment work to maintain and improve soil quality" (Ministry of Education, p. 35).

#### 4.1.3.3.9 Conclusion

This curriculum has the second most coded datum that relate to the code studied in this analysis. It is characterized by its high engagement with themes related to climate change and humanity's impact on nature. Its unique curriculum content is dominated by its engagement with the ideas of policy, regulation, and mitigation strategies driven by technology, which puts it somewhere between the SGR and EM category of thought on the issue of climate change.

## 4.2 Summary

There is not great variation within the curricula that were analyzed here. The New Brunswick Environmental Science curricula presents as an outlier, however, because of the presence of sustainability education methodologies and because it has the most diverse approach regarding ideological approaches to teaching about the environment and matters related to climate change. Saskatchewan emerges with some surprising revelations, such as being the only province to use the term Anthropocene while concurrently having the most outdated curriculum in Social Studies 10. Ontario interacts the least with the topics explored in this study suggesting that climate change, sustainability education, and new ways of thinking about climate change and the integration of Indigenous worldviews are mostly absent within the province's curricula. Sustainability education and its methodologies are barely present in eight out of nine curricula. The general set of codes dominates within the curricula, which means climate change and matters related to it are being taught from a point of view that is often lacking in direction or is purely observational, suggesting that adequate problem framing and pathways to solutions are not present within the curricula.

# 5 Discussion, recommendations, and conclusion

## 5.1 Introduction

The chapter presents a final discussion of the initial research questions while reflecting on the use of Fairclough's three-dimensional model for critical discourse analysis (text, discursive practice, social practice) as the foundational methodological tool to examine curricula. This study asked what the shared and differential ideological slants are towards climate change in the curricula of the provinces studied and if they relate to what the literature says about climate change and education in Canada. The goal afterwards was to compare these results with what contemporary pedagogical theories suggest are the best approaches and methods that can be used to activate education as a mitigation factor towards climate change.

Returning to Fairclough's three-dimensional model, text, as the nucleus of the model, is defined as "written or spoken language produced in a discursive event" (Fairclough, 2013, p. 95) and were examined extensively in the previous chapter. In summary, the curricula analyzed do not fit well into any of Nesbit's (2014) three categories of typology of public articulation towards climate change (Ecological Activists, Smart Growth Reformers, Ecomodernists) because the majority of the interactions with climate change and ideas related to it are descriptive or general, and as will be discussed below, lack problem-framing or solutions, and therefore 714 of the 799 coded (Appendix A) fall into the general category of codes. The second most coded category is the Smart Growth Reformer category (51 coded datum), then the Ecomodernist category (20 coded datum), and finally the Ecological Activist category (14 coded datum). However, as will be explored in this section, a lack of strong framing of climate change within education has its own implications.

## 5.2 Discursive Practice

Analyzing discursive practice is a move away from micro analysis of the text and a step towards the macro: it is a move towards investigating the production, distribution,

and consumption of a text, but also to analyzing “the construction and restructuring of hegemonies” (Fairclough, 2013, p. 136). Hegemony, the concept originated by the Italian philosopher Antonio Gramsci, is often understood as domination through consent and coercion which is enabled through the dissemination of ideology within institutions (religion, government, education) and by the use of discourse (Lash, 2007). Examining hegemony (as understood by Fairclough to be how power is enacted in capitalist societies (Fairclough, 2013) locates and interrogates the ways in which ideology is constitutive and constituted by discursive practices. Fairclough explains that “discourse conventions may embody naturalized ideologies which make them a most effective mechanism for sustaining hegemonies” (Fairclough, 2013, p. 126), which begs the question in this project, what discourse conventions are present in the curriculums of Canada that establish authority and spread conventional wisdom and attitudes towards climate change?

Critical discourse analysis is focused on finding what is made ‘common sense’ through the use of discourse, and Fairclough’s method, which explores discursive practice, illuminates aspects of how hegemony is formed through the use of text. The discursive practice element creates a link between how hegemony is enacted as “various domains of civil society (e.g., work, education, leisure activities) or practices which naturalise particular relations and ideologies… are largely discursive” (Fairclough, 2013, p. 129).

Curricula in and of themselves are discursive events. They are guiding documents that are intended to “articulate learning goals (intended curriculum), inform learning experiences (enacted curriculum), and define what serves as evidence of learning (assessed curriculum)” (Strauss et al., 2023, p. 28). They are, within their respective provinces and territories, well-circulated documents that public schools are expected to use and serve to shape current thinking and ideas (Woodside-Jiron, 2011).

The Government of Ontario explains regarding the production of curricula that “Curriculum is developed by the Ministry of Education in consultation with education stakeholders and partners” (Ontario, n.d.-d, para 7), highlighting the government’s role

in the creation of the documents and stressing the authority involved in its *production*. As the government website later states, “having province-wide curriculum and assessment policies provides for consistent planning, implementation, evaluation and reporting of student learning and achievement across school boards” (Ontario, n.d.-d, para 1). stressing that the *distribution* of the text is province-wide and normalizes expectations for educators, which is to say, dictates that it is consumed by all educators though variation in the methods by which the information is taught will vary.

The Science 10 and Environmental Science curriculums in Saskatchewan were written after the publication of the document *Renewed Curricula: Understanding Outcomes* (2010) and follow the intended framework for learning outlined by the document. The curriculum renewal process was “undertaken to incorporate recent educational research, and to make clear the desired results for learning” (Ministry of Education, 2010, p.1). These two curricula were written by the Ministry of Education with the contributions and advice of the provincial Secondary Science Curriculum Reference Committee members with special thanks given to former Science Reference Committee members, First Nations’ Elders and teachers, university faculty members, and pilot teachers and educators (Ministry of Education, 2015; Ministry of Education, 2016). The production of the curricula was under the jurisdiction of the Ministry of Education and what is positioned as a group of experts, imbuing the document with authority by means of its authorship and its focus on integrating the latest research and pedagogy. As it is intended to address the learning needs and potential of its student body, its consumption is meant to form the learning experience across the province (Ministry of Education, 2015; Ministry of Education, 2016). The Social Studies 10 curricula is similar in that it was written by the Ministry of Education and a group of experts, the Social Sciences Curriculum Advisory Committee, and the components of the curriculum are “required areas of study and the common essential learning” (Saskatchewan Education, 1992, p. 5).

The New Brunswick curriculums are the same as their counterparts in Ontario and Saskatchewan: they are prepared by the Ministry of Education with the help of teachers,

advisory committees, First Nation advisory committees, and consultants, again imbuing the documents with authority (Department of Education and Early Childhood Development, 2021; The Department of Education and Early Childhood Development of New Brunswick, 2022; Government of New Brunswick, 2023). Like the other provinces and their curricula, these curricula provide the standards that are taught across the province, demonstrating that the distribution and consumption are standardized and expected: access to the curricula, expectations of use, and learning outcomes are the same for each public school within the province.

The discursive practice is similar across provinces. The documents create and cement a discourse convention of curricula: that they are written by experts, provide standard learning goals that are up to date upon publication, and implicitly embody authority. So, while "'education' is a changing and often personalized, historically and politically constructed concept (with no absolute correct meaning to retreat to)" (Harris, 1999, p.3), these curricula, in contrast, utilize the discourse convention of educational authority by working to define education, defining the parameters of what will, and by default, what will not be taught.

## 5.3 Social practice

Analyzing social practice as a dimension of discourse can be understood as the "explanation of the relationship between the discursive processes and the social processes" (Fairclough, 2013, p. 132). Education, as Kress writes, is a social process in and of itself. Education is "embedded in 'the social' and, being social, it is the product of social agents, structures, processes, values, purposes, and constraints" (Kress, 2011, p. 205). The texts associated with education, such as curricula, thus have a part in shaping and constituting the practices, values, parameters, and structures of the educators and students – all those involved in the social process – of enacting the text (Kress, 2011).

One aspect of social practice that can be explored is that of genre. Genre, in this usage, means the organization of social participants in the making of texts, otherwise

known as ways of acting (Kress, 2011; Fairclough, 2013). Curricula, as a genre, set parameters around educational experiences and thereby as texts, suggesting that while there are ways of acting in creating curricula (the Ministry of Education oversees committee members considered experts who write the documents), it also helps to determine ways of acting within actual educational settings such as classrooms or lesson planning sessions.

Curricula as social practice are prime examples of text having been socially produced with culturally available resources expressing the interest of their makers (Kress, 2011). They work to make classrooms across the provinces educationally and culturally cohesive and aligned. As Foucault claims, education creates institutionally produced knowledge as "every educational system is a political means of maintaining or of modifying the appropriation of discourse, with the knowledge and the powers it carries with it" (Foucault, 1971, p 19). Ultimately, curricula represent the dialectic nature of hegemony: they are mandates that radiate from provincial governments, populated by discourses that embody naturalized ideologies, while consistently constituting and being constituted by their own discourses. Recall from chapter two of this project that one of the main problems with changing how climate change is taught or in integrating SE into curricula is that our teachers are often the product of a similar educational system, and there is a major issue with lack of information regarding the basics of climate change (28% of pre-service teachers could not identify the correct cause of climate change (Demant-Poort and Berger, 2021), pre-service teachers are not instructed in how to teach climate change and are unprepared to teach from an SE framework (Beckford, 2021). That our teachers are not prepared to teach about climate change or within the SE framework illustrates the constituted and constitutive nature of curricula as social practice. The genre (way of acting) solidifies curricula's authority while establishing the foundation and boundaries of how an actor within educational settings can teach or learn.

## 5.4 Climate change and education in Canada

The methodology of critical discourse analysis revealed that most of what is found within the nine curricula of the three provinces falls into the general category of codes (714 of 799 coded datum see Appendix A) meaning that the outcomes or activities within the curriculum lack any strong ideological slant to them because they were purely descriptive, lacking in details, or, as will be stressed here, lack a framing of the problem and an exploration of the solutions which is consistent with other studies that have been done on related subject matter within Canada.

A study by Bieler et al. (2017) examined the depth of engagement with climate change education policy across all provinces and territories in Canada by analyzing the climate-related educational mandates in formal EC-12 education, but this study did not look at individual curriculum documents. The study found “a significant gap exists between the focus on education in Canada’s climate policies and the attention to climate change in education policies, including sustainability education policies” (Bieler et al., 2017, p. 69). Despite that each jurisdiction mentions education as an aspect of addressing CC in their climate policies, fewer than half (six/13) mention climate change in their education policies (Bieler et al., 2018), strongly suggesting that there is a disconnect between the priorities of climate policies and educational policies. Additionally, the study found that within the six jurisdictions that do mention CC in educational policies, there was significant difference in the amount of detail offered with respect to timelines and funding for the fulfillment of the stated climate education objectives, yet a similarity is found in that the focus in these policies was mostly concerned with school energy efficiency (Bieler et al. 2018).

The study by Bieler et al. also utilized Nisbet’s (2014) framework on typology of public articulation on CC and found:

> a strong presence of smart growth discourses that frame climate education as a way of realizing economic opportunities associated with climate change, as well as, ecomodernist discourses underlining the role of various technological and policy innovations in making school more efficient (Bieler et al. 2018, p. 79)

My study of individual, subject-specific curriculum documents uncovered similar findings: after the General category of codes (714 coded datum), Smart Growth Reformers is the most cited category within the literature with 51 coded datum, Ecomodernists follows with 20 coded datum, and Ecological Activists coming in last with 14 coded datum, which suggests that within educational policy and curriculum across the country, the ideas of Smart Growth Reformers and their outlook on climate change dominates in comparison to the other categories from Nisbet's (2014) framework. *Climate change* and *sustainability* from the General category of codes are coded many times in the curricula (64 and 110 coded datum respectively out of 714 coded data in the General category). What these findings suggests is that while curriculum writers are aware that these are pressing issues, they are directing educators to teach them in an insipid manner that lacks problem framing, an outlook on nature, an outlook on technology, policy proposals, or models towards social change. These curricula overwhelmingly use simply descriptive or investigative language and teaching methods that lack points of view to the extent that they do not fall into one of Nisbet's (2014) typology.

Variation in what is taught within provinces as well as the lack of problem framing and solutions is a conclusion in a 2019 study by Wynes and Nicholas. The 2019 study reviewed curriculum from the 13 jurisdictions of Canada and organized their content into six categories which were guided by statements in the IPCC Fifth Assessment report (Wynes and Nicholas, 2019). The categories are: It's climate (foundational knowledge), It's warming (rising temperatures), It's us (it's anthropogenic), Experts agree (scientific consensus), It's bad (impacts of CC), and We can fix it (approaches and policies for mitigation) (Wynes and Nicholas, 2019). The authors read all high school science curriculum documents from each of the provinces and territories as well as ten textbooks from seven provinces. Results of the 2019 study found that every province covered "It's climate", while the categories "We can fix it" (five out of 13 provinces" and "Experts agree" (only Saskatchewan) were the least represented (Wynes and Nicholas, 2019). There were also controversies found within some curriculums. Manitoba, for

example, supplies supplementary materials from Friends of Science, which is an organization that rejects the scientific understanding of climate change (Wynes and Nicholas, 2019). The authors found that many curricula also suggest that climate change being human caused should be taught in the form of a debate (Wynes and Nicholas, 2019). Even the “We can fix it” topic which was limited to five provinces is taught in a questionable way, with some provinces focusing on energy efficiency and recycling while others focused on political steps, but they did not find that these provinces connected the two things (how an individual contributes to political or structural change). This aligns with the findings of the study conducted here. In the language of Wynes and Nicholas (2019) study, “We can fix it”, “Experts agree”, and “It’s us” were barely found within the provinces studied: New Brunswick, Ontario, and Saskatchewan. One similarity within these studies is that Saskatchewan is the only province to have used the “It’s us” language directly by using the term anthropogenic within its curricula. What this suggests is that problem framing (It’s us) and solutions (We can fix it) are large pieces of the climate change and education puzzle that are missing from curricula across the country.

## 5.5 Sustainability education in Canada

Sustainability education’s strength is “in its capacity to alert educationists, broadly defined, to a shared concern for the future of both the planet and local communities” while its weakness lies in its “lack of shared meaning”, making it difficult for it to be implemented in mainstream educational spaces (McKeown and Nolet, 2013, p. v). Canada has a long history of engagement with the concept of SE, including hosting the first international ESD conference in the world in October of 1992 following actions related to the influential 1987 Brundtland declaration (Hopkins, 2013). Contemporaneously, Canada claims commitment to providing sustainability education (although it uses the term Education for Sustainable Development), as it is one of the key activity areas in *Learn Canada 2020*, a 2008 joint declaration written by the Council of Ministers of Education (an intergovernmental body of ministers of education in Canada) (Council of Ministers of Education, Canada, 2008). The document lists ESD as

such: “Education for Sustainable Development: Raise students’ awareness and encourage them to become actively engaged in working for a sustainable society” (Council of Ministers of Education, Canada, 2008, p 2), and later goes on to remind that education is exclusively under the jurisdiction of the provinces and territories, suggesting that while this may be a goal of the council, the execution or inclusion of ESD is up to the jurisdictions.

In general, the provinces analyzed in this study have very limited interaction with sustainability education. Interestingly, the Ministry of Education of Ontario provides a framework for implementing SE in the province, which it claims moves “beyond a focus on symptoms – air and water pollution, for example – to encompass the underlying causes of environmental stresses, which are rooted in personal and social values and in organizational structures” (Ontario Ministry of Education, 2009, p 4). There is as well a more extensive document published by the province in 2017 titled Environmental Education Scope and Sequence of Expectations which is a resource guide for 9-12 education within the province that is meant to identify the embedded with the goal of helping teachers bring SE into the classroom (Ministry of Education, 2017). Despite all this written commitment, the results of this study show that Ontario’s engagement with sustainability education is extremely low with only two instances of coded datum, and the concept of exploring the underlying causes of climate change was not present in Ontario’s curricula examined in this study. To add onto this lack of engagement with SE, Ontario had the least amount of coded datum of any of the three provinces and therefore had the least engagement with concepts even loosely related to climate change.

A search of Saskatchewan’s Ministry of Education’s website reveals no documents that suggest there is a provincial commitment to SE. While Saskatchewan is the province with the most coded datum in this study and is the only one to use the language of the Anthropocene, a provincial framework does not exist. New Brunswick’s curricula engage the most with SE with 39 coded datum that fall within the *sustainability education* code. The curricula also present to the reader a perceived commitment towards introducing aspects of SE. Yet, much like Saskatchewan, it does not have a

provincial framework available on the Ministry of Education's website. Thus, while Canada's Council of Ministers of Education suggests that Canada has a strong commitment to SE, the findings of this study suggest otherwise: it is unequally implemented if it is present at all, and provinces lack frameworks meaning that jurisdictions are not guided towards its usage.

The inclusion of civics or social studies curricula in this study was, of course, by design. They are courses that are not hard sciences but could be reasonably assumed to include climate change as a cursory topic that could be integrated into the curricula. Yet, climate change and sustainability education are not mentioned in any of the three civics/social studies courses analyzed in this study, which suggests that adequate interdisciplinary learning on climate change, which is a major aspect of sustainability education, is lacking. More research would have to be done on this subject to explore if there is a lack of interdisciplinary teaching on the matter, but the suggestion here is that it is not occurring at the level at which it should.

## 5.6 Future directions

One outstanding question generated from this study is regarding the integration of Indigenous knowledge in the curricula. *Indigenous knowledge* is coded a total of 200 times in the general category of codes. Only when Indigenous methodology or a genuine attempt at integrating an alternative-to-the-norm, Indigenous worldview was integrated in a curriculum did it fall into the Ecological Activist category in the *code new ways of thinking.* Therefore, the vast majority of the time Indigenous knowledge or worldviews were simply paid lip service, often in the introductory texts of the curricula, instead of being genuinely integrated or utilized by formal schools. Yet, experts exceedingly agree that Indigenous knowledge is integral to mitigating the effects of climate change and fostering a healthier planet (IPBES, 2019). The United Nations 2019 Global Assessment Report on Biodiversity and Conservation for example, focuses in part on the effects that climate change has on Indigenous communities, but also on how Indigenous communities are very often the people who protect our land and its resources (IPBES, 2019). As the report shares, "nature is generally declining less

rapidly in indigenous peoples' land than in other lands" (IPBES, 2019, p 16), "indigenous peoples and local communities, including farmers, pastoralists and herders, are often important areas for in situ conservation of the remaining varieties and breeds" of wildlife (IPBES, 2019, p 28), and "Indigenous peoples often manage the land and coastal areas based on culturally specific world views, applying principles and indicators such as the health of the land, caring for the country and reciprocal responsibility" (IPBES, 2019, p. 34). It is out of the scope of this study and this author to comment further on how to respectfully and genuinely implement Indigenous methodologies and thought processes within Canadian curricula, but this study does beg the question, is it included in a manner that utilizes the strengths of Indigenous worldviews or should curriculum developers, educators, policymakers, etc., be exploring ways to more genuinely integrate Indigenous insights into education in Canada?

## 5.7 Conclusions

Responding to the first research question which asked what the overall ideological position towards climate change in the provinces studied here was, the study found that Nisbet's (2014) categorization of public intellectual's response towards CC with its three categories of EA, SGR, and EM was not sufficient to conceptualize how the curricula direct teachings towards climate change. That is not to say that Nisbet's (2014) framework was unhelpful, but that so much of the content found within the curricula lacked strong problem framing, outlook on both nature and technology, discussion on policy, and models of social change that it was difficult at times to categorize when issues related to CC were mentioned. 714 of the 799 codes fell into the general category of codes (see tables 12-14 in Appendice A). This lack of adequate framing is the result of a failure of deep engagement with the topics within the provinces, and is problematic for thinking of education as a mitigation factor if the status quo within curricula is maintained. Following the General category of codes in number of coded datum was the SGR category with 51 coded data (table 13), then EM (table 14) with 20 coded datum (table 12), and finally EAs with 14 coded datum.

Regarding question two which asked about the underlying ideological positions towards climate change within the three provinces, the study found that they were also dominated by the General category of codes. New Brunswick had a total of 274 coded datum, with 239 fitting into the General category, 19 in SGR, 12 in EA, and four in EM (see table 16 an Appendice A). New Brunswick was the province that engaged most with the EA category. It is also the curriculum that engaged most with the theme of Sustainability Education (39 times) because of its Environmental Science curriculum (38 of the coded datum come from this curriculum), suggesting it is a course that could work as inspiration or as a guide for future curricula interested in actually integrating SE into their framework.

Ontario was also dominated by the General category of codes with 212 coded datum in this category, 17 in SGR, and six in EM (see table 17 in Appendice A). Ontario had the least amount of coded datum out of all the provinces suggesting its engagement with the topic was not only less than the other provinces, but more conservative as well, considering none of its content fit into the EA category.

Saskatchewan as well was dominated by the General category of codes with 263 of 290 codes falling into this category, followed by 15 coded datum in SGR, ten in EM, and two in EA (see table 18 in Appendice A). The analysis of Saskatchewan's curricula exposed an incredibly outdated curriculum, Social Studies 10, which this author would characterize as unabashedly colonial and biased and needs to be rewritten.

Question three emphasized the importance of asking if climate change education within Canada could be assumed to support adaptation and mitigation strategies, with the understanding that SE is the leading framework to help accomplish this. The study found that the nine curricula studied here had extremely limited engagement with SE (excepting New Brunswick's Environmental Science curriculum), despite the country's desired engagement with the framework as expressed through federal and provincial documents (Government of Canada, 2005; Ontario Ministry of Education, 2019). The absence of deep engagement with CC within the curricula denotes that Canada's curricula are not providing education that would help to foment PEBs within its students, but instead perpetuate status quo thinking which sees the issue of CC relegated to the

sciences, and even though, does not asks students to think of where the problem of CC comes from or how we can pave a way to solutions.

## 5.8 Recommendations

Following the results of this study, the recommendation is that stakeholders (being curriculum developers, policymakers, educators of educators), explore the literature further on sustainability education so that in future revisions of curricula, sustainability education is more adequately integrated into Canadian education. It is evident that Canadian Ministers of Education are aware of its importance, and that even provincially as in the case of Ontario and its document Environmental Education, Scope and Sequence of Expectations, there is acknowledgment that it is a valuable framework to utilize and an intent to integrate it (Ministry of Education, 2017). Yet as we have seen from the findings of this study, it is barely integrated and traditional or normative education widely dominates (Ministry of Education, 2017, Council of Ministers of Education, Canada 2008).

Introducing standardized objectives into provincial curricula that outline a commitment towards adequate education on climate change as well as scaffold education on climate change would be a reasonable place to begin to approach the problem. These standards should transcend beyond cognitive engagement to action (Chew Hung, 2022), which is a major aspect that has been lacking in the study of these nine curricula. Models of social change was a category defined by Nesbit (2014) for each of the three categories Ecological Activist, Smart Growth Reformers, and Ecomodernists, and they are only coded a total of 12, 6, and 6 times respectively (see Appendix A), suggesting that no matter the ideological approach to solutions, solutions are barely covered. This is again consistent with what Wynes and Nicholas (2019) found: “we can fix it” is underrepresented in the textbooks of Canadian classrooms. Thus, vertical (“when a given content area is intentionally coordinated over time”) and horizontal alignment (“when multiple content areas are intentionally coordinated within a given time frame”) towards climate change education is necessary so that content can be scaffolded and built upon and interdisciplinary teaching is possible (Strauss et al.,

2022, p. 6). These standards should begin from a place where they address what are considered elements that create pro-environmental behaviors: knowledge, skills, attributes and behavior (Chew Hung, 2022; Kollmuss and Agyeman 2022). Utilizing the conceptual framework of SE or its almost synonymous frameworks of EE, ESE, ESD, etc, would provide the guidance and tools to creating these standards. Sustainability education is, as discussed, “locally relevant and culturally appropriate; interdisciplinary” (McKeown and Nolet, 2013, p. 7). Its goal is to create pro-environmental behaviors and utilize “education as a primary strategy for raising environmental awareness and instilling global citizenship” (Chew Hung, 2022, p. 24).

Another recommendation based of these findings is that Canada integrate education into its National Adaptation strategy. Currently the strategy has a five-pillar approach that includes disaster resilience, health and well-being, nature and biodiversity, infrastructure, and economy and workers (Government of Canada, 2023). The National Adaptation Strategy features long-, medium-, and short-term objectives to reach the goal of adaptation which it describes as an ongoing process of learning about risks, setting priorities, and integrating measures and actions (Government of Canada, 2023). Education’s potential to encourage pro-environmental behaviors possesses transformational potential that transcends the classroom to “educate citizens to be the future custodians of the environment but to also enable them to engage in critical and thoughtful inquiry” (Chew Hung, 2022, p. 24). Making education a pillar of the National Adaptation strategy would cement its importance outside of education and stress its essentiality for Canada’s future.

Finally, as has been discussed multiple times in this study, adequate pre-service teacher training is required so our teachers are well equipped in the classroom to deliver the content and lessons that climate change mitigation requires (Boon, 2016; Demant-Poort and Berger, 2021; Beckford, 2021). Teacher education programs “must help teachers recognise their responsibility in building a sustainable future”, and must provide the training necessary so teachers are not lost in the classroom or perpetuate misinformation (Boon, 2016, p. 41).

What all of this suggests is that small shifts are not what are needed in Canadian education. What is needed is a genuine commitment to the environment for the health of our planet and the future of our students that is reflected in the pedagogy and curricula of each province.

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# Appendice A

**Table 12: Ecological Activists**

| Category | Code | Themes | Total count |
|---|---|---|---|
| | Problem framing<br>Ecological collapse | Ecological collapse<br>Concrete limitations | |
| | Outlook on Nature<br>Environmental fragility | Environmental fragility<br>Indigenous knowledge<br>Environmental protection | 1 |
| | Outlook on Technology<br>Grassroots developments | Nuclear as green<br>Renewable energies<br>Grassroots developments | 1 |
| | Policy Proposals<br>Strict regulation | Regulating industry<br>Promoting local economies<br>Energy rationing<br>Local governance | |
| | Model of Social Change<br>New ways of thinking | New way of thinking<br>Grassroots organizing<br>Social protest<br>Ecocide / Environmental ruin<br>Progress for whom? | 12 |
| Total | | | 14 |

**Table 13: Smart Growth Reformers**

| Category | Code | Themes | Total count |
|---|---|---|---|
| | Problem framing<br>Some regulation necessary | Acknowledging climate denial<br>Because of market failure<br>Some regulation necessary | 6 |
| | Outlook on Nature<br>Sustainable growth | Ecological limits<br>Sustainable growth<br>Economic growth<br>Smart sustainable economy<br>Principles of sustainability | 23 |
| | Outlook on Technology<br>Invisible hand tech developments | Invisible hand energy market<br>Nuclear energy necessary<br>Carbon capture | 9 |
| | Policy Proposals<br>Large agreements | International agreements<br>National carbon pricing<br>Government investment in tech<br>Learning tech for the future | 7 |
| | Model of Social Change<br>'Green' living | Market-driven change<br>Civic engagement<br>'Green' living | 6 |
| Total | | | 51 |

**Table 14: Ecomodernists**

| Category | Codes | Themes | Total count |
|---|---|---|---|
| | Problem framing<br>Innovation can solve it | Energy innovation<br>Opportunity for human innovation<br>Human progress<br>Societal resilience | 10 |
| | Outlook on Nature<br>Nature is resilient | Nature is resilient<br>Managing nature | |
| | Outlook on Technology | Renewables are insufficient | 4 |

| | | | |
|---|---|---|---|
| | Extractive innovation | Natural gas/Coal<br>Carbon captures<br>Extractive innovation | |
| | Policy proposals<br>'Clumsy' Policy | Engage with tech industries<br>Conservative/neoliberal policies | |
| | Model of Social Change<br>We must innovate | Technology for change<br>People innovate | 6 |
| Total | | | 20 |

**Table 15: General category**

| Category | Code | Themes | Total count |
|---|---|---|---|
| | Anthropocene | | 7 |
| | Climate change | Climate change<br>Human-caused global warming<br>Greenhouse gasses affecting temperature<br>Human-caused climate emissions | 64 |
| | Employment | Careers<br>Employment<br>Professional lives<br>Skilled trades | 48 |
| | Good Citizenship | Civic engagement<br>Active and informed citizenship<br>Civic skills<br>Contributing to community | 140 |
| | Human-nature relationship | Individuals and environment<br>Human impact on environment<br>Human health and environment | 103 |
| | Indigenous general | Indigenous<br>First nations<br>Aboriginals | 200 |

| | | | |
|---|---|---|---|
| | | Indigenous perspectives are different than Western<br>Indigenous issues | |
| | Sustainability | Sustainability<br>Stewardship<br>Sustainable | 110 |
| | Sustainability education | Synonyms for SE<br>Place-based learning and the environment<br>Learning from personal experience and environment<br>SE pedagogy and practices | 42 |
| Total | | | 714 |

**Table 16: New Brunswick**

| Category | Code | # of datum examples |
|---|---|---|
| EA | New ways of thinking | 12 |
| TOTAL EA | | 12 |
| SGR | Sustainable growth | 15 |
| SGR | Invisible hand tech developments | 2 |
| SGR | Large agreements | 2 |
| TOTAL SGR | | 19 |
| EM | We must innovate | 2 |
| EM | Extractive innovation | 2 |
| TOTAL EM | | 4 |
| GEN | Climate change | 14 |
| GEN | Sustainability | 38 |
| GEN | Employment | 2 |
| GEN | Good citizenship | 65 |
| GEN | Human-nature relationship | 28 |
| GEN | Indigenous general | 53 |
| GEN | Sustainability education | 39 |
| TOTAL GEN | | 239 |
| Total | | 274 |

**Table 17: Ontario**

| Category | Code | # of datum examples |
|---|---|---|
| SGR | Invisible hand tech developments | 6 |
| SGR | Large agreements | 5 |
| SGR | ‘Green’ living | 6 |
| TOTAL SGR | | 17 |
| EM | We must innovate | 4 |
| EM | Extractive innovation | 2 |
| TOTAL EM | | 6 |
| GEN | Climate change | 20 |
| GEN | Sustainability | 46 |
| GEN | Employment | 24 |
| GEN | Good citizenship | 70 |
| GEN | Human-nature relationship | 31 |
| GEN | Indigenous general | 19 |
| GEN | Sustainability education | 2 |
| TOTAL GEN | | 212 |
| Total | | 235 |

**Table 18: Saskatchewan**

| Category | Code | # of datum examples |
|---|---|---|
| EA | Environmental fragility | 1 |
| EA | Grassroots development | 1 |
| TOTAL EA | | 2 |
| SGR | Some regulation necessary | 6 |
| SGR | Sustainable growth | 8 |
| SGR | Invisible hand tech developments | 1 |
| TOTAL SGR | | 15 |
| EM | Innovation can solve it | 10 |
| TOTAL EM | | 10 |
| GEN | Climate change | 30 |
| GEN | Sustainability | 26 |
| GEN | Employment | 22 |
| GEN | Good citizenship | 5 |
| GEN | Human-nature relationship | 44 |
| GEN | Indigenous general | 128 |
| GEN | Sustainability education | 1 |
| GEN | Anthropocene | 7 |
| TOTAL GEN | | 263 |
| Total | | 290 |