Bridging the Ecological Knowledge and Knowledge-Action Gaps: A Utopian Vision for Education in Manitoba

by

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CHAPTER 1

A SCHOOL EDUCATIONAL PROBLEM:

THE CRISIS AND THE KNOWLEDGE AND KNOWLEDGE-ACTION GAPS

> *Unchecked consumerism operates on the premise that others are only instruments to be used and that the environment is a commodity. This attitude fosters unhappiness, selfishness and contempt upon other living beings and upon our environment. People are rarely motivated to change on behalf of something for their future and that of the next generation* (Ricard, 2013, para 16).

This thesis seeks to advance a curriculum which provides learners with educative experiences required to promote an ecological literacy. This particular type of literacy enables individuals and communities to understand their connectedness to all systems, to appreciate the finite carrying capacity of the planet, to predict consequences of human activity, and to ultimately create sustainable communities through action, or praxis. The proposed curriculum is a vision of public education in Manitoba, borrowing examples of experiences throughout the world which are then adapted to meet the ecological, social, and political realities of this province. It is a utopian-inspired curriculum as it seeks to shed current restraints imposed by contemporary educational practices in Manitoba. By removing certain constraints, this philosophical inquiry

can then be used to provoke a dialogue as to how we might transform learners into agents of social and ecological change.

To begin, it is important to define what I will be referring to as *ecological literacy*, as ecological literacy is one of the major conceptual pillars which I base my proposed curriculum on. Like any type of literacy, ecological literacy refers to the skills and abilities to understand and produce new knowledge within a certain discipline. The kind of knowledge, skills and abilities that ecological literacy is concerned with is deep knowledge of ecology, knowledge of the consequences of human activity on all systems on earth, and the skills and ability to take meaningful action to mitigate destructive human activity. But *ecological* literacy is more than just another type of literacy. Orr and Capra suggest that ecological literacy is

> more than a scientific understanding of measurable factors; it is also about enlivening a spirit and attitude within humans. It is about knowing and feeling, a combination that might equate to a more encompassing worldview and citizens who are able to further human culture without compromising the health of the natural environment. (as cited in Stankewich, 2014, p. 36)

When one is ecologically literate, one is aware of one's surroundings, understands how all systems are related, and has developed the skills and abilities to make meaningful and transformative change within one's communities. It is more than another type of literacy in that it also contains an ethical imperative by which one must see oneself as only one small part of a greater ecosystem and biosphere, and, as a part of this greater system, one is compelled to protect

all on which we depend. It is the destruction of these very systems that presents us with the crisis of our time. Ecological literacy, according to Orr (1989, p. 334), is the ability to read not text, but it is the ability to read the earth.

The Crisis

The thesis's goal is to encourage policy makers, administrators, and educators to think more broadly about the elements required to meet the challenges associated with the ecological catastrophe as outlined by Rockström, Steffen, Noone, Persson, Chapin, Lambin et al. (2009). The authors outline nine distinct boundaries beyond which human existence is endangered; three of which have been crossed. They explain the catastrophe as such:

> The exponential growth of human activities is raising concern that further pressure on the Earth System could destabilize critical biophysical systems and trigger abrupt or irreversible environmental changes that would be deleterious or even catastrophic for human well-being. This is a profound dilemma because the predominant paradigm of social and economic development remains largely oblivious to the risk of human - induced environmental disasters at continental to planetary scales. (Rockström et al., 2009, p. 2)

In 2015, the research group including Rockström updated the state of the planetary boundaries and revealed that now we have crossed four, including climate change, biodiversity integrity, land-system change, and biogeochemical cycles — nitrogen and phosphorus (Steffen,

Richardson, Rockström, Cornell, Fetzer, Bennett, et al., 2015). Two of these, climate change and biosphere integrity, are considered critical boundaries and it is noted that "significantly altering either of these 'core boundaries' would 'drive the Earth System into a new state'" (Steffen et al., 2015, as cited in Stockholm Resilience Centre, 2015, para 2). At present, human activity is dramatically altering the ability of the Earth to support us. According to Jones (2010),

> Over the last decade, and more dramatically in the last few years, increasing evidence of major problems in the earth's ecological balance, particularly relating to the issue of global warming, has resulted in a dramatic increase in concern about ecological issues. In the face of the overwhelming evidence of climate change, it is difficult to argue that humans are having no impact, or only a benign impact, on the natural world. It is widely and generally agreed that humans have reached population levels and technological capacities that mean we are capable of destroying the fragile ecosystem that sustains us. The fundamental conclusion drawn by much of the emerging evidence is that there is a crisis and we are the cause. (p. 67)

Furthermore, the 2014 IPCC Intergovernmental Panel on Climate Change Report, which addresses one part of the ecological crisis (climate change), corroborates the findings of Rockström et al. (2009) by suggesting that human activity has indeed caused climatic shifts which have resulted in substantive alterations to physical systems, biological systems, and human and managed systems (IPCC Summary for Policy Makers, 2014, p. 4). Based on the comprising of these systems, the IPCC reports that there have been significant changes to

hydrological systems, precipitation levels, migration patterns, and species interaction and that these changes are leading to ill-health, water quality and quantity, and overall human well-being (pp. 5-8).

Based on this evidence, a scarcity of resources, like food and water, will create heightened competition and lead to global instability. According to a report released in part by NASA's Goddard Flight Centre (Ahmed, 2014), the compromise of natural systems will exasperate the "prospect that global industrial civilisation could collapse in coming decades due to unsustainable resource exploitation and increasingly unequal wealth distribution" (para 1). In GEO4 (UNEP, 2014), UNEP acknowledges what scientists and academics have been telling us for decades about the consequences of human activity:

> The warming and acidification of the global ocean, it influences the Earth's surface temperature, the amount, timing and intensity of precipitation, including storms and droughts. On land, these changes affect freshwater availability and quality, surface water run-off and groundwater recharge, and the spread of water-borne disease vectors and it is likely to play an increasing role in driving changes in biodiversity and species' distribution and relative abundance. (p. 37)

From climate change, depletions in ozone levels, air pollution, species loss, soil erosion, and a myriad of interconnected system attacks, the Earth is in crisis and humans are the cause of the destruction. As this is the case, that human activity is compromising the systems on which we depend for life and that this will lead to scarcity and global instability, why is it that we,

particularly in the developed West, do so little about it? Why is the destruction of the biosphere not on the front page of every media outlet, on the lips of legislators in every country, and the primary focus of policy makers and curricula developers? The answer may rest in two critical gaps related to the human cognition. The first, which I label for my purposes as *the knowledge gap*, is based on a fundamental lack of knowledge related to the ecological crises, and the second, which I call *the knowledge-action gap*, refers to our disinclination to take meaningful action once we have gained the knowledge. I will discuss each in turn.

The Knowledge Gap

I recently had the opportunity to share some time with pre-service teachers at a small liberal arts university. As is often the case, we began talking about critical ideas related to education and we began to attempt to answer some essential questions: What is learning? What is excellence in teaching? What is education? I then asked the soon-to-be teachers what the greatest crisis facing humanity is. Most responses dealt with notions of inequality, poverty, and ignorance of the "other" — all great answers, but I was shocked that not one of the educators mentioned the destruction of the biosphere, climate change, resource depletion, systems degradation, or any articulation of ecological issues. This was perplexing.

Understanding the consequences of human activity on all systems on earth has been a shortcoming of our very humanity. While popular conversations might raise issues of pollution, recycling, or rain forest deforestation, we are often confused by terms such as climate change and global warming and we rarely see past one-dimensional or primary causes and consequences (Anderson & Tsurusaki, 2010, p. 409).

While many Canadians suggest that they are committed in some form to helping the environment or doing good things (Kennedy, 2009, p. 151), we will still consume more resources today and produce more carbon then we did yesterday. Our small efforts, like recycling and composting, as indicated in the IISD's *Measuring Knowledge, Attitudes, and Behaviours Toward Sustainable Development* study (Michalos, Green, Kahlke, & McDonald, 2009), provide evidence that we value behaviours we consider ecologically responsible, such as placing paper in a recycling bin, but as Kennedy suggests, "While an individual may express environmental values, in some instances other priorities such as safety or financial security may take precedence over environmentally-supportive behaviour" (p. 151). She notes that this discrepancy is not only a gap in values, but it also highlights a deficiency in our understanding of how significant the ecological crisis is and what type of action is required to mitigate it. We loosely become aware of critical ecological issues, but we simply do not understand the behavioural and systemic change required to address the issue. We fail to see how we are fundamentally connected to all systems on Earth. Barth, Fisher, Michelsen, Nemnich, and Rode (2012) argue "that individual consumer behaviours play a pivotal role in achieving sustainable consumption, and that the endeavour of bringing about such changes poses a tremendous challenge to well-entrenched synaptic patterns and associated behaviours resting upon an unsustainable, expansionist myth" (p. 302). By this, we simply are not cognizant as to the extent of the crisis and how our lifestyles, particularly in the West, are fundamentally responsible for the destruction of the biosphere. Data from America's National Snow and Ice Center confirmed the lowest amount of Arctic ice coverage since 1979, when scientists started keeping records. Using this data, NASA scientist James Hansen acknowledged two important things. The first: "We have a planetary emergency." The

second: “There's a huge gap between what is understood by the scientific community and what is known by the public... unfortunately, the gap is not being closed” (Andrade, 2012, para. 7). Hansen, along with most within the scientific community, not only articulates the severity of the state of the biosphere, but also implies that humans are not conscious of the reality.

According to the National Environment Education and Training Foundation (NEEFT) Survey of 2001, the knowledge gap refers to a superficial understanding of how humans impact natural and human systems. The report concludes that:

> Just as environmental attitudes are relatively entrenched, so too is environmental knowledge, or the lack of it. Unfortunately, many Americans overestimate their knowledge of environmental issues and problems. And although their general support for the environment is strong, it may be their lack of knowledge on specific environmental topics — such as the leading causes of pollution or sources of energy — that are holding people back from taking effective actions to protect the environment (NEEFT, 2001).

Based on this knowledge gap, the report observes the following:

> Environmental education is more about understanding important causal relationships - what might cause air and water pollution, the ramifications of recycling… and about an individual‘s ability to sort out those connections. This understanding of causal connection is the single biggest problem in the environmental knowledge gap. The NEETF/Roper

> studies show that most people grasp simple one-step causes of problems easily enough. The majority can, for example, understand that a car pollutes the atmosphere or a factory can pollute a stream. But add a couple of complicating steps to the process (a car deposits small amounts of oil on the ground and rain washes it into a drain that eventually goes to a stream), and understanding drops off steeply. Few people seem to grasp multi-step causal relationships. (as cited in Anderson & Tsurusaki, 2010, p. 409).

In Manitoba, research has been conducted looking specifically at deficiencies, successes, and trends in cognition, attitudes, and behaviours related to the concept of sustainability. In 2008, the International Institute for Sustainable Development (IISD) surveyed both households and students as to knowledge, attitudes, and behaviours related to sustainable development in Manitoba (Michalos et al., 2009). While the study's central aim was to create a tool and baseline for measuring knowledge, attitudes, and behaviours related to sustainable development, several key findings speak to the knowledge gap to which I refer.

The results specifically point to clear gaps in knowledge. One of the statements on the survey was "I have taken a course in which we talked about sustainable development." (p.34) 13.7% of students surveyed agreed or strongly agreed with this statement. A second statement in the survey where students were asked to agree or disagree was "I look for signs of damage to the environment." 41% of students agreed with this statement. Only 60% of students agreed or strongly agreed that maintaining and promoting biodiversity was critical to healthy ecosystems, and only 53.9% agreed or strongly agreed that sustainable consumption "is about using goods and services in ways that minimize the use of natural resources and reduce waste." (p. 31).

While the adults in the survey did demonstrate a higher knowledge of ecological issues, their understanding was dramatically increased with the amount of education they have received. This is problematic, given that Statistics Canada reports that as of 2013, only 61 000 Manitobans were enrolled in postsecondary institutions (2015).

The students demonstrated a lack of understanding of the implications of human activity, as only 44% of total students understood that sustainable development would not be possible "until richer nations stop exploiting the work and the natural resources of poorer countries" (p. 34). Most students do not see themselves as a contributor to ecological and sociological issues. The survey indicates a general lack of a deep understanding of ecological issues and points clearly to how greater education can equip Manitobans with the knowledge required to take meaningful action in their lives. I will speak more to this part of the study when I focus on the knowledge-action gap.

This gap, however, is only one part of the equation. Most of the pre-service educators whom I spoke of earlier agreed that recycling and composting were good things to model in the classroom. But this superficial, albeit important, recognition suggests merely a recognition that some human behaviour has an adverse effect on various ecosystems, but we simply are not sure as to what extent. This is the first gap to be closed. The second gap, what I call *the knowledge-action gap*, refers to the phenomenon whereby when we do indeed understand many of the ramifications of our consumer life-styles, we still feel powerless or simply do not have the capacity to take meaningful action.

Rodrigo's Question: Akrasia and the Knowledge-Action Gap

Recently, I was working with a group of middle years teachers in Brazil. Throughout the week, we were working on strategies to cultivate curiosity in our students and allow them the space to ask important questions that could drive a learning community's learning. One morning, I was asked to teach a grade 6 debate class on how to construct an argument. As a means to engage the students, I walked into the classroom and showed them a map of the world from 1992, which showed where 29 000 rubber duckies made landfall after falling off a cargo ship in the Pacific. The map showed how these ducks, due to currents and prevailing winds, managed to make landfall on every continent. I then dumped out the garbage can in the classroom, emptying plastic water bottles and cups onto the floor. I asked the students where they thought much of our plastic ends up and why it does not break down. From there, our learning community was able to inquire into the massive oceans of plastic, which currently exist, and question why exactly things are made out of plastic even though we know that plastic does not break down. We broke out into teams and began to research the school's usage of plastic cups. The students decided that they needed to convince the administrators that they should ban all plastic cups and bottles from the school. As the teacher, I was delighted with their inquiry. Then, a student named Rodrigo asked this question: "If I am a person who really wants to help the environment, then why do I do things like use plastic cups when I know that it is bad?"

The significance of Rodrigo's question is based on two underlying gaps in human cognition related to climatic, geological, and ecological changes. The first gap is between what is known from the research underpinning the pending ecological crisis as we have previously discussed and how much people know of it. But it is not merely a knowledge gap, as Rodrigo

points out; it is also one of malaise and motivation. This gap is based on what Zizek (2011, p. 352) describes as "agnostic pluralism," or a lack of political passion. Zizek identifies a major gap in our understanding of the pressing environmental crisis and our motivation to react to it: "The gap...is that between knowledge and belief: we *know* the (ecological) catastrophe is possible, probable even, yet we do not *believ*e it will really happen" (p. 328).

By naming the knowledge-action gap, I refer to what Plato referred to as Akrasia in *Protagoras*. Through Socrates, Plato explains that Akrasia is a purely human problem by which "most people are unwilling to do what is best, even though they know what it is and are able to do it" (as cited in Kretz, 2012, p. 14). Kretz (2012) contends that Akrasia refers to human "weakness of the will or failing to do what one believes to be right" (p. 14). From an environmental ethics perspective, Kretz asserts that more than education is needed to bridge the gap between knowledge of the ecological crisis and the required action. She suggests that motivation is critical to minding the gap and that "part of the solution involves identifying how to motivate behavioural change to reflect espoused beliefs" (p. 23). Education needs to motivate action, change behaviours, and transform the learner.

Data on Manitoban attitudes and behaviours seems to reflect agnostic pluralism or Akrasia. According to Michalos et al. (2009), 25% of Manitoba youth "try to avoid purchasing goods from companies with poor track records" regarding sustainable and ethical practices and only 40% have changed their lifestyle to reduce waste.

The purpose of this philosophical inquiry is to examine how education, as opposed to perhaps various forms of schooling, can produce learning experiences whereby ecological knowledge can be gained and the appropriate motivation can be generated to change attitudes

and, most imperatively, behaviours. This transformation, as will be discussed, will focus on the fostering of cognitive dissonance through an understanding of how the learner is connected to all systems on Earth. Stewart and Lorber-Kasunic (2008) articulate the idea of Akrasia as such:

> We know that we should respect the complexity and fragility of life on our planet, we should reduce energy and material consumption, be open and unafraid in our dealings with otherness, exercise more, eat less, spend time with friends and family, help those in need and more actively participate in the political life of our community. In many cases we actively desire to do right in such matters. But for the most part we fail. (p. 21)

Education as Solution: Bridging the Knowledge and Knowledge-Action Gaps

According to Barth et al. (2012), "Sustainable development in general, and sustainable consumption particularly, involve and require fundamental societal transformations that can only result from shared learning and collaboration as a process of societal learning" (p. 302). The following philosophical inquiry is based on this perspective, and holds the premise that educators are critical to the future of humanity and human flourishing. Education has always been key to building literate and empowered communities. Education's modern challenge is to create an ecologically literate citizenry that understands planetary boundaries and one that can create sustainable solutions. By using specific criteria for what an experience requires for an ecological literacy to be developed, the proposed curriculum will suggest an avenue to achieve this literacy. The criteria are developed from the works by Dewey, Freire, and the Centre for Ecological Literacy.

It is my argument that in order to close the gap between our understanding (knowledge gap) of the current ecological crisis and the collective action required to address it, or simply put the knowledge-action gap of our time, learners need to be immersed in educative experiences which reveal how they are interconnected and interrelated with all systems on Earth. These empowering experiences need to lead towards learner-driven action, transformation, and a new ecological literacy. Like any literacy, ecological literacy is not simply the end goal; it is a process of growth, awareness, and development within the individual *and* learning communities through intentional, rigorous, organized, and meaningful educative experiences. This thesis is devoted to discussing what experiences exist already in the world, the benefits of this type of approach, and a utopian proposal as to how our province can close this knowledge-action gap.

The task then is to envision a space whereby pedagogy and curricula come together to immerse students within an environment that fosters ecological literacy so that they may indeed acquire the skills and abilities required for personal and societal transformation. To this end, the proposed research is a letter, of sorts. It is a letter to academics, to educators, to policy makers, and the public that suggests an alternative way of educating and transforming young people in an effort to close these gaps. It is a proposition, a "what if?", a means for reawakening. What if we completely altered the manner in which we educated learners? What if a new pedagogy and curriculum were designed and implemented in an effort to perpetuate all species and provide well-being for all? This thesis aims at achieving this reconciliation, firstly by identifying the conceptual pillars for this type of social transformation, and then proposing a pedagogy and curriculum designed to immerse the teacher and learner in an environment whereby they are compelled to address ecological crisis.

If we do indeed fail to foster learning communities that can help us navigate the present and impending ecological crises, we are potentially doomed for a sad ending to our species and others. It is as Golding suggested in *Lord of the Flies* when the children are finally rescued (Golding, 1954). The Naval officer, who is desperately trying to figure out what has happened to these boys and their ecosystem, is confused and bewildered. When it is realized that the boys were the cause of the death and deconstruction, there is a sense of unbelievable shame. Ralph, one of the central characters and one who represents the thin vinery of civilization, is devastated:

> For a moment he had a fleeting picture of the strange glamour that had once invested the beaches. But the island was scorched up like dead wood…His voice rose under the black smoke before the burning wreckage…Ralph wept for the end of innocence, the darkness of man's heart. (Golding, 1954, p. 248)

If we are to ignore the current ecological crisis and leave a scorched planet for future generations, history will most certainly judge our society and our inability to create sustainable communities which seek to protect the very biosphere that keeps all species alive and communities which seek to provide everyone with the necessities for a decent life and well-being. We must confront this reality frankly. It is incumbent on education and educators to bridge these gaps for the sake of humanity and all species on Earth.

CHAPTER 2

ADDRESSING THE EDUCATIONAL PROBLEM:

A UTOPIAN-INSPIRED APPROACH

The most Utopian thing in Utopia is that there are no schools at all (Dewey, 1933 in Dewey Outlines Utopian Schools).

The Vision

The vision, or the utopian idea, proposed here to address the knowledge gap between the ecological crisis and our ability to comprehend it and, secondly, the knowledge-action gap between the understanding of the science and our motivation to act upon it, takes into account two pillars: ecological literacy and experience. In order to press the importance of developing ecological literacy in students through experiential education and the incorporation of systems thinking, I propose a multidisciplinary, experiential, and intensive curriculum that places students in an educational context in which they journey through whole ecosystem experiences which are to enable them to see how all systems on Earth are connected and that the laws of thermodynamics, particularly the first law, limit our use of energy and resources. The vision will be developed through an understanding of some of the current literature on philosophical inquiry within education as the methodical approach (Chapter 2), an in depth examination of the conceptual pillars and a proposed curriculum based on these pillars and 12 specific criteria

intended to help determine which experiences lead to ecological literacy (Chapter 3), and a consideration of helpful models already in use around the world (Chapter 4).

Chapter 4 will look at what educators and communities are doing throughout the world to address ecological literacy, systems thinking, experience, and global citizenship. While nowhere near an exhausted collection of learning communities, I have selected a group that I perceive as innovative. These examples will help test the criteria I developed in Chapter 3. Chapter 5 will describe the Whole Ecosystem Experience School (WEE School) that is my utopian-inspired vision. Finally, Chapter 6 will relate the vision to the theories, the conceptual pillars, and the gaps identified in the initial chapter. Essentially, this final chapter will help me determine if what I have proposed might actually do what it is intended to do.

Methodology: Philosophical Inquiry

What do philosophers do and how do we, people who draw upon the works of philosophers and are curious ourselves, enter into what is called philosophical inquiry? The act of philosophical inquiry is designed to generate questions and answers, devoted to understandings of meaning, reason, truth, and values. Philosophical inquiry forces us to think about how bodies of knowledge are created and how we contribute to them, what is right and wrong, and challenge concepts that may or may not be real. According to Chaplin (1965), philosophical inquiry is an "attempt to frame the alternative possibilities in or for an inquiry" (p. 8). As such, philosophical inquiry is a critical process. Secondly, Chaplin suggests that this type of inquiry is speculative in nature. He posits that if alternatives are unavailable, that we must go through a process of making these "unavailable alternatives" known (p. 8). Lastly, Chaplin views

philosophical inquiry as analytical. By this, he argues that this type of thinking is not necessarily focused on alternatives or speculative alternatives, but on the tools and concepts we might generally use in fields such as nursing, engineering, or even education.

Hamm (1985), in a similar vein, offers three important questions that one asks when entering the realm of philosophical inquiry. Firstly, one must ask, "What do you mean?" or "What does it mean?" (p. 4). Within education, we might ask ourselves what we might mean when we speak about learning, teaching, assessment, or even education itself. Secondly, Hamm suggests that we ask "How do we know?" or on what grounds to we purport to know something. And lastly, "What is presupposed?" What assumptions are being made when we claim we know or value something?

Both Hamm and Chaplin suggest that philosophical inquiry is a process of understanding how knowledge is created, what we might take for granted, or not, when analyzing critical concepts, and how we differentiate between good and bad, right and wrong, or just and unjust. Furthering their description, Knight and Collins (2010) define philosophical inquiry as

> the questioning of underlying assumptions, assumptions whose truth or falsity cannot be decided by appeal to experiment and observation. Philosophical inquiry is inquiry in which data gathering makes up only a small part of the task. In contrast to resource-based learning, philosophical inquiry is necessarily active. It is directed at issues whose resolution depends less on data gathering than on the formulation of arguments (p. 308).

Philosophical inquiry, then, provides us with an exercise in critically analyzing norms that we might take for granted, is an opportunity to ask questions related to meaning, reality, and truth, and offers time and space to develop answers and alternatives. While is does not ignore empirical data, data gathering, or scientific method, it is not strictly dependent on these tools. Philosophical inquiry is the business of asking why?, how do we know?, and what if? As educators, it will be argued that we need to think about why we educate, what truths or falsities we take for granted, what alternatives might exist, and what unavailable alternatives might by voiced. This thesis is an attempt at philosophical inquiry. The concept proposed within this thesis is utopian "inspired" curriculum. The term "inspired" is used strategically in this context as the curriculum will not completely be "utopian", since it will be drawing upon real experiences which have been used with learners throughout various parts of the world. As a singular program, each of these experiences could be implemented piecemeal, but in this curriculum, they will be streamed to provide an overall experience that would most certainly conflict with pragmatic constraints of the current education system. These experiences will also be altered to address the demography, climate, history, economy, and educational practices specific to Manitoba. A list of criteria for adequate experiences will be created to determine what types of programs and activities would foster learning and transformation of the type described in Chapter 1. These criteria will be fundamentally based on writings by Dewey, Freire, and the Centre for Ecological Literacy. Before we discuss the criteria themselves in Chapter 3, the rest of this chapter will develop further the method of philosophical inquiry used to develop the utopian inspired curriculum.

Philosophical Inquiry in Education

The origin of philosophical inquiry in Western society can be traced back to Plato, Aristotle, and Socrates. The concepts of philosophy and education were inseparable and their common purpose was to understand "how to foster desirable qualities of a good person, a good thinker, or a good citizen" for participating in the *polis* (Burbules, 2006, p. 489). Throughout the next few centuries, we witness a slow evolution of philosophical inquiry, exemplified in the Enlightenment.

For our purpose, the conceptualization of philosophical inquiry will be based on what Litz (1975) has referred to as a process "concerned with goals, the clarification of concepts, intentions and justification for action; it is an attempt to integrate the world in a consistent, coherent, and meaningful way" (p. 233). Inquiry in this manner has less to do with techniques and methods within the classroom, but focusses predominantly on the purposes of schooling and education. Litz (1975) goes on to argue that

> 'Doing philosophy' prods us into examining what we are doing in reality, and, even more importantly, why we are doing what we are doing. The investigation of divergent and often conflicting philosophical views challenges individuals to reexamine their own activities and basic assumptions. Philosophical address allows us to restate, in our way, what we believe to be the actual character of the world that confronts us in our living; it is a foundation for belief; it provides us with the essential tools with which problems and their various solutions can be examined. Partially because of its allowance for latitude

> and flexibility, philosophy can humanize an educator's perceptions of a task too often viewed in a purely mechanical light. (p. 234)

As such, the proposed inquiry with the purpose to develop an utopian-inspired curriculum, seeks to confront century-old understandings of schooling and education in order to determine how new visions might help us with the current ecological crises.

Given this understanding, why is philosophical inquiry a necessary research method in education? The answer to this may rest in the very goal of education itself. If we take education at one level - that is being somewhat simplistic and superficial - one might perceive a system by which our society transmits certain truths, values, and traditions. But, if we look deeper at the concept of education, the intent might be larger, more purposeful, and fundamentally about the pursuit of what is significant. As educators, perhaps our role is greater than perpetuating truths from previous generations. Perhaps our role is to provide a space where students can deconstruct these truths and develop their own instead (Bai, 2006). If this is indeed the grand purpose of education, then the framework for research must be philosophical in nature. Bai (2006) provides a purposeful conceptual understanding of education, whereby education "is dedicated to the cultivation of autonomy as human agency" (p. 7). As such, she asserts that if education is designed to allow learners to "enact one's freedom grounded in personal knowledge and ethics," (p. 8) then it is only logical that philosophical inquiry be a mechanism for understanding how we teach and how learners develop this human agency. The relationship between education and philosophical inquiry seems inseparable given that the goal of formal education might be to answer the critical questions of society and come closer to the notion of truth in terms of the

purpose of human existence. Bai (2006) defines this via a question: “How shall human beings apprehend the world and their place within it so as to lead more responsible lives?” (p.8). Coupled with this development came the need to understand what education is, what it means to educate and what it means to learn. Collingwood (2005) furthers this necessity for philosophical inquiry within education as a research methodology by suggesting that if what we are teaching “is in the nature of thinking, [philosophical inquiry] begins to be desirable, if we are to do it well, that we should understand what we are trying to do” (p. 1). He argues that philosophy allows educators to reflect on what they do. Why do we teach? What do we teach? How do we teach? These are critical questions that can be analyzed through philosophical inquiry. This is paramount to practice, given the competing interests within classrooms.

Snik and van Haaften (2001) suggest that philosophical inquiry is paramount to establishing the “foundations” of education; “that is, the systematic analysis and critical assessment of the basic ideas and conceptual models that, often implicitly, guide educational theory and practice” (p. 73). They assert that philosophical inquiry helps create the building blocks for researchers and teachers so that we can investigate in a micro manner, once we have established the macro framework. We cannot attack smaller issues within education without looking at the foundations. Biesta (2001) sees philosophical inquiry as a means for creating doubt, in more of a Socratic method. Biesta still advocates for a philosophical investigation of education. He suggests that the practice of philosophical inquiry within education “remains loyal to the main thrust of Western philosophy which, ever since it has lodged itself in Western culture, has conceived of itself as a critical enterprise” (Bietsa, 2001, p. 125). Philosophical inquiry is essential to both practitioners and theorists.

Utopian Inquiry

One type of philosophical inquiry consists in the developing of utopian ideas as a means of generating a dialogue. It is a means of asking "what if" questions in a context that does not hold the standard constraints that are accepted in other forms of inquiry. Burbules and Warnick (2006) suggest that "the benefit of this kind of speculation is clearly not to provide immediate, workable advice," and that it "is to ask interesting questions and hypothesize about possible answers associated with the philosophy of education" (p. 497). They acknowledge the usefulness of utopian inquiry and point to Plato and his *Republic* as the first example of the use of utopian inquiry.

In the context of identifying the relationship between ecological literacy, experience, and systems theory, it is critical to toss "impractical" solutions on the canvass as a means to engage all creativity, imagination, and possibilities prior to succumbing to everyday constraints. Further, for problems as critical as the one identified here, beginning with a utopian inquiry can create a new conversation based on a completely new vocabulary. If the models and systems of the past have not worked, then new ideas are required to be imagined and massaged so that some of these ideas can be incorporated into new pedagogies and curricula.

The utopian school or tradition began in 19th century England as a reaction to industrialization, capitalism, and the effects therein (poverty, crowded cities, etc.). Out of this tradition came the development of the infamous Garden Cities we see surrounding English city centres, science fiction literature (see Callenbach's *Ecotopia, 1975*), and Quaker-based experiments on various farms. These utopias recognized or professed a deficiency within society although they were heavily criticized by many ideologues, especially Marx.

Within the field of education, there has also been a tradition of this type of thinking. Through the likes of Morris and Dewey, utopian ideas have been expressed as "ways of living that would be radically more desirable than that which capitalist civilization and culture can provide for" (Freeman-Moir, 2012, p. 22). Freeman-Moir describes utopian thinking and practice as something far greater than mere blue-printing nifty ideas. He posits that

> utopia is a process the outcomes of which cannot be guaranteed and, therefore, the role, for example, of fate, suffering, and tragedy in human affairs must be taken into account. From this point of view utopian thinking is neither an exercise in futile dreaming nor is it a nostalgia for a world, or theoretical system that has been lost. Instead, utopian thought aims at what Ruth Levitas refers to as the imaginary reconstitution of society and it is best understood as method. (Freeman-Moir, 2012, p. 23)

In the context of education, Freeman-Moir argues that utopian thinking is not about providing bullet points of recommendations to levels of government, but that it is a method by which society and education can be reimagined — "an education in conceiving alternative modes of life," and where we situate "imagination as hypothesis" (Freeman-Moir, 2012, p. 23).

Dewey used utopia as a principle methodology during the first half of the 20th century. In both *My Pedagogic Creed* and *Dewey Outlines Utopian Schools* (Dewey, 1933), he attempts to experiment with preconceived notions of education as a reaction to capitalism and consumerism. According to Freeman-Moir (2012), for Dewey, "utopia is a culture in which

communities endeavour to lean forwards to consequences and backwards from them to new needs and solution" (p. 32). In *My Pedagogic Creed*, Dewey established countless "I believe" statements as a means to critically analyze current conditions and reimagine what might be. Famously, he asserts: "I believe education, therefore, is a process of living and not a preparation for future living" (2013, p. 17). Utopian thinking, according to Dewey, is correlated to notions of Socratic examination - an essential ingredient to democracy. A few years later, but decades before Illich's (1970) *Deschooling Society*, in another utopian offering, Dewey specifically describes what his utopia might look like in a submission to the *New York Times* (Dewey, 1933). In this address entitled *Dewey Outlines Utopian Schools*, he is able to, free of any encumbrances, to reimagine the way we learn, why we learn, and fundamentally what the experience of learning looks and smells like. He begins his speech with these words:

> The most Utopian thing in Utopia is that there are no schools at all. Education carried on without anything of the nature of schools, or, if this idea is so extreme that we cannot conceive of it as educational at all, then we may say nothing of the sort of present we know as schools. (Dewey, 1933, para 1)

Dewey is not making recommendations to the State or outlining how to improve reading scores and compete with other countries for mathematics glory; rather, he is clearing the slate in terms of how we have structured our schooling system as a means to imagine a new start. He is compelled to do this as a reaction to the development of education, society, and democracy in the United States at the beginning of the 20th century. He is attempting to remove the constraints and

practices brought on by an economic system and "capitalist society with its imperatives of economic competition, acquisition, and control" (Freeman-Moir, 2012, p. 34). These imperatives, according to Dewey, brought notions of competition, formal examinations, standardized tests, rewards, and punishments into an education system that essentially ignored the experience of the learner.

Greene's (1971) thinking certainly fits within this methodology as she saw the limits of conventional qualitative and quantitative research within education. Her focus has been on the essence of education and on a philosophy in order to expose traditional methodologies based on the fact that they are "preoccupied with priorities, purposes, programs of intended learning and intended (or unintended) manipulation," and that "we pay too little attention to the individual in quest of his own future bent on surpassing what is merely 'given,' on breaking through the everyday" (Greene, 1971, p. 255). She criticizes contemporary education as a means to accumulate knowledge, to create disciplinary silos, and present knowledge that is "external to the knower" (Greene, 1971, p. 256). The purpose of using utopian inquiry as discussed here is to counter the pedagogy and curricula which Greene describes. It is a process of questioning, to be thrown into the educational mainstream as a means to create a disturbance, a dialogue, and further action. This dialogue needs to focus on the learner's experiences, systems theory, and ecological literacy in order to create pedagogy and curricula that are designed for sustainability and well-being for all species.

CHAPTER 3

CONCEPTUAL PILLARS AND CRITERIA FOR ECOLOGICAL LITERACY

> *There needs to be a social and cultural transformation, at all levels. We can legislate, berate, and punish people into a sustainable lifestyle, but that isn't transformation — it's just coercion. We can pine for an earlier, idyllic time that will never return (and likely never existed anyway), but that just leads to paralysis. When individuals make better choices every day, it leads to transformation. In those thoughtful, deliberate and entirely personal choices, there is real hope.* (Denton, 2012, p. 15)

There are two fundamental concepts that are required to close the knowledge and the knowledge-action gaps: ecological literacy and experiential education. Strongly associated with these pillars are the concepts of transformation and global citizenship, through the design of experiences for an ecological literacy. These experiences need to be transformative in nature, whereby the brain structure and chemistry are physically changed and attitudes and behaviour are altered (Zadina, 2014, pp. 18-19). The learner must also see herself as a global citizen, acquiring the skills and knowledge to ensure that all humans and species have the basic necessities for a decent life. Educative experiences lead to transformation, global citizenship and ecological literacy.

These ideas become the new imperative in education, not setting aside reading, writing, and arithmetic, but rather pillars for channeling and energizing learning and teaching in a time of

planetary crises. Based on these pillars, I will propose criteria for analyzing current experiences and one which will direct the utopian curriculum. The criteria will take conceptualizations of ecological literacy, including notions of systems thinking, from a variety of thinkers and then will be used as a means to design the utopian experience. Similarly, the criteria borrow from the likes of Freire, Dewey, and Kolb as a means for fostering experiences that are truly educative and transformative. Within this notion of experience, transformation and global citizenship will be investigated as required elements in both experiential education and ecological literacy as learners need to fundamentally become different people. The utopian curriculum proposed in this inquiry is dependent on the assumption that learning and transformation are synonymous. As such, the intent of the proposed curriculum is to transform the brain chemistry of the learner; the aim is to change attitudes and behaviours so that the learner recognizes that she is connected to every other human, species, and system on earth and that she has an obligation to ensure that everyone has the basic necessities for a decent life.

Firstly, ecological literacy will be analyzed by drawing on the ideas from a variety of scholars, but much of what will be taken and imported into the proposed criteria for experiences which close the identified gaps will come from David Orr and the Centre for Ecological Literacy. Orr's understanding of ecological literacy and the characteristics identified by the Centre will become key elements within the criteria for experiences designed to close the gaps. Secondly, I will address the concept of experiential education, including possible misconceptions and specific understandings. These specified conceptualizations of experiential education, drawn from Dewey, Freire, Kolb, and Roberts, will form the rest of the criteria for experiences designed to close the gaps. Critical to experience, I will briefly explore how transformation and global

citizenship education are necessary elements of experiential education. I will make the case that there an interconnectedness between the natural science and the humanities is critical in creating transformative experiences which lead to an ecological literacy.

Ecological Literacy

Bosnia (1999) suggests that "literacy is part of the complex web of activities through which humans organize themselves socially and culturally" (p. 143). Perry (2012) goes beyond this understanding of literacy and posits that any literacy can be formed and shaped by "social relations, cultural models, power and politics, perceptions on experience, values and attitudes, as well as things and places in the world" (p. 52). As such, the assumption is made here that literacy is greater than simple language acquisition and application — that it is somehow different than simply being able to read and write. (Although these might be critical components of a specific cultural literacy.) Any literacy speaks to the skills and abilities required to not only understand a particular body of knowledge and distribute it, but also to further it — to create something new. Ecological literacy implies that we understand ecology, that we can speak to the consequences of human activity on all systems and species, and fundamentally that we can create meaningful solutions designed to protect and support systems on which we depend because we are part of them. An ecological literacy is based on a shift in values, on understanding the power of nature, on respecting the relationship between all systems, and knowledge of places and things on earth.

David Orr offers ecological literacy firstly as a method, or pedagogy, and secondly as content and pathway, or as curriculum. He was the first to introduce the term in 1989 (p. 334). In terms of pedagogy, ecological literacy requires a shift away from industrial and scientific

methods. Orr argues that for someone to be ecologically literate, "one must certainly be able to read and…even like to read," and that ecological literacy presumes "the ability to know what is countable and what is not, which is to say the limits of numbers" (p. 86). But, as we will see, to be ecologically literate requires much more. In terms of curriculum, place, multidisciplines, ecology, systems, and an understanding of thermodynamics prove to be foundational catalysts for social reconstruction. Boehnert (2012) also suggests that:

> Thus a way of seeing and knowing that recognises ecological embeddedness is necessary if we are to learn how to effectively see and respond to environmental and social challenges. This shift in awareness, the development of 'ecological literacy', is a foundational premise for redesigning society's infrastructure to provide ways of living within the carrying capacity of the earth. (p. 34)

Ecological literacy is not just the end goal. We do not hope that someone is literate in ecology simply by performing a bunch of tasks. Ecological literacy, as an outcome, is dependent on ecological literacy as pedagogical content, as syllabus, and as the pillars of a learning community. By this, I mean to suggest that for any literacy, let us say for music, that the teacher must be literate in the cello (for example), that the learning environment must live and breathe the cello, and that the course content is based on the cello. When one is literate in the cello, one cannot only play the cello but can create new music and knowledge that might not otherwise be articulated. Such is the case with ecological literacy — the teacher must be ecologically literate,

the syllabus or learning experiences must be bathed in notions of ecologically literacy, and the pedagogy must and design must create a community devoted to this literacy.

Ecological literacy is described by Hardin as the ability to ask "What then?" (as cited in Orr, 1992, p. 85). The skills, abilities, and methodologies for being able to ask such a question in relation to human behaviour and the planet are based in other literacies and our ability to think critically about dilemmas. For example, a learner's ability to ask "What then?" following the devastation of Lake Winnipeg would require the use of a variety of skills, disciplines, and an understanding of how to integrate a variety of literacies. In terms of pedagogy, scholars, like Duialibi, argue that "Education for sustainability or ecological literacy means to teach ecology in depth, in a systemic and multidisciplinary manner" (2006, p. 66).

Orr and ecological literacy. Orr would not argue with Duiabli's understanding of ecological literacy, but takes it even further with the ideas of experience and phenomenology. Moreover, an ecological literacy is an answer to the problem of formal education and to the banking model described by Freire (as cited in Orr, 2004, p. 26). Orr's pedagogy rests heavily on the question he poses: "How do we teach them to love land and community when our society values such things far less than it does individualism and consumption?" (Orr, 2004, p. 26). As stated before, he acknowledges that reading, writing, and numeracy are all critical components to ecological literacy, but that is valued-based and dependent on and a product of a drive "by the search for knowledge," and that "ecological literacy is driven by the sense of wonder, the sheer delight in being alive in a beautiful, mysterious, bountiful world" (1992, p. 85). Orr argues further that ecological literacy "requires the more demanding capacity to observe nature with

insight, a merger of landscape and mindscape" (p. 85).This intersection of place and cognition is the essence of ecological literacy as one must certainly have basic skills, abilities, and knowledge, but these must work in tandem with a critical understanding of the relationships we have with the planet, our obligation to the planet, and our joy for the planet. Simply understanding basic facts about ecology or science does not make one ecological literate. Rather as Orr suggests, "the absence of kinship with life" will not save us from peril (p. 87).

All institutions, according to Orr (1992), ignore the liberal and neoliberal forces, both political and economic in nature, which affect how and why we teach and learn. Based on this blindness to nature, the foundations for Orr's (1992, pp. 89-92) pedagogy are as such:

1. All education is environmental education.
2. Environmental issues are complex and cannot be understood through a single discipline or department.
3. For inhabitants, education occurs in part as a dialogue with a place and has the characteristics of good conversation.
4. The way education occurs is as important as its content.
5. Experience in the natural world is both an essential part of understanding the environment, and conducive to good thinking.
6. Education relevant to the challenge of building a sustainable society will enhance the learner's competence with natural systems.

Based on these criteria, the utopian curriculum proposed to close the knowledge and knowledge-action gaps will situate the learner outside, will demand that the learner think critically and reflect as to how she fits within the immediate ecosystem and about the consequences of her actions, and will challenge the learner to create meaningful solutions towards sustainable communities and societies.

Cutter-Mckenzie and Smith (2003) deconstruct Orr's conceptualization of ecological literacy by arguing that it "primarily constitutes 'knowing, caring and practical competence,'" (p. 502) and that ecological literacy can be reduced to simply "knowing how the world works, and therein knowing how to preserve and maintain the environment. To this end, Orr argues that the ecologically literate person understands the dynamics of the environmental crisis" (p. 502). By this, ecological literacy is the ability to take action. If one is ecologically literate, one knows, but one is also able to take meaningful action in one's community is imperative to the conceptualization of what it means to be literate in this manner. Systems thinking and experience act as catalysts for this transformation, ability, and action. One needs educative experiences to think in systems in order to become ecologically literate and create sustainable communities through progressive action. The educative experiences we create and facilitate for our learners will enable them to see the universe and themselves as a network of complex systems, and then fundamentally enable them to ask "What then?"

Systems thinking. Systems thinking is a critical component of ecological literacy. The tendency for humans to think by way of systems has been eroded by the industrialization of education itself (Betts, 1992, p. 38). The fragmentation of systems into smaller pieces throughout

history, according to Miller (2007), has disconnected us from the earth, each other, and education. He suggests, in dealing with the latter, that "we divide knowledge into subjects, units, and lessons. Yet students can often not see the relationship between these subjects, the relationship between facts within a subject, or the relevance of the subject to their own eyes" (p. 4). By this, industrialized education has managed to create a wedge between our understanding of how all things are related - undermining our ability to reconcile the ecological crisis at hand. Systems thinking, discussed by Aristotle but made popular in the 1990s by Orr (1992), Betts (1992), and Capra (1985), seeks to decompartmentalize our learning processes. This is essential to the development of an ecological literacy and the perpetuation of our species. The old ways simply cannot overcome the dilemmas which we face and as Nguyen, Graham, Maani, and Ross (2011) suggest, "complex environmental and sustainability problems tend to transcend the jurisdictions and capacities of any single organization or profession to manage" (p. 14).

What is system thinking? There are many interpretations of systems thinking, but Capra (2007) and the *Centre for Ecoliteracy (*http://www.ecoliteracy.org/*)* tend to provide an understanding that lends itself to education. Within this interpretation, living systems and relationships are used as the perspective for sense-making. When this type of thinking is employed, we no longer deal with linear causal relationships, but deal with the larger contexts which these relationships engage. The perspective, not only in the teaching context, moves our thinking where "living systems are nonlinear - they are networks - while our scientific tradition is based on linear thinking, chains of cause and effect" (Capra, 2007, p. 11). As a species dependent on the land and all systems, humans used to think in this manner - that we were part of a larger system (Miller, 2007, p. 4). Through the likes of Descartes, Bacon, and Newton and the

creation of a new industrialized and individualized relationship with nature, we have managed to break complex concepts in to small, manageable parts. This has created a deficit in our ability to deal with complexity, and has also helped to cut human participation within these networks out of our understanding. This has been characterized by Davis, Luce-Kapler, and Sumura. (2008) in the following manner:

> For centuries, the prevailing opinion in western societies has been that the planet is an inert resource, something that is separate from humanity and free for exploitation. Schools have participated in the development of perpetuation of this mindset in many ways, the most obvious of which has been an emphasis on the development of instrumental competencies. The stress has been placed learning *how* to do things, not on learning *why* things are done or if they are sustainable. More cogently, the emphasis has been on *knowledge*, not *wisdom.* (p. 212).

Capra (2007) attempts to resolve this linear and micro thinking by suggesting that systems thinking allows the learning community to move from the parts to the whole, from objects to relationships, from objective knowledge to contextualized knowledge, from quantity to quality, from content to pattern and from structure to process. By shifting these emphases, the learning now focuses on systems and relationships which are designed to sustain life; human beings, the individual are now viewed as part of a complex network and dependent on other species. With this shift, the perspective becomes one of relationships - relationships between each other and the biosphere.

Senge (2012) describes what this might look like when he describes a Grade 8 classroom activity. The students' task is to create a trail system near Tucson, Arizona. He describes how students, working collaboratively, have to take into consideration economic, ecological, social, cultural, and political issues when investigating where the trail will go. The students take into account our relationship to various species, to burial grounds, and to the local economy.

What this example demonstrates is a paradigm shift in the structuring of pedagogy, curricula, and the classroom environment itself. It also creates an epistemological shift insofar as the learner is now able to contribute to a body of knowledge and personalize it. The learning becomes more meaningful and problems are solved. Knowledge is not consumed, but created. There is a moral imperative to teaching in this context - a context which rejects the "rhetoric of domination, mastery, ownership, and management - that is, vocabulary that places humanity apart from and superior to other aspects of the world" (Davis et. al., 2008, p. 213).

Peter Denton (2012) in his manifesto *Gift Ecology* outlines the notion of systems thinking arguably at its essential meaning. He points, firstly to the Renaissance as the beginning of our species' disconnect from nature and the idea of breaking the whole into smaller pieces (p. 37). Through the likes of Leonardo de Vinci and Descartes, complex systems began to be broken down into smaller parts in an attempt to make meaning. This practice, however, according to Denton, is problematic as he suggests that this produced a desire to mechanize our appreciation for all systems, including the human body and natural organisms. He contends that: "Understanding the movement of the body through its anatomy led to the perception that all systems, including organic ones, could be represented and reproduced as mechanisms behaving in linear, casually related sequences" and that this has led us to try "and understand system

complexity in terms of linear causality, looking for causal connections that will never be found, reducing Nature to a bucket of bolts" (p. 43). This lack of systems thinking, initiated hundreds of years ago, has created a massive problem in terms of how we envision ourselves within the complexity of this planet:

> So, against the power of Nature, we asserted our own power. We have changed the planet by design, using its material resources at the whim of our exhaustible need, and have lost sight of where the real power lies. Yet we should never underestimate a butterfly, nor disregard an earthworm. (Denton, 2012, p. 47)

Systems thinking suggests that we understand our relationship with the butterfly, the earthworm, the wood tick, the mosquito, the perch, the nitrogen cycles of a specific ecosystem. Denton offers that "we live in relation with all the elements of the Earth system, related in ways more subtle than we can begin to imagine" (p. 47). This level of thinking, understanding, or at least recognizing, our relationship to all systems is critical to fostering ecological literacy.

Capra (2007) offers, as Orr does with ecological literacy, a course outline or syllabus if you will of concepts of natural systems which need to be embedded into our thinking. He posits that "These closely related concepts are different aspects of a single pattern of organization: nature sustains life by creating and nurturing communities. Our present formulation includes the following: networks, nested systems, interdependence, diversity, cycles, flows, development, and dynamic balance" (p. 13). He goes further to suggest that systems thinking is very difficult for most humans to understand and develop as we do not see these natural communities as non-

linear and due our propensity for materialism. (p. 11) Systems thinking then is a skill, a body of knowledge, and fundamentally an ethic. When we think in systems, we recognize that:

> When we walk out into nature, living systems are what we see first. First, every living organism, from the smallest bacterium to all the varieties of plants and animals (including humans), is a living system. Next, the parts of living systems are themselves living systems. A leaf is a living system. Every cell in our bodies is a living system. Finally, communities of organisms, including both ecosystems and human social systems such as families, schools, and other human communities, are living systems. (Capra, 2007, p. 3)

As such, to foster ecologically literate learning communities, we need to create experiences for learners whereby they can imagine, explore, and identify their relationship with a variety of different systems and communities. This type of thinking, that is systems thinking, will lead to a literacy in ecology that will lead to sustainable communities. To do this, to be transformed, is to become a true global citizen.

Criteria for ecological literacy. The first set of criteria that will be included are taken from the *Five Practices of Emotionally and Socially Engaged Ecoliteracy* as designed by Goleman, Bennet, and Barlow (2012) as part of the Centre for Ecological Literacy (http://www.ecoliteracy.org/). The first practice deals with the concepts of empathy and systems thinking. The authors outline this as *Developing Empathy for All Forms of Life*. As such, if an experience is to nurture an ecological literacy, the learners must be able to see themselves as part

of a variety of complex systems and webs while enlisting compassion and empathy for all living creatures. I will speak at greater length about systems thinking and global citizenship further in the chapter, but these two concepts are essential to this particular criterion. In order to develop an ecological literacy, it is critical that firstly an educational experience allows the learners to fully understand how individual systems work in harmony within one ecosystem and how the learners are indeed connected to all these systems. Additionally, education experiences must be designed to develop the imagination of the learner whereby they become empathetic thinkers who value and protect the existence of all species.

Secondly, ecological literacy in Goleman et al. (2012) is fostered through *Embracing Sustainability as a Community Practice*. Learners are able to apply their understanding of systems thinking and work collectively to create societies that are sustainable. Learning communities and environments must model sustainable behaviour and attitudes at all times. Teachers, staff, and learners must ensure that the totality of their lives is devoted to preserving and sustaining all life on this planet. Next, the idea of *Making the Invisible Visible* is applied. Goleman et al. (2012) describe this practice as "students recognizing the myriad effects of human behaviour on other people and the environment" (p. 11). This criterion refers directly to the idea of systems thinking and also speaks to the development of a science literacy but also the ability to identify relationships of cause and consequence.

Fourthly, students apply critical thinking and systems thinking skills to *Anticipate Unintended Consequences* of human actions through collective action (Goleman et al., 2012). Based on the previous criterion, the learner should develop a capacity to begin to predict the impact of small and large-scale human activity on a variety of ecosystems and the biosphere as a

whole. She should be able to develop critical research questions, logical hypotheses, and then conduct research and gather evidence to support her argument. The anticipation of these consequences is also a call to action, whereby the learner uses her inquiry and new found data to provoke public dialogue and attempts to address the cognitive gaps with society itself.

Finally, and perhaps a culmination of the previous four criteria, ecologically literature programming allows for the *Understanding of How Nature Sustains Life* (Goleman et al., 2012). This criterion speaks directly to the first gap, namely that people are simply not aware of the current ecological crisis. Educational experiences designed to elicit and cultivate an ecological literacy must perpetually reinforce the notion of the fragility, complexity, and finiteness of life on earth. The learner must go through a process of growth whereby she becomes highly aware of how her very own life is dependant not only on the earth and biosphere as totality, but also on the millions of species and systems on which she depends for the necessities of human existence. Table 1 summarizes the discussed five criteria for experiences to fulfil if they are to contribute to the development of ecological literacy.

Table1

Criteria 1-5 for Experiences for Ecological Literacy

Criterion	Experience A	Experience B	Experience C
Develops Empathy for All Forms of Life			
Embraces Sustainability as a Community Practice			
Makes the Invisible Visible			
Anticipates Unintended Consequences			
Understands How Natures Sustains Life			

Through Orr's conceptualization of ecological literacy and its articulation and further development by the Centre for Ecological Literacy, we now have part of a framework by which an utopian curriculum can be proposed. These five criteria are the foci and the ultimate outcomes of the learning experience. But how do we achieve these ends? How do educators hope to have students gain this literacy and fundamentally transform their skills, attitudes, behaviours and brain chemistry? The answer rests in the concept of experience and experiential education.

Experiential Education

The conceptions of experiential education and experiential learning seem to be part of the common vernacular of educators, but it is difficult to simply state what they might mean. Is it simply a matter of learning by doing? Are the concepts synonymous with outdoor education,

project-based learning, inquiry learning, or placed-based learning? Do these concepts refer to philosophy, methodology, or curriculum? And furthermore, what do we mean by experience?

This thesis is not about performing a conceptual analysis of experiential education or learning, but some clarity needs to be established in order to position the experience of a learner and of a learning community as a conceptual pillar for this utopian vision. The curriculum is designed to not only use the experience of the student as a basis for transformation, but also as a means of creating new experiences so that students can make sense of the contemporary body of knowledge that has created the crisis, and what new knowledge must be constructed in order to create sustainable well-being for all. Roberts (2012) suggests that experiential education is much different from experiential learning, as the former is a field and that the latter refers to essentially all educative experiences. For the purposes of the development of the criteria, an educative experience is a cycle which fundamentally transforms the learner, through a change in direction and changes in attitudes and behaviours, into a citizen who has the capacity to deconstruct her role within the world, who has a thirst for knowledge, and who is able to imagine the plight of all living things. This transformation into a global citizen is essential for an ecological literacy. Roberts (2012) suggest that students need to make meaning of their lives and situate themselves within the world for behaviour to change. Transformation requires an alteration to how we act and how we will act. This transformation seems to be a requisite for the societal change needed to save our species. Learning *for* transformation and learning *as* transformation require, as Mezirow (2000, p. 7) suggests, processes where we reveal many concepts we take at face-value so that we can come closer to the truth and more informed action. This, presumably, is the quest and challenge we signed up for when we all became educators.

When we speak of experience and using the experience of the learner to create future educative experiences, we need to understand firmly what we mean. For this, I often go to the words of Viktor Frankl (1992) in *Man's Search for Meaning*. In this work, Frankl describes his experiences in a Nazi concentration camp and how he and others survived. Frankl describes his understanding of experience in the narrative as he describes how he counselled fellow prisoners:

> But I did not only talk of the future and the veil which was drawn over it. I also mentioned the past; all its joys, and how its light shone even in the present darkness. I quoted a poet — to avoid sounding like a preacher myself — who had written, "Was du erlebst, kann keine Macht der Welt Dir rauben." (What you have experienced, no power on earth can take from you.) Not only our experiences, but all we have done, whatever great thoughts we may have had, and all we have suffered, all this is not lost, though is past; we have brought it into being. Having been is also a kind of being, and perhaps the surest kind. (Frankl, 1992, p. 90)

So when we speak of experiential education, we must begin with the experience of the learner and the collective experiences of the learning communities. Negating the unique stories of the learner means to invalidate his or her being, life, and story. I am often guilty of this arrogance and it generally results in learning and teaching that is superficial, dissatisfying, and not transformative.

Boydell (1976), in his conceptual analysis of experiential education, greatly influenced Roberts' understanding as his conceptualization identifies two key characteristics associated with

experience and learning. The first is that these learning experiences must “lead to meaningful learning” (p.17). In Deweyan fashion, Boydell is not content with merely providing experiences that are interesting, engaging, or stimulating, but that these experiences ultimately render themselves educative; the learner has fundamentally grown in consciousness and his or her understanding of the world has been transformed and individualized. The second characteristic suggests that “this learning is achieved by the learner sorting things out for himself - i.e. he restructures his perceptual experiences and hence gains insight, or learning” (Boydell, 1976, p. 17). As such the teacher’s role becomes one of organizer and facilitator of experiences and developer of the learning community and environment.

For the purpose and scope of this thesis, experiential education focuses on Deweyan and Freirian notions of using the existing experiences of learners to create greater educative experiences so that the learner can then be transformed. The rationale for this is that Dewey certainly laid the foundation for this thought and Freire has been able to propose a curriculum and pedagogy that provides the learner with agency and a capacity for social and political transformation. Freire, who was essentially writing about experience at the same time as Kolb (1984), employs a far greater transformative expression of experience that reconciles tightly with ecological literacy. The focus within this context will be on a social and political transformation where students “name the world”. Freire suggests that through dialogue, reflection, and finally praxis, the learner learns to name the world, which means that the learner is able to create her own knowledge based on an analysis and deconstruction of previous concepts that were transmitted by an oppressive or colonial force. To further narrow the focus, however, experiential education will be looked through the lens of ecological literacy. Dewey and Freire will be

reviewed in order to shed light on how the two concepts are dependent on each other. This notion of experiential education goes beyond bake sales and service work. It identifies the need for an embedded experience, whereby students thoroughly contemplate how we use resources, be they natural, capital, or human.

Transformation and experience. The importance of experience is directly connected to transformation. Through the experience of the learner, we can help create educative experiences that lead to sense-making, or meaning, that fundamentally lead to transformation. To create an environment for the transformation of the learner into an agent of social change, we must begin with the experience of the learner. How does she see the world and her place within it? What forces in her life have brought him or her to this learning community? If we fail to start at this point, we miss out on critical knowledge not only about the learner, but knowledge that the learner may have that is valuable to the community. How can we begin to have a conversation about how the Earth sustains all life, when some of our learners may not have had the experience with ecosystems out their back door?

The second challenge is to use the experience of the learner to build, as Dewey (1938) would suggest, educative experiences. He suggests "if an experience arouses curiosity, strengthens initiative, and sets up desires and purposes that are sufficiently intense to carry a person over dead places in the future, continuity works in a very different way" (Dewey, 1938, p. 31). Is this not what needs to happen in order to transform learners from cogs to creators? Do we not need to capitalize on their experience and curiosity to move from learning experience to learning experience? Is this not how learners make sense of the world? Illich (1970), observing

Freire in the early 1960's, noted that "I have frequently witnessed how discussants grow in social awareness and how they are impelled to take political action as fast as they learn to read. They seem to take reality into their hands as they write it down" (p. 26-27). For transformation to emerge, we need to allow learners to see the world from their perspective and then take the necessary action to change it based on their experience.

Figure 1. Image taken from and used with permission from Manitoba Education: http://www.edu.gov.mb.ca/k12/esd/

Recently in one of my learning communities, we had been discussing a great length the notion of sustainable development. We had looked at the etymology of the term, how it is used, and a variety of cultural and political contexts. One day, we discovered that both Shell Canada and Manitoba Education use the same Venn diagram to illustrate the concept of sustainable development (Figure 1). One of our community members, however, simply could not make sense of the diagram. It did not relate to his experience, as the idea of the Venn diagram was too abstract. He then asked whether he could draw his own diagram on the board (see Figure 2). This is what he created. An artist in his own right, the learner was able to use his understand and experience with shapes and space, to create a model for sustainable development based on our collective exploration.

We were all shocked with his idea, as he created his own knowledge and a new meaning and purpose for our analysis. He had changed the language of sustainable development and was now able to use his model to educate others.

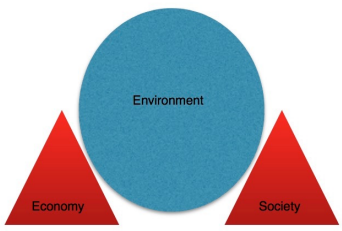

Figure 2

In education, we often speak of meaning and making learning really meaningful for learners. Unfortunately, the intended meaning

is often prescribed by governments, curricula developers, school boards, principals, and teachers. Rarely do learners get to think about their meaning or what is meaningful to them. They might reflect in journals at the end of a week of lessons on *To Kill a Mockingbird,* but do they get any closer to identifying what their purpose is? Why do they even exist? Illich (1986) famously exposed how we as educators attach meaning to our learners in his famous speech to the Conference on InterAmerican Student Power in 1986:

> All you will do in a Mexican village is create disorder. At best, you can try to convince Mexican girls that they should marry a young man who is self-made, rich, a consumer, and as disrespectful of tradition as one of you. At worst, in your ’community development‘ spirit you might create just enough problems to get someone shot after your vacation ends and you rush back to your middleclass neighborhoods where your friends make jokes about ’spits‘ and ’wetbacks.’ You start on your task without any training. Even the Peace Corps spends around $10,000 on each corps member to help him adapt to his new environment and to guard him against culture shock. How odd that nobody ever thought about spending money to educate poor Mexicans in order to prevent them from the culture shock of meeting you?

Here, Illich demonstrates that even with the best intentions (through service work, bake sales, Kiva donations), we often do not make space for purpose for those who we are trying to educate. Ronell goes as far to suggest that there is too much emphasis placed on meaning and that it is “Very often the emergency supplies of meaning brought to a given incident, structure or

theme in one's life are cover-ups, are ways of addressing the wounds of non meaning" (as cited in Taylor, 2009, p. 35). Do we not do this with bake sales, buying organic apples, or with blue boxes? Do we not perform these sort of frantic activities to provide meaning to our classrooms and to our learners? I know I am guilty of this, but where I have found success is through the allowance of critical questions from the learning community.

Transformative experience: An example. At the advent of the Idle No more protests in December 2012, many of my students had questions related to the protests and the angst felt by our brothers and sisters within First Nations communities. I could have easily told them my perspective and what was right and wrong, as this is often the path of least resistance, but I stopped. I allowed them to inquire into the motives of demonstrators and for them to ask questions. They soon realized that they needed to go to the start: to Confederation, to the Numbered Treaties, and to the Indian Act. They were then able to look at their own community, Red River, and think about the last 200 years of societal conflict and bliss and how this manifests itself today. There was a purpose to their research and inquiry that came from them. They spoke with First Nation leaders, dissected primary sources, and even published their collective work as a means for a larger political discussion.

One afternoon just after lunch, I was about to begin teaching my Canadian History class. I noticed that four of my students, the ones with energy and mischievous intent, were missing. If there is one thing that I cannot tolerate, it's tardiness. I knew they were going to be late, so I prepared my speech that would no doubt condemn their tardiness. When they arrived, I heaved my chest and began to expel as much hot air as my lungs could carry. Before my lecture could

begin, however, the boys began to quickly explain that en route to school, they had noticed a small Anglican church with an even less pronounced #idlenomore sign on the front lawn. They immediately screeched on the brakes and clamoured inside the church to investigate. Once inside, the priest invited them in and they had an hour-long discussion about why he supported the Idle No More movement. The boys then handed me a video of the conversation which we watched as a community. Idle No More had meaning for these young citizens. It was about them and their relationship with other citizens. Fortunately, their teacher was not part of this process, subjecting them to his purpose and pursuit of meaning.

Interpreting the example. Although I often question how we assess transformation, I know those young men who stopped at that Anglican church were transformed. When I first met them, they had many angry things to say about indigenous people in this country - perhaps a product of their experience. Following this critical investigation of Idle No More, however, through educative experiences and their own sense-making and purpose, they became more empathetic to their brothers and sisters, became less polemic in their thought and ideas, and looked for solutions, rather than conflict in their research. Still today, we often share a smile and laugh about those learning experiences and how far that particular learning community traveled. I am confident of their transformation and have hope for our species.

> Transformative learning is not just thinking though - it is a holistic process and includes self awareness, social embeddedness, and behaviour change. I suppose to me transformative learning is the ability to imagine things otherwise and then go about

> actualizing that not-yet reality. In many ways, this ought to be a central aim of education more broadly. (Jay Roberts, personal email communication, March 25, 2015)

There are certain common characteristics of conceptualizations of experience which can help serve educators as a starting place for creating educative, meaningful, and transformative learning communities and experiences for learners. Experience should not be viewed as a magic cure to the rigour mortis of traditional learning formats, but should be a launching point for such ideas as growth. Roberts (2012) suggests that "thinking about experience in education means considering the ways in which notions such as 'risk' and 'challenge' are embedded in the act of having an educative experience," and these risks and challenges are experience with some degree of "newness" (p. 115). This challenge and risk, experienced by both the educator and the learners, may result in new understandings and new ways of thinking. Such experience, as a means of "opening up to the world" (p. 117) can lead to seeing oneself as part of a complex series of intricate and complex networks. This is referred to as systems thinking, which can then lead the learner to a place of ecological literacy and in a position to take significant action based on this transformation in his or her thinking.

Global citizenship education. Like transformation, the notion of global citizenship is somewhat nebulous, not unlike closely akin concepts such as globalization. Throughout curriculum documents in Canada, the term is thrown around and often is watered down by neoliberal concepts such as the knowledge economy, global community, and internationalization. The idea of globalization is an economic imperative. It does not refer to traveling, social

economic development, or empathy. It is, as Appiah posits, used “to talk about economic processes” (as quoted in Taylor, 2009, p. 89).

If we want to look closely at what we mean by global citizenship and our collective purposes for teaching young people how to become global citizens, we must look beyond the industrial and economic underpinnings. Appiah refers to this notion of global citizenship in a very classical way by characterizing it as cosmopolitanism, or rather the “general feeling that we have to take moral responsibility for one another the way fellow members of a city-state, a polis, did, not by imposing some global megastate or monarch on top of us” (as quoted in Taylor, 2009, p. 90).

In a global state, Ruitenberg (2005) moves the notion of global citizenship as cosmopolitanism to a point where we are fundamentally still nomads - not linked by geographic or national borders, but by our relationship with each other. She suggests that “If one wishes to educate students to have a commitment to their social and ecological environment, one needs to start with an emphasis on commitment rather than on locality or community” (p. 219). As such, global citizenship begins as a relationship of responsibility towards each other and other species, regardless of nationalistic, economic, class-based, or other barriers. Citizenship education is based on the idea that we are in fact “nomads who have learned the ethical gestures of hospitality and openness to a community-to-come will bring nourishment to any place in which they land” (p. 219). But within a learning community - particularly a digital example - the realization of these relationship and responsibility we have with one another can seem somewhat conceptual and abstract for the learners (and often the educator, in my case.) What is required is a pathway

for self-exploration and knowledge acquisition of the "other." This is where the humanities come into play.

Nussbaum (1993) positions the humanities as an essential means for global citizenship education. She suggests that there are three key components to allowing the learner to clearly understand the relationship of responsibility they have with other humans and species. Nussbaum refers this nomadic cosmopolitanism as "humanity" and suggests that there are three capacities and avenues for this type of education.

Firstly, she suggests that the learner needs to develop the capacity for "critical self-examination of oneself and one's tradition," in the Socratic manner" (Nussbaum, 1997, p. 9). This not only means questioning one self, but also one's beliefs and the beliefs of others concerning how knowledge is constructed. This type of self-examination and deconstruction requires the ability to construct meaningful arguments using sound logic. An environment that develops this type of thinking and debate, as I have observed, can be difficult digitally. More on this later.

Nussbaum (1993) suggests that the second capacity required for citizenship education is that of knowledge of global affairs and how other people live. Having this capacity allows us to understand the "ways in which common needs and aims are differently realized in different circumstances." (p. 10). This, as she contends, requires a tremendous amount of rigour and critical research, elements which can often evade some project-based and inquiry-based learning experiences.

The last capacity refers to our ability to imagine the plight of someone else, another species, or system. She refers to this ability as the "narrative imagination" - or simply the ability

to empathize with the situation of others. This certainly takes practice, but is fundamental to the first two capacities as humanity most definitely needs to critically analyze our common assumptions and engage in an investigation as to our co-habitants on the planet. Without these, the notions of cosmopolitanism or nomadic citizenship are too abstract for our imaginations.

Later on, in reaction to the commodification of education, Nussbaum envisions the role of the humanities even further in terms of citizenship education. Specifically, she suggests that the "ability to recognize fellow citizens," and this could most certainly be attributed to other species and systems, "as people with equal rights…to look at them with respect, not just tools to be manipulated for one's own profit" (2010, p.25). As such, global citizenship can be conceptualized as our capacity to imagine and mitigate the plight of others (including people, other species, and ecosystems) based on our capacity for critical examination, our ability to acquire and generate significant knowledge about the world, and our willingness to engage in imaginative compassion which surpasses all boundaries of race, ethnicity, gender, nationality, and class. As such, global citizenship cannot be an alien notion when we devolve into the possibilities of creating ecologically literate learning communities. In fact, one could argue, as will be evident in the proposed curriculum, that it is essential.

The link between global citizenship and ecological literacy rests in the very idea of empathy, or the narrative imagination. The link is also highly dependent on the integration of both the natural sciences and the humanities. By this, I would argue that if learners are to develop empathy for not only fellow species members, but for all forms of life, that they not only need to be immersed in a direct experience in nature, but that they also need to explore literature and reflect upon and create their own narratives. Learners must be able to examine their place within

the complex web of systems which sustain their lives, they must engage in a pursuit of knowledge related to the natural world, and then it is critical for them to imagine the plight of all forms of life. Nussbaum argues that the humanities, be it literature or cultural activities, develop our narrative or moral imagination and this in turn leads to empathy for others and potentially other forms of life. Ray, McKnight, Bidwell, Fourment, Flanagan Pritz, and Reinhart (2015) write that “environmental empathy can be stimulated by translating results from environmental research into narratives that speak to children'" and that “books that present an engaging narrative can help develop an environmental empathy in young audiences" (p. 1). McKnight (2010) argues that in order to avoid ecophobia, that is the paralysis which occurs when we are petrified of the ecological crisis, that we need to develop environmental empathy through narrative. She posits that the narrative can “engage...children in learning about ecological relationships in the natural world and in mastering ecological language," and that such experiences may provide a foundation for future learning and development of environmental empathy." (p. e10). It is through transformative experiences where learners will be able to develop this imagination and become ecologically literate. To simply immerse learners in nature at a scientific research station might ignite a passion for the beauty of nature and science, but it may not lead to a change in direction, growth, and transformation.

Criteria for experience. Dewey outlines two principle categories for determining whether or not an experience has been a positive one or whether it should be discarded. The first is based on his notion of continuity (Dewey, 1938). His theory of experience argues that all previous experiences in our lives, and those of those who create lessons and curricula for

learners, determine current and future experiences. By this, we all come into the same learning experience from varying backgrounds, abilities, and perspectives. Indeed, Dewey's notion of continuity is finding new validation through recent research in educational neuroscience that indicates that all learning is based on the pre-existing neural network of the learner, (Zadina, 2014, pp. 21-22). Educators must take this into account when designing experiences for the learner. Roberts (2012) argues that an experience must "achieve a continuity in which past and present interact to create the future," and that this continuity of experience ensures that the primary focus of learning is to understand that there is a moral imperative to knowledge which often implies praxis (p. 59).

In order to distinguish between experiences that have value and those which do not, Dewey (1938) suggests that democracy be a pillar of the learning environment and community. By democracy, Dewey refers to the tension between one's individual growth and the development of a cohesive, cooperative, and collaborative experience. Students need to be honoured, deemed as equals within the learning environment and have the experiences embedded within the curricula. Democratic learning environments also acknowledge, as MacMath (2008) suggests, that "we are all capable of intelligent and well-informed opinions and we can solve any problem if we work collaboratively" (p. 3). Modelling and cultivating a democratic learning environment prepares the learner for participation in future democracies and ensures that the learner has , "a healthy skepticism, a desire for evidence, a reliance on observation rather than sentiment, discussion rather than bias, and inquiry rather than conventional idealization" (Anderson & Major, 2010, p. 106). For an experience to be educative transformative, the experience(s) of the student and the collective need to be honoured and there

must be space and freedom for the learners to share their own experiences. Roberts (2012) argues that Dewey viewed democracy as integral to learning as "democracy becomes 'lived' experience through the interrelationships and interdependence of social relations bound together by experiences," and it is a must in a democratic learning community "for individuals and societies to create the good life" (p. 60).

Secondly, Dewey insists that experiences lead to further positive and transformative experiences through growth. Having said this, he maintains that growth can also refer to the development of bad or misguided behaviour. To avoid these mis-educative experiences, Dewey explains that "experience arouses curiosity, strengthens initiative, and sets up desires and purposes that are sufficiently intense to carry a person over dead places in the future, continuity works in a very different way" (p. 31). As such, for an experience to be educative, there must be growth in a new direction. For Dewey, the very purpose and end of education is growth. He argues that "the very idea of education is a freeing of individual capacity in progressive growth directed social aims" (p. 115). Growth, Dewey (1938) suggests, must be understood "in terms of the active participle, *growing"* (p. 72). Growing implies that there is change in behaviour and in the physiology of the brain. It implies for the learner, as Hildreth argues (2011), that "growth represents a form of learning that enables individuals to continue learning throughout their lives" (p. 34). Growth and educative experiences open the learner up to new possibilities and arouse the senses rendering the learner stimulated, open, and curios.

Coinciding and essential to the notion of continuity and of Dewey's (1938) conceptual understanding of experience is that of interaction. Although continuity and interaction may seem like parallel ideas, as they often do complement each other, they can also intersect and must

intersect for an experience to be educative. “Any normal experience is an interplay of “objective and internal conditions”, he argues (p. 88). Dewey looks at interaction as not only the interaction of a learner with the outside world, but also with the inner self. He denounces traditional education as a form of education whereby we only focus on external conditions and we ignore the child. This is, according to him, progressive education where teaching and learning through experience is more difficult (p. 23). When designing learning experiences, educators must rely both on external factors, namely the world, and the internal experiences and understandings of the learner. Relying on one too heavily can violate the educative experience. For example, as highlighted by Bassey (2010), the early education of Malcolm X, according to Malcolm X, was focused too heavily on the extrinsic world - that is that the learning experiences were about *informing* him of the world around him. This world had no meaning for him, given the colonial and oppressive reality of the United States in the mid-20th century, and it led him to an early life of crime and destructive behaviour. It was only later in life when Malcolm X was able to juxtapose his experiences with the outside world where he was able to grow and be transformed. Interaction, in this way, is emancipatory education and certainly leads to educative experiences. Certainly in a Canadian context, we can make parallels with Malcolm X’s experience and those of residential school survivors. It is only through reconciliation, attachment, and an honouring of experience where the experience of the learner can become educative.

Given Dewey’s criteria of experience, the development of the criteria for distinguishing between experience that would foster ecological literacy are presented in Table 2.

Table 2

Criteria 6-9 for Experiences for Ecological Literacy

Criterion	Experience A	Experience B	Experience C
A democratic environment is cultivated whereby there is social interaction and discourse.			
Opportunities for growth and transformation are present.			
Change in direction of the learner's attitudes and behaviour is evident.			
Interaction between inner and outer conditions are continually at play.			

Building upon Dewey's criteria of an experience, it is important to highlight that these criteria are supported by the conceptualizations of transformation and global citizenship I included above. If there are "opportunities for growth and transformation" and a "change in the direction of the learner's attitudes and behaviour", then the learner can enter a process of self-examination and develop empathy for all forms of life. As will become clear in Chapter 5, this transformation is highly dependent on the interaction between the natural sciences and the humanities; between place and the imagination. It is through this process where an ecological literacy can be attained.

Dewey's criteria look firmly at the social experience. This, however, may not be enough to determine if a learning experience can help develop ecologically literate learners. For this, we need to investigate the political experience for learners. Freire certainly provides a framework for transformation in this manner.

Within *Pedagogy of the Oppressed*, Freire (1970) outlines the political dimension for which transformation is to take place within the learner, as opposed to the social context which Dewey discusses. As part of his contribution to the conversation pertaining to experience he identifies what he labels the "Banking Theory." He describes this system as not being neutral and that:

> In the banking concept of education, knowledge is a gift bestowed by those who consider themselves knowledgeable upon those whom they consider to know nothing. Projecting an absolute ignorance on to others, characteristic of the ideology of oppression, negates education and knowledge as process of inquiry. (Freire, 1970, p. 58)

To this end, in the banking concept, the experience of learning is owned by the elite and its accumulation of knowledge. The experience of the learner is ignored, deliberately, as means of oppression. In opposition to this methodology, Freire proposes an avenue for the creation of new narratives based on the experience and the inquiry of the learner. He offers that students must enter into a "praxis", or a process of reflection and action for the purpose of personal and collective liberation. This process requires collective dialogue between the teacher and learners and within the learners themselves to create their own body of knowledge. Through this process,

liberation becomes a process: “the action and reflection of men and women upon their own world in order to transform it” (Freire, 1970, p. 79). The purpose of education is one, as Socrates might suggest, of self-examination, coupled with action taken to confront oppression, inequality, and injustice. Freire applies this later to the ecological sphere, when he states that “It is urgent that we assume the duty of fighting for the fundamental ethical principles, like respect for the life of human beings, the life of other animals, the life of birds, the life of rivers and forests” (Freire, 2004, p. 46). As such, we will include three criteria: dialogue, reflection, and praxis.

In terms of dialogue, Freire argues that the educative relationship must be dialogical and dialectic in nature — that student and teacher are on equal footing and that the purpose of discourse is a quest or a journey where knowledge is created where a relationship of tolerance and generosity has been fostered between mentor and learner. According to Rule (2010), Freire’s understanding and application of dialogue is an “authentic way of being,” rather than simply a quick technique, portion of a lesson plan, or even methodology (p. 927). Rule posits further by defining Freire’s notion of dialogue:

> Freire defines dialogue as the encounter between men…mediated by the world, in order to name the world and transform the world. It is a process underpinned by values of mutual respect, humility, respect, faith, hope, love, and critical thinking. It is essential to an authentic education process which explores the role of women as subjects in the world and of the world. Dialogue is thus essential to communication; value-laden, educational and transformatory. (p. 930)

Dialogue, therefore, allows the learner to stretch her mind, entering into a variety of conceptual analyses and into deep areas of inquiry through a sharing and contrasting of ideas with a mentor and learning community. This dialogue opens the learner to new experiences, cognitive dissonance, and new understandings of the self within the world. This ultimately leads to transformation and a change in attitude and behaviours. A dialogic learning environment is then critical for developing ecological literacy and closing the gaps, because dialogue provides time and space to exchange ideas. Dialogue creates a situation where both learner and elder offer insight, collaborate, and reflect on the knowledge being created. A dialogic relationship strays away from the empty vessel approach and ensures that the learner is allowed and encouraged to experiment with new knowledge. The learner is encouraged to ask questions and challenge new ideas. Freire positions dialogue as follows:

> Through dialogue, the teacher-of-the-students and the students-of-the-teacher cease to exist and a new term emerges: teacher-student with students-teachers. The teacher is no longer merely the-one-who-teaches, but one who is himself taught in dialogue with the students, who in turn while being taught also teach. They become jointly responsible for a process in which all grow. (p. 80)

It is not enough, however, that learners and learning communities enter into dialogue. Learners must be able to reflect on dialogue and then take their understanding of the world and apply it through praxis. Mezirow (1990) suggests that the practice of purposeful reflection is essential to transformation. He argues that critical reflection “enables us to correct distortions in

our beliefs and errors in problem solving" (p. 1). Reflection is a means of challenging our beliefs and synthesizing our ideas with those of others. From a biological perspective, reflection actually changes the brain structure (Zull, 2002). According to Freire, reflection is the means for human consciousness, thinking about how people and the world intersect. Once conscious, the learner is then able to apply her new understanding of the world, generated through dialogue and reflection, and apply through, as Freire would argue, naming the world. By naming the world, this praxis enables the learner to position herself and take action based on her relationship with other people and the Earth itself.

The relationships between dialogue, reflection, and praxis are critical to developing an ecological literacy and are critical components of the programs that will be investigated in Chapter 4. In order to achieve a change in behaviour in attitudes and close the two critical gaps, the learner must enter into a series of experiences and a process of rebirth, where the concepts they took for granted are met head-on and where a new consciousness and understanding of their place in the world is revealed.

Conclusion

The investigation of ecological literacy and experience has led to the following set of 12 criteria that will be used to assess the quality of the utopian proposal.

Table 3

Complete List of Criteria for Experiences for Ecological Literacy

Criterion	Experience A	Experience B	Experience C
1. Develops Empathy for All Forms of Life			
2. Embraces Sustainability as a Community Practice			
3. Makes the Invisible Visible			
4. Anticipates Unintended Consequences			
5. Understands How Natures Sustains Life			
6. A democratic environment is cultivated whereby there is social interaction and discourse.			
7. Opportunities for growth and transformation are present.			
8. Change in direction of the learner's attitudes and behaviour is evident.			
9. Interaction between inner and outer conditions are continually at play.			

Criterion	Experience A	Experience B	Experience C
10. Dialogue is an essential element of learning.			
11. Reflection and time and space for reflection are considered paramount to learning.			
12. Praxis is considered a key element to learning.			

These criteria provide the basis or traffic lanes necessary in order to ensure that the curriculum does what it intends to do, namely to close the knowledge and knowledge-action gaps. The utopian proposal will need to adhere to these criteria if it is to really address the two gaps. Similarly, as we will explore in Chapter 4, the current learning experiences that will help to shape the proposal will meet (some of) these criteria.

CHAPTER 4

CURRENT MODELS

> *Becoming an educated citizen means learning a lot of facts and mastering techniques of reasoning, but it means something more. It means learning how to be a human being capable of love and imagination.* (Nussbaum, 1997, p. 14).

Now that a list of criteria has been established on which to base the proposed curriculum that seeks to bridge the knowledge and the knowledge-action gaps, I wish to juxtapose the criteria with programs which exist and are applied throughout the world. This task will accomplish two aims. The first is to acknowledge certain educative programs which have informed my thinking through personal visits, the literature, and by general familiarity. The second aim is to apply the criteria to existing models to see what learning experiences that meet those criteria *actually* might look like. To accomplish both of these goals, I intend to discuss the programs based on each criterion, describing the individual program and then addressing specific criteria. Several of the programs will speak to more than one criterion given their pedagogical immersion in notions of experience and ecological literacy. The list of chosen programs is by no means an exhaustive list, rather the list simply speaks to my own experience as an educator and someone who is curious about how and why we learn and teach.

The Five Criteria from the Centre for Ecological Literacy

In order to suggest how the first five criteria have influenced my design and to apply the criteria, I looked to the Forest School movement, predominately by way of Western Europe and the UK, to inform my analysis. As the reader will note, Forest School designs and pedagogies have greatly informed my design. The criteria are taken from the Centre for Ecological Literacy (Goleman et al., 2012) and are as follows: Develops empathy for all forms of life, embraces sustainability as a common practice, makes the invisible visible, anticipates unintended consequences, and understands how natures sustains life.

Forest schools were first conceptualized in the mid-twentieth century in Scandinavia as a means to introduce young learners to notions of natural play and the natural environment itself. These schools were initially developed in Denmark by Ella Flatau as a means for giving preschoolers a chance to walk in nature — where learners are immersed fully in the natural environment. They began to further materialize in the 1970s in most Scandinavian countries, given that most curricula suggest learners do not attend school until the age of seven. The spread of forest schools throughout the rest of Europe began to transpire in the mid 1990s when teachers and administrators from the United Kingdom began to visit Danish forest schools. These visits resulted in the first British forest school, Bridgewater College, and has ushered in a movement that has witnessed the emergency of a vast network of schools throughout Wales, Scotland, and England. In terms of Canada, there is an impressive network of forest schools, as evidenced by the Forest Schools of Canada Network (2016).

Murray and O'Brien (2005), in a report designed to look at the efficacy of British forest schools, have conceptualized these schools as such: "Forest School is an inspirational process

that offers children, young people and adults regular opportunities to achieve, and develop confidence and self-esteem through hands-on learning experiences in a woodland environment" (p.11). From the literature, the principle intent of forest schools, particularly in the UK, does not deal with elements of ecological literacy. In fact, according to Elliot (2014), forest schools are designed to address issues related to behaviour, the notion of play, self-confidence, imagination and life skills, and the opportunity to experiment (p. 5). The primary goal of forest schools in certain European contexts has less to do with bridging the knowledge or knowledge action gaps, but more to do with whole-child development based on a Reggio Emilio model. Ridges, Knowles, and Sayers (2012), however, acknowledged in a study of three British forest schools that a base understanding of the natural world and curiosity about various systems which learners come into contact with was a significant finding (p. 58). Their findings concluded that:

> At baseline the children identified some elements of the natural world that captured their interest and some children reported a curiosity about specific nature and wildlife. Following Forest School, more children reported their motivation to find out more about the natural environment had developed, and they were becoming more aware of local environmental issues. For example, three of the children argued why some of the red squirrels in a pine wood located in a neighbouring area were dying, and they were able to justify the points they had made based on their own experiences. Some of the children described how they hunted (their own description) for mini beasts in their own garden and how they handled the creatures once they had found them. It was apparent that the

> skills they had learned during the Forest School sessions had been transferred into their home environment and discovery play and provided further support for the changes in their knowledge and understanding of the natural environment. (Ridges et al., 2012, p. 58)

The Canadian experience of forest schools seems to enter fully into notion of ecological literacy and addresses what Louv (2005) conceptualizes as the nature-deficit-disorder. According to the Forest School Canada website (2016), a catch-all network for all forests schools in Canada, its mission is the following:

> Our mission is to foster rich learning experiences, ecological literacy, and healthy living by connecting children to nature through the use of the Forest School model in the early, primary, and secondary years.

The Forest and Nature School Report released in June 2014 professes that a ritual outcome of experiences within its network is to establish "an on-going relationship with the land" and is heavily embedded in notions of experiential education (Carruthers Den Hoed, 2014, p. 12). FSC also suggests that programs based on this ethos have benefits related to counteracting "children's decreasing knowledge of biodiversity and the environment" and further suggests, based on the research performed by Murray and O'Brien in 2007, that "through repeated contact with the site, children acquire knowledge of the natural phenomena around them" (p. 46). The report goes on to suggest that in forest schools "much of the learning comes through child-

initiated exploration." The authors provide anecdotal evidence that the forest school experience does lead to notion of ecological literacy and the five criteria above:

[Wayne shows] improved knowledge of bugs and flowers.

Wayne's parent, New Hinksey, Oxfordshire

Chloe is certainly now more aware of the natural environment and enjoys pointing things out.

Parent's comment, New Hinksey, Oxfordshire

Leanne identifies plants and in general she seems able to name more things out of doors.

Practitioner's comment, Oxfordshire

When asked about changes they noticed in their child's behaviour that they attributed to Forest School, Greg's parent noticed that their son 'is much more concerned about wildlife and animals, and is very protective of them, particularly small animals'.

MacEachren (2013), in interviews with two forest school educators in Ontario, was able to conclude that many experiences, such as one where students were asked to spot owls, provide "an ideal learning atmosphere that allows children's curiosity to become both focused and expansive as they make connections to their own lives" (p. 226). According to MacEachren, one of the teachers' greatest goals via the forest school experience is to "try and infuse that sense of passion, inquiry, inspiration, and attachment to the natural world, with the hopes that it will have

long-lasting impacts on how we live and the kind of leaders we are creating for the future" (p. 230).

The Canadian experience of forest schools seems to build upon the original intent of the European construct and, at least through the FSC and several prominent educators, takes it further to look at the five criteria for ecological literacy as suggested by the Centre for Ecological Literacy. What is unique to these Canadian conceptualizations of forest school is the idea that ecology and systems thinking are not add-ons to the curriculum. In fact, experiences are created to situate the learner in an environment where all aspects of the child's learning is considered.

A Democratic Environment Is Cultivated

Launched in 1998 by creator Mark Springer in Wayne, Pennsylvania, *Soundings* is a program of study specifically geared for eighth graders within the middle school experience. The program seeks to offer an "integrative and democratic alternative curriculum," as a reaction to traditional schooling which was not deemed effective for many of his students (Springer, 2006, p. vii). As Springer professes, the learning at *Soundings* is "supposed to be all about the students." (p. 1). His design is a reaction to, as he claims, the fact that "the 19th century factory model of education seems once again be in ascendancy: good old-fashioned reading and writing and 'rithmetic taught to the tune of high-stakes hickory sticks" (p. 2). In order to counteract what can be perceived as a slide to a time when education was merely about rote learning and skill acquisition, Springer has developed a learning environment based on the following vision:

1. Students must have a vested interest and shared control over their learning.
2. Learning must be process and performance based.
3. Learning must be based on real-world and real-work relevance and first-hand experiences.
4. Learning must be integrative.
5. Learning methods should emphasize cooperation rather than competition.
6. Learning is better facilitated with an atmosphere of respect, concern, and support wherein the learner feels safe and comfortable.
7. The teacher's role is that of mentor and guide.
8. The teacher must model the desired behaviours and attitudes.
9. Parents and the community at large should be integral parts of the learning process.

This vision was put into practice with the Watershed program (Springer, 1994) whereby Springer and his colleague designed a learning experience that focused on hydrology and allowed middle school students to see how everything they studied connected to their local watershed. From this project, Springer developed an entire program for young people based on developing learning communities based on democracy, collaboration, discussion, mentorship, authenticity, and fundamentally the experience of the learners.

According to the school's website, this vision:

> works something like this: following a process of asking, analyzing, and grouping lots of questions, the class works together to decide which questions they most want to study. These then become our themes for the year. For each theme selected, students

> learn to set goals and objectives, develop and initiate plans to achieve those aims, present their results, and assess their performance. As they experience this process with its emphasis on both quality performance and higher order thinking skills such as analysis, synthesis, and assessment, students master essential skills and concepts from all academic disciplines and apply them to real world issues (*Soundings* website via Radnor Middle School, http://www.rtsd.org/Domain/416).

The Experience at *Soundings* speaks to democracy as characterized by Giroux (1997) where his vision sees schools as "democratic spheres, as places where the skills of democracy can be practised, debated and analyzed" (p. 119). Democracy at *Soundings*, and as we will see in other programs, is not the practise of voting, but it is the art of cultivating an environment whereby the learner has fundamental control of her questioning and reasoning. The process is fundamentally emancipatory, as the role of the teacher becomes that of an elder or guide. The community itself must negotiate the parameters of design, scope, and relevance of the work. The educator is responsible for fostering an environment where there is the freedom to experiment and question without the often oppressive forces of the institution and/or the adult. Giroux suggests that even the most progressive or well-intentioned teacher can devoid a learner of a democratic experience: "regardless of how politically or ideologically correct a teacher may be, his or her 'voice' can be destructive for the students if it is imposed on them or if it used to silence them" (Giroux, 1996, p. 142).

Opportunities for Growth Are Present

The mission of Hobsonville Point School based out of New Zealand is as follows: "To create a stimulating, inclusive learning environment which empowers learners to contribute confidently and responsibly in our changing world (Hobsonville Point School website)." Hobsonville has designed its curriculum to address notions of inquiry and citizenship and does so through a specifically designed timetable that supports what the school has described as *Big Projects* and *Passion Projects*. Based on a project based learning model that has made considerable inroads in the past few decades, Hobsonville Point suggests that the aim of these learning experiences is to educate learners in the following manner:

> larger scale, links with internal or external expertise/mentors, business partnerships, community links, encourage social responsibility & citizenship; apply learning across curriculum areas with focus e.g. Wetlands; exposure to wide range of learning experiences, scope for student participation across range of roles. (Amos, 2014, para 13).

As part of this designed inquiry, there are two types of projects which are intended to provide the learner with choice and opportunities for growth. The *Passion Projects* differ from the *Big Projects* in the sense that these projects (the former) are initiated by the learners, but still attempt to address complex problem-solving, inquiry, and citizenship. The program relies heavily on Larmer and Mergendoller's (2010) recognition that Project Based and Inquiry Learning

> is meaningful if it fulfills two criteria. First, students must perceive the work as personally meaningful, as a task that matters and that they want to do well. Second, a meaningful project fulfills an educational purpose. Well-designed and well-implemented project-based learning is meaningful in both ways. (p. 34)

Based on the blogs of two educators at Hobsonville Point Secondary School, Sarah Wakeford (2015) and Claire Amos (2014), the experience created for learners is based fundamentally on the experience and curiosity of the child coupled with mentorships and learning networks which support the inquiry and promote a rigorous environment. The projects extend from social justice causes, to wetland ecosystem research, and community engagement. There is clearly a purpose behind the design of these experiences and they speak to notions of democracy, growth, and a continuity of experiences. Additionally, the learners are asked and encouraged to relate their experiences with the world. The learners go through a process of problem-posing for the purpose of creating meaningful solutions for a sustainable and just future. The educational experience, that of the two inquiry projects, allows the learner to use his experience to enter into periods of cognitive dissonance and growth. There is an apparent reliance on both social and political conceptualizations of experience, as proposed by Dewey and Freire, respectively.

Change in Direction of the Learner's Attitudes and Behaviour is Evident

Located in Estes Park, Colorado, Eagle Rock School is a reaction to traditional frameworks of schooling in the United States and takes often marginalized and vulnerable

learners who do not have a tradition of success in the aforementioned educational construct. The school characterizes itself as such:

> An Eagle Rock student has the desire and is prepared to make a difference in the world. Eagle Rock has a positive effect on schools in the United States. Eagle Rock is a value-driven school. A fundamental philosophy, 'Eight Plus Five Equals Ten,' has animated Eagle Rock since its inception. The eight themes, five expectations, and ten commitments shape daily living; they are the source and purpose of ongoing conversations (www.eaglerockschool.org).

Established in 1993 with funding from the American Honda Education Corporation, the school is aimed exclusively at students who have dropped out of traditional learning environments. The eight themes professed in its mission statement look at frameworks for environmental stewardship, service to others, intellectual discipline and cross-cultural understanding. These themes drive the five expectations which emphasize developing an expanding knowledge base, communicating effectively, creating and making healthy choices, participating as an engaged global citizen, and providing leadership for justice. These themes and expectations then focus on critical commitments that all members of the learning community must make:

1. Live in respectful harmony with others
2. Develop mind body, and spirit

3. Learn to communicate in speech and writing
4. Serve the Eagle Rock and other communities
5. Become a steward of the planet
6. Make healthy personal choices
7. Find, nurture, and develop the artist within
8. Increase capacity to exercise leadership for justice
9. Practice citizenship and democratic living
10. Devise an enduring moral and ethical code

The success of the school is profound, as 90% of the students end up graduating (Brown Easton & Soguero, 2011, p. 28). The school and the teacher education aspect of the school fundamentally challenges four assumptions which many educators take for granted. These assumptions are (Brown Easton & Souguero, 2011 pp. 30-33):

1. Adults must create, maintain, and improve schools.
2. As it once was, so it shall forever be in terms of time, credit, and graduation.
3. Schools need to organize learning according to content areas.
4. School doesn't need to change

In fact, Eagle Rock turns these assumptions on their head by providing a democratic approach to learning. Students choose when they wish to graduate, learning experiences are based on student-proposals, and students are woven into all aspects of school life, including the

selection of staff (Brown Easton, 2005, p. 54). Like many of the other schools discussed in this chapter, Eagle Rock students are required to present their findings of their projects, work with peers, and collaborate with experts in the field. Learners at Eagle Rock learn to learn. They gain valuable skills in terms of the creation of their own knowledge and they "understand that they are in charge of their own learning but also know that they have great support and wonderful flexibility in deciding how to learn and demonstrate learning" (p. 55).

Interaction between inner and outer conditions are continually at play

Riverpoint Academy, located in Spokane, Washington, is a STEM school and design-based environment created in 2012. Closely connected with Washington State University, which is currently entering its fourth year of a research project on Riverpoint, the school allows students to "take on real-world challenges and, using a design process to develop solutions, actually work on them" (Riverpoint Academy website). At the school there are no traditional classrooms and students meet each morning in a massive hangar to review the plan for the day. According the Education Lab Blog (2014), "students spend four hours on 'Human-centered Design' which includes a half credit of social studies and environmental science," and then the rest of the day on "'Inventioneering,' which includes English, science, computer coding, and social studies." The only traditional class taught at Riverpoint Academy is mathematics.

Based on similar models as High Tech High (I will speak to HTH in a moment), Riverpont Academy stresses connections and dialogue with adult experts who help guide students through their inquiry. One specific program at the school, labelled Sustainapreneurship, focuses projects on design-thinking but from a holistic perspective. According to the website of

the team teachers, Sustainaprenuership “is a radically collaborative effort between” teachers and students and focuses on “sustainability, human-centered design and entrepreneurship, and a humanities approach to design thinking” (Drew, 2014). While the program focuses heavily on STEM-based curricula, students are asked to address problems from an interdisciplinary framework and develop solutions which speak to how humans interact with each other, other species, and various systems. The work students do is authentic, public, and collaborative - not only with other students, but with community partners.

Dialogue between learners, elders, and the community is an essential element for learning

Based on the original MET School in Providence, Rhode Island, (www.metcenter.org) this design creates mentorships between elders in the community and the learners and is fundamentally focused on the experience and growth of the child. The learners work on large inquiry-based projects throughout their tenure at the school while going out into the world and learning from experts in the field. The model has been established in Winnipeg, Manitoba at the MET School at Garden City Collegiate. The Winnipeg school describes itself as:

> The Met School engages students in their learning through creative and challenging academic work and through internships that provide real world learning opportunities. Our students have the responsibility to contribute to our school and their internship site with projects related to the curriculum. Students start in the Met School exploring their interests, examining career connections and doing research on our city. They develop resumes, work on their interview skills and arrange to interview people who work in the

> field of their interest. With the assistance of their advisors (teachers) and the support of parents, our students find internship placements in the community.
>
> (Seven Oaks School Division, 2015).

What is of interest from this framework for the proposed curriculum is the mentorship program, or the role of the adult/elder. Illich (1971), in Chapter 6 of *DeSchooling Societ*y, emphasizes the creation of knowledge networks and the role of parents, experts, and what amounts to a rolodex of adult educators in the lives of young people. Hassan, an instructor at Red River College, decided to become a mentor to a student at the MET school. The decision not only enabled a student to learn about pharmacy from him, but as Hassan states: "I personally think that the rewards of getting involved in this type of work are well worth the effort. Student motivation and commitment affect me directly and it is not something I could simply wish away" (2013). Two days a week, students and elders from the community come together to answer critical questions about self and the world around them.

Furthermore, the school design offers a radical new learning environment for students who cannot effectively access learning in traditional environments. According to Pearson (2012), the "MET school is designed for students seeking an alternative learning environment in which to pursue their passions". Parents, the community, teachers, and the students commit to learning in the field for four years and develop solid relationships based on the experience and inquiry of the learner.

On a recent visit to the MET School in Winnipeg, I was struck by the dialogue between learners, elders, and mentors within the community. As I traveled from room to room, I engaged

learners (or more often than not, they engaged me) in discussions related to their learning. My inquiry led to other learners becoming involved in our discussions about particular areas of inquiry and work. The students challenged each other's assertions and the teacher was used as a sounding board for these arguments. Furthermore, the learners were able to take their conceptualizations into the community and interact with mentors to test their new understandings. This mentor-elder-learner relationship appeared to be critical to the growth of the learner and leads to impressive opportunities for reflection.

Reflection and time and space for reflection are considered paramount to learning

Dewey (1916) suggests that reflection is not merely something we do, but that the practice of reflection is done "overtly to bring about the anticipated result" (p. 115). Later, Dewey (1933) suggests that "reflection is active, persistent, and careful consideration of any belief or supposed form of knowledge" (p. 9). Wong, Kember, Chung, and Yan (1995) conceptualize reflection as a process by which "students integrate theory with practice, appreciate the world on their own behalf, and turn every experience into a new potential learning experience" (p. 48).

Based on these understandings of reflection, the criterion speaks to a purposeful and active inquiry on one's own learning, action, and position. Moreover, the reflective practice I speak to is a two-pronged approach where the individual is thinking through aspects of a problem whilst in the situation, and reflection-on-action which occurs afterwards. To explore and test this criterion, I will refer to two programs. The first is the notion of four-point reflection, a commonly used methodology to help learners access and deconstruct they experiences. This is

currently employed at Royal Roads University in Victoria, British Columbia and incorporated into the Leadership program at St. John's-Ravenscourt School. Secondly, I will comment on a reflective program which my teaching partner and I have created with a combined Global Issues and English Language Arts class.

The four-point reflection design, originally conceived at Royal Roads University within its Educational Leadership program and now adapted by the Leadership program at St. John's-Ravenscourt School in Winnipeg, Canada, is based on Kolb's (1984) experiential learning cycle, where reflection observation is a central cog in the notion of experience and learning. The reflection design at St. John's-Ravenscourt is based on four critical questions posed to the learner:

1. What is the experience?
2. How could you improve?
3. What did you do well?
4. How have or will you change because of this experience? Set a goal to move forward.

Points 3 and 4 speak to linking the experience of the learners with their investigation and search for truth. From there, learners are able to set critical goals for where they need to go in terms of knowledge acquisition, changes in attitudes and behaviour.

In my own practice, my teacher partner and I have used reflection as a means for students to critically analyze what they are doing within a process of learning and following experience. We have recently created a unique course at St. John's-Ravenscourt School in Winnipeg, Canada,

which blends to new Global Issues curriculum and the Grade 12 English Language Arts curriculum. The ten themes within the Global Issues curriculum have been embedded in the reading, thinking, and communication which we do on a daily basis. As part of the learning experience, students are asked to create Wordpress sites where they can speak about and blog about what they read on a weekly basis. Through Wordpress, learners are able to create a closed-circuit social network where they are alerted when some in the group as posted a reflective piece. The other learners and elders are then able to comment on the reflection of a colleague. At the end of each term (approximately three months), the students are then asked to reflect on the totality of their reflections as this often leads to research questions, the formations of arguments, and eventually to what is known as the Take Action Project (TAP). The TAP allows students in Manitoba to apply their learning and via praxis, test their ideas in authentic ways. TAP is the initial stage of praxis.

Praxis is considered a key element to learning

High Tech High in San Diego, like the MET School, uses the notion of praxis as a critical piece for teaching and learning. Like the MET School, High Tech High is a multi-disciplinary education community whereby traditional academic silos are dissolved and a cross-disciplinary environment is created, where students are able to create research questions which inevitably cross the boundaries of specific bodies of knowledge. Coupled with this, students are required to interact with the community in the form of internships where they can apply their new knowledge in ways that are of interest to them.

At the end of each term, the learner is also tasked with a public exhibition of his work. The community is invited to come to exhibition evenings and listen to the findings of the learners. This public display of knowledge creates an authentic and rigorous challenge for the learners, whereby the motivation for inquiry and excellence is both intrinsic and extrinsic. The stakes are high and the learner must ensure what she has created is logical and meaningful to a greater audience. HTH refers to and conceptualizes praxis, authenticity, and adult world connections as such:

> HTH students connect their studies to the world beyond school through field studies, community service, internships, and consultation with outside experts. Students routinely create work for authentic audiences and exhibit that work in professional venues. All high school students complete substantial internships in the world of work and service, where they develop projects that contribute to the workplace.

Praxis at HTH becomes an extension of what happens within the learning community and provides a space for students to interact with the larger community, experiment with their ideas, and reflect, both during the learning and following, on what they could do better and the impact of the experience on them.

Conclusion

The programs and learning experiences described in this chapter are by no means an exhausted list of the incredible learning opportunities envisioned and practiced throughout the world. These, however, caught my attention based on my professional learning network and due to my view that these programs and experiences show many of the critical elements for developing ecological literacy which have informed the criteria described in Chapter 3. This is not to suggest at all programs fulfill all criteria, in fact none of them do, but they do provide examples on what program could look like that address successfully the criteria developed in Chapter 3.

Immersing learners in the notion of place is not a new concept, but is beginning to be become common place throughout the West. From the farm experience created at schools like Hotchkiss School (see the Hotchkiss School Farm website: http://www.hotchkiss.org/abouthotchkiss/environmental-initiatives/farfield_farm/index.aspx) in Connecticut to the Fort Whyte Outdoor School program (CBC, 2014, http://www.cbc.ca/news/canada/manitoba/fort-whyte-launches-outdoor-school-pilot-program-1.3438001), there is a desire on the part of educators and parents to create learning communities which have ecosystems and learning at their core. It is this very idea that has prompted, in part, the utopian curriculum proposed in Chapter 5.

CHAPTER 5

WHOLE ECOSYSTEM EXPERIENCE SCHOOL

Change the game. Transform the impossible into the improbable — and then make it happen. (Denton, 2012, p. 154)

The Whole Ecosystem Experience School (WEE School), the curriculum and experiences designed to help bridge both the knowledge and the knowledge-action gaps, provides learners with experiences embedded within specific ecosystems located in Manitoba and surrounding jurisdictions. The School is designed as a means to entrench elements of ecological literacy within the day-to-day interactions and activities of learners via a cycle. This cycle consists of situating each learner within these various whole ecosystem research environments on an eight-week basis. Issues related to student demographics, location of hospitals, commitment to sports teams, minor logistics, and other constraints are acknowledged, but will be set aside for the purposes of this utopian experience. This curriculum is also intended to allow learners to explore a variety of areas of inquiry and application, which may not be mentioned specifically. The following experience is a glimpse into how an immersion in a specific ecosystem triggers inquiry and results in profound revelations, reflections, and applications of knowledge. The proposed curriculum is also intended to trigger new ideas, debate, and possible extensions on the part of the reader. As such, the possibilities for where this curriculum can go and where they inquiry of the learner might lead are endless. The curriculum is driven by scientific inquiry and supported

by the Humanities. In this case, the Humanities manifest themselves through literature, but this does not preclude possibilities for other avenues of expression.

WEE School is a design that situates senior school-aged learners in a variety of research field stations throughout Manitoba, Saskatchewan, Nunavut, northwestern Ontario, and North Dakota - representing the various ecosystems, drainage basins boundaries, physiographic regions, and landmasses which impact Manitoba, ecologically, socially, politically, and economically. Learners spend eight weeks in each ecosystem on a rotational basis. These rotations take them into wetlands, boreal forest, arctic environments, Precambrian shield, traditional prairie, urban areas, First Nations communities, and a variety of mixed-ecosystem areas. For each rotational location, a designated research station has pre-existed or has been created in collaboration with research organizations, like the International Institute for Sustainable Development, and/or local universities.

The purpose of WEE School is to provide learning communities with educative experiences which will lead to transformation whereby the learner will think with systems in mind and will be able to take action through an evolving ecological literacy. By using the experience of the learner, educative experiences are designed and fostered so that the individual learner begins to think about how she is related to countless systems on Earth.

To properly outline what takes place and how learning is framed at W.E.E School and the philosophical and pedagogical underpinnings, we will examine one ecosystem specifically. This specific WEE School ecosystem is located at the Experimental Lakes Area (ELA) research facility located east of the town of Kenora in northwest Ontario. The ELA is situated in a relatively remote part of the Precambrian Shield and includes access to 59 research lakes

designed for whole ecosystem research on research questions such as hydrology, climate, fish species, and how human actions affect whole ecosystems. The research conducted at the ELA examines the big picture impact of human behaviour on the smallest systems.

In order to adequately explain the WEE School in totality or via one specific ecosystem experience, it is important to establish the curriculum based on a model or models which focus on objectives, resources, assessment, and personnel — elements which are required for curricula and educational programming to have any meaningful substance. As such, Tyler (1949) and Schwab (1973) will form this framework as both models help curriculum designers navigate goals, experiences, learners, and assessment with clarity and purpose.

Tyler and Schwab

Tyler's (1949) model of curriculum was chosen as a basic structure as it address four essential elements to curriculum design: having clear objectives for learning, selecting (and designing) learning experiences aimed at achieving these objectives, organizing said experiences for maximum effect, and finally evaluating these experiences to determine if they indeed did achieve the outcomes. Tyler's framework is pragmatic in the sense that it allows educators and learning communities to carve out a basic framework for why one might educate and a broad understanding how one educates. What is missing is the inclusion of the learner in this model, so for this I have drawn in Schwab's (1973) model to fill the gaps left by Tyler.

In Schwab's model, five critical elements are put forward as a construct for curricula. These include subject matter, learners, milieus (or contexts), teachers, and the act of making curriculum. While Schwab places heavy emphasis on subject matter, the learner and the

interaction of the learner with place, subject, matter, and the members of the learning community become critical essential for learning and achieving outcomes. As such, Tyler and Schwab are employed to compliment two streams of curriculum design - one very pragmatic, and the other focused on experience. What I attempt to do below is to meld these design models so as to provide a balanced framework that is focused on clear objectives, well-designed experiences, learner-centered environments, rigorous subject matter, and meaningful assessment.

Educational Purposes (Tyler)

The overarching purpose of WEE School is to close the knowledge and knowledge-action gaps discussed in previous chapters and by creating ecologically literate learners who are properly positioned to create sustainable and meaningful solutions for societal well-being. In order to achieve these macro objectives, general learning outcomes coupled with specific learning outcomes must be clearly established and directly and casually related to the learning experiences so they can be assessed in a manageable and meaningful manner. These specific learning outcomes will be addressed when I discuss subject matter (see specific learning outcomes for each subject matter below.)

Subject Matters (Schwab & Orr)

> *There must be someone familiar with the scholarly materials under treatment and with the discipline from which they come. Suppose the materials under consideration are historical; then a member of the group must be familiar not only with this body of historical material but must also know what it is to be a historian. (Schwab, 1973, p. 503)*

The WEE School is a multidisciplinary learning environment dependent on a variety of bodies of knowledge. These bodies of knowledge form the epistemological core of what learners will navigate, engage with, and ultimately contribute to throughout their journey. The teachers will need to have expertise in many, but not all areas, and will need to work collaboratively with each other to ensure that the subject matter is presented, engaged with, manipulated, and built upon in a rigorous manner. The subject matter in this case will be borrowed from Orr, who offered the following as a foundation of subjects towards an ecological literacy, but specific learning outcomes for the Experimental Lakes Area location are offered for each. The general learning outcomes are those set out by the Centre of Ecological Literacy and are assigned to each rotation, so they are not ELA specific.

Table 4

General Learning Outcomes (GLOs)

Develop empathy for all form of life
Embrace sustainability as a community practice
Make the invisible visible
Anticipate unintended consequences
Understand how nature sustains life

Table 5

Specific Learning Outcomes (SLOs)

Learners will be able to . . .
. . . articulate the laws of thermodynamics in theory and also reflect on how they are applied at ELA.
. . . demonstrate a knowledge of local flora and fauna, species diversification, weather patterns, bodies of water, etc. and articulate how all systems are connected together.
. . . demonstrate an understanding of the concept of carrying capacity and will be able to articulate it within the context of a specific ecosystem and the planet itself.
. . . describe in theory and in application how energy is transferred throughout an ecosystem -- from the sun all the way to their dinner plate at ELA.
. . . learn about the principle of least cost, end use analysis and then be asked to apply it theoretically and practically throughout their rotational experience and policy development.
. . . demonstrate that for many ecological issues, solutions need to move beyond new technologies.
. . . delve into the smallest systems and organisms while witnessing how they all are dependent each other in the larger ecosystem. They will be able to analyze systems, institutions, and organizations based on scale and predict consequences.
. . . engage in sustainable farming practices through the cultivation of indigenous foods. The learners will be able to make ethical decisions regarding the use of the forest as a resource.
. . . describe the basic principles of steady-state economics with reference to freshwater use and climate.

Learners will be able to . . .
. . . enter into ethical discussions related to mitigating the ecological crisis, relying heavily on their understanding of ecology, the laws of thermodynamics, energetics, and the other subject matters encountered.

The laws of thermodynamics. Orr (1992) argues that the Brundtland Report sent us down a path of misinformation in terms of our conceptual understanding of what sustainable development really means (p. 27). The Report, according to Orr, made sustainable development synonymous with economic growth. This thinking is highly problematic given that we live on a planet where resources are finite. Orr argues, as would the entire scientific community, that "Because growth cannot be sustained in a universe governed by the laws of thermodynamics, we must confront issues of scale and sufficiency" (p. 27).

The laws of thermodynamics to which Orr refer turn notions of traditional conceptualizations of economic growth on their heads. Of the four laws of thermodynamics, the main emphasis should concentrate on the fact that energy and matter cannot be made or destroyed, and that secondly, when matter is used, it moves from low entropy to high entropy - that is from ordered matter into waste. An example of this would be the burning of oil (low entropy) which then creates greenhouse gas emissions (high entropy). This process, under the unlimited growth conceptualization of 20th century economic theory, has pitted our existence and that of other species and systems against the laws of physics.

It is critical that the learners at WEE School have an in-depth understanding of the laws of thermodynamics and the conservation of energy if they are to engage in critical questioning

and discussions related to infinite growth. They will no doubt be exposed and have been exposed to arguments suggesting that we must continue our dependence on fossil fuels, for example, as straying from this will cause catastrophic and irrevocable damage to our economy and modern civilization. These arguments have permeated Western culture for generations, and learners will need careful guidance as they come to understand that the structure and nature of our universe cannot sustain our current conceptualization of growth and economic progress.

SLO: *Learners will be able to articulate the laws of thermodynamics in theory and also reflect on how they are applied at ELA*. Learners will reflect through their writing and conversations with elders about how within a specific ecosystem, energy is not destroyed or created, but part of a network that sustains life. Learners will also be able to describe why these laws are critical when looking at solutions to consumption and waste.

The basic principles of ecology. Ecology, at its essence, is the study of various organisms and how they relate within a specific environment or networked environments. Capra, through the Centre for Ecological Literacy (Stone, 2012), condenses the principles of ecology into five key foundations for which learners are to make decisions related to their individual and collective actions. These are:

1. Matter cycles continually through the web of life.
2. Most of the energy driving the ecological cycle flows from the sun.
3. Diversity assures resilience.

4. One species' waste is another species' food.
5. Life did not take over the planet by combat, but by networking.

Understanding these key principles goes beyond conventional learning of the ecological cycle in the Grade 10 science textbook used in Manitoba. These principles of ecology, as outlined by Capra, force the learner to not only see the planet as a series of complex and interconnected systems, but also pushes the learner to view life in both its poetic simplicity and its vast and miraculous state of being. In my teaching of the Global Issues course in Manitoba, my Grade 12 students are often astounded by the fact that most energy is created through photosynthesis and that this energy cannot be destroyed. This understanding allows them to fully realize how dependent they are on this process of photosynthesis, on the plants around them, and how other species will require their energy when they are dead. At WEE School, these basic principles of ecology are compounded as learners are able to collect and observe data of how complex systems are interconnected, how these systems are powered by the sun, and how the diversity of species in lakes— if we take the ELA rotation as an example—is critical for the health and wellbeing of the entire ecosystem.

SLO: *Learners will demonstrate knowledge of local flora and fauna, species diversification, weather patterns, bodies of water, etc. and articulate how all systems are connected together.* At ELA, learners will be able to describe key features of the boreal forest, for example, and observe causal relationships between it and the state of various lakes (and vice versa).

Carrying capacity. Orr (1992) describes carrying capacity as "the total population times resource-use level that a given ecosystem can maintain" (p. 27). On a global scale, this would equate to what Franck, Bloh, Mûller, Bondeau, and Sakschewski (2011) describe as "the maximum number of people that can live on the food and other resources on planet Earth." (p. 2019). The Earth's carrying capacity has been estimated anywhere between 11.5 billion to over 200 billion people. Franck et al. (2011) conclude that K, or the planet's carry capacity, is between 31 and 28 billion people if we all became vegetarians (p. 2025). This massive scale lends itself to a variety of factors, namely the wellbeing of humans within these populations and assuming that things like photosynthesis, nitrogen, and other cycles operate in consistent manners. These estimates also vary in terms of whether humans will continue to eat animals and whether or not we take all forest lands and turn them into pastures.

Regardless of what estimations are considered, it is critical that learners at WEE School understand that each ecosystem they investigate has a carrying capacity and that this carrying capacity, in the natural world, is often mitigated by the ecosystem itself. On a global scale, learners must begin to tackle the reality that the planet's resources may be indeed exhausted due to human population and human activity. Learners must contemplate how and why humans have been prolific in terms of population growth and understand that there are implications to this growth.

SLO: *Learners will demonstrate an understanding of the concept of carrying capacity and will be able to articulate it within the context of a specific ecosystem and the planet itself*. The learner will be able to reflect through writing and discussion about the ethical debate surrounding

carrying capacity and how our species moves forward. Learners will demonstrate a proficiency to analyze various conceptualizations of carrying capacity and various solutions; from half-earth solutions to estimates of population curbing.

Energetics. Energetics is the investigation into how energy is transformed and how it flows. It is critical that learners gain a knowledge of how energy is transferred from the sun, predominantly, to systems, and finally to whole ecosystems. Learners will need to understand how energy is conserved and how what we deem as waste might in fact be energy for another system or species.

SLO: *Learner will be able to describe in theory and in application how energy is transferred throughout an ecosystem -- from the sun all the way to their dinner plate at ELA*. Learners will be able to enter into discussions about energy transfer and how many kilocalories various species require to survive and flourish, and what happens when these cycles are compromised either naturally or unnaturally. Learners will be able to reflect through their writing on how they encounter specific ecosystems and how they depend on all systems for life.

Least-cost, end-use analysis. Made popular by Amory Lovins and the Rocky Mountain Institute, the concept of least cost, end use analysis suggests that rather than looking at the supply side of resource allocation, we first must examine demand. What is it that people want? Lovins argues that when designing processes or accomplishing a task, it is more efficient to look at the ends or the final desired outcome and then determine how much energy is required, what kind of

energy, and from where this energy will come (Lovins, 2015). In a 2005 article in *Scientific American*, Lovins speaks about least cost, end use analysis by way of transportation. Lovins makes a few assumptions. The first assumption is that nearly two thirds of carbon emissions in North America come from vehicles. The second assumption, however, is that travelling by car is also more efficient than the alternatives. So the end use analysis suggests that vehicles do serve an important purpose, but there are better ways to use resources. Lovins offers a response:

> Yet the solution is obvious from the physics: greatly reduce the car's weight, which causes three fourths of the energy losses at the wheels. And every unit of energy saved at the wheels by lowering weight (or cutting drag) will save an additional seven units of energy now lost en route to the wheels. Concerns about cost and safety have long discouraged attempts to make lighter cars, but modern light-but-strong materials--new metal alloys and advanced polymer composites--can slash a car's mass without sacrificing crashworthiness (Lovins, 2005, para 14).

SLO: *Learners at WEE School will demonstrate an understanding of the principle of least cost, end use analysis and then be asked to apply it theoretically and practically throughout their rotational experience and policy development.* For example, students at ELA might be asked how Manitoba might mitigate the eutrophication of our lake systems, given that the end use of phosphorus is ultimately to feed humans. How might we make this system more efficient?

Limits of technology. Technology cannot extend the carrying capacity of the Earth nor the amount that we consume. While technology can create greater efficiency, as described by Lovins (2005), according to Hueseman (2003), "unless growth in both population and consumption is restrained, these technological improvements only delay the onset of negative consequences that, as a result, will have increased in severity, thereby reducing our freedom to choose satisfying solutions" (p. 21). Learners will gain the understanding that in order to create sustainable communities, there needs to be a significant change in attitudes and behaviour and that elements of the current western economic system will have to be replaced with ecologically responsive strategies.

SLO: *Learners will be able demonstrate that for many ecological issues, solutions need to move beyond new technologies*. Learners will be asked to investigate issues related to freshwater use, climate change, biodiversity, ocean acidification, nitrogen cycles, etc. and hypothesize about solutions which look at social, political, ethical, economic, and emotional side of a problem. This process will ask learners to not only use what they know of the natural sciences to determine what problems exist, but to use the social science methodologies and the humanities to think creatively about how we might change human attitudes and behaviour.

Appropriate scale. The learning experiences provided by the WEE School provide learners with the appropriate ecological scale necessary to observe and discuss how human activity can be either destructive or beneficial to whole ecosystems. By appropriate scale, I refer to what Orr (2011) considers as the necessity to understand that small is often better than big. He

argues that as a system, organization or institution becomes larger in scale, it becomes more difficult to predict human error in the system, the organization or institution (p.108). According to Orr, “grand scale creates islands of ignorance, small things that go unnoticed, and costs that go unpaid" (p. 107).

The ability to scale, to see the big picture, is just as important as determining that perhaps the scale of urban centres is too large to support sustainable living. From an agricultural and forestry perspective, appropriate scale allows the learner to identify what resources must be protected, how much use of land is too much, and how energy can be returned to the systems which provide us with food and air to breathe.

SLO: *At ELA, learners are able to delve into the smallest systems and organisms while witnessing how they all are dependant each other in the larger ecosystem*.

Sustainable agriculture and forestry. According to Peter Singer, in 1994 the United States consumed over “100 million cows, pigs and sheep,” and five billion chickens were slaughtered (as cited in Sterba, 1995, p. 19). Even when we put aside moral and ethical questions surrounding this activity, it is clear our planet cannot sustain the “production” of these animals given the amount of resources required. The role of technology to create feed versus food also places limits on how we grow food and sustain life on this planet. According to Orr (1992), conventional agribusiness-type agriculture “destroys soil, biological diversity, farmers, and farm communities as if these were simply replaceable industrial components.” (p. 171). The industrial

farmer, according Orr, attempts to mitigate the loss of top soil and poor yields by applying more pesticides, chemicals, and practices which fundamentally puts the land at risk.

Sustainable agriculture, however, applies the principles of ecology and the laws of thermodynamics ensuring that at each stage of food development energy is returned to the soil, resources are used at maximum efficiency, and that the ability to produce more food in the future is not compromised. Similarly, sustainable farming is viewed as a natural process and one which replenishes itself through natural systems. At all WEE School locations, sustainable farming and food growing will be developed to help students understand which foods grow within each specific ecosystem and how these specific ecosystems sustain this type of growth. From prairie, to subarctic, to boreal forest, the learners will be tasked with growing food for their communities and ensuring that this process is maintained for generations to come.

SLO: *Learners at ELA will be able to engage in sustainable farming practices through the cultivation of indigenous foods*. *The learners will be able to make ethical decisions regarding the use of the forest as a resource.* This would include the growing of various berries, mosses, wild rices, and herbs. Learners will be challenged to imagine how they might be able to grow their own food in other locations, specifically in urban or arctic centres.

Steady-state economics. To be sustainable, any economy cannot surpass the limits set out within the laws of thermodynamics or the basic principles of ecology. Simply stated, an economy cannot outgrow the ecological limits of an ecosystem or the biosphere without fundamentally compromising the survival of those systems. It is also critical to understand, as

Daly (1991) suggested, that "growth is not synonymous with betterment" (p. 1). Learners at WEE School will be introduced to the concept of steady-state economics as a means to have them question conventional views on resource distribution, a view firmly embedded in Western education, religion, and society. Steady-state economics takes into account the costs of growth and asks learners to envision an economy that does not grow or only grows slightly while ensuring that basic needs are met.

SLO: *Learners will be able to describe the basic principles of steady-state economics with reference to freshwater use and climate*. The ELA has been collecting data on climate and freshwater flow for over four decades and learners will be able to use this data to determine tipping points in consumption and waste.

Environmental ethics. According to Sterba (1992), environmental ethics helps us answer the following question: "What does morality require with respect to the particular environmental problems that we face?" (p. 1). To answer any ethical question related to human behaviour and attitudes drives at the dichotomy between "do's" and "do not's." From an environmental perspective then, learners at WEE School will be engaged in facilitated discussions related to their own moral reasoning concerning how they operate as a small yet key entity within the web of life on this planet. The learning community will be engaged in a discussion as to what is the right thing to do when we understand conceptual underpinnings like the laws of thermodynamics and the basic principles of ecology. It is these discussions on what is right and wrong when creating public policy that will lead learners to close the gap between their knowledge of the

ecological crisis and their ability to do something about it. Not only will learners understand how they are implicated in perpetuation of the decline of the nine planetary boundaries, but they will be able to see their individual and collective actions and determine what is right and wrong, balancing a wide range of variables and systems. Some discussions might lead to utilitarian understandings of morality while others might stray to more categorical understandings of morality, but the emphasis will be on the process of balancing costs to systems, people, and the biosphere itself.

For example, learners might be asked whether or not sport utility vehicles should be banned or whether or not all fossil fuels should be kept in the ground. Understanding the laws of thermodynamics and the basic principles of ecology will provide them with a base conceptualization of the limits on the planet while providing them with an opportunity to contemplate how their decisions might play out in the public sphere. Orr suggests this type of exercise allows learners to explore the idea of virtue (1994, p. 62). Orr looks at virtue from an etymological perspective and argues that virtue "is a product or reason" and that this exercise in reason leads to what Aristotle might call moderation. To be virtuous is to imply that one takes into account implications of behaviour, costs of actions, and ideas like honesty, restraint, and courage, as opposed to impulse and other "don'ts". Learners will explore what virtue is in the present and in the context of sustainability, while arguing consequentialist or categorical reasonings for their positions on how to mitigate the ecological crises. Whatever stance they take, it will be bathed in the fundamental recognition that they are dependent on all livings things on the planet and that their attitudes and behaviours might have to change in order for them and the species to survive.

SLO: *Learners will be able to enter into ethical discussions related to mitigating the ecological crisis, relying heavily on their understanding of ecology, the laws of thermodynamics, energetics, and the other subject matters encountered.* These discussions at ELA occur at meal time, in the research boat, in the lab, and through reflective writing. Learners should be able to take what they have learned about the complexity and interconnectedness of systems to create meaningful arguments and potential policy.

Orr (1994, p. 14) also makes reference to a sub series of skills learners should master in order to gain competency in what he calls "living well in place". These include: "growing food; building shelter; using solar energy; and a knowledge of local soils, flora, fauna, and the local watershed" (p.14). The specific WEE School rotations, depending on specific locations, place varying focus on each. The Experimental Lakes Area location, for example, places a tremendous emphasis on ensuring that learners gain a significant understanding of the soil, flora, fauna, and watershed of the ecosystem, but places a reduced emphasis on growing food, given the limitations of what can be grown within the Precambrian Shield.

Further to these bodies of knowledge, students will also be required to engage in learning that is based on numeracy, computation, and literacy in a variety of languages. As much as possible, the learning of numeracy and literacy skills will be done in collaboration with field experiences, but there will inevitably be times when learners will have to come in from the field to develop specific skills. Numeracy in this context refers directly to the mathematical knowledge required to collect, test, and analyze data. In terms of literacy, the humanities play an essential role within achieving the outcomes and adhering to the criteria of an experience

designed to bridge the two gaps. As such, learners will engage in a variety of texts, both fiction and non-fiction, as a means to develop the imaginative narrative required to develop empathy for all forms of life. Similarly, learners will be required to reflect on their experiences and will need to communicate this reflection a in a variety of ways. In both contexts, both numeracy and literacy, elders will be required to scaffold the level of each learner depending on skill level.

Learners (Schwab)

> *There must be someone familiar with the children who are to be the beneficiaries of the curricular operation (Schwab, 1973, p. 502).*

The learners at WEE School will have completed Grade 10 and are entering either Grade 11 or 12. Grade 10 was chosen as a prerequisite for the School as the learners will be coming with a general understanding of scientific method and also a familiarity with ecology, physics, biology, and chemistry (Manitoba Education, 2001.) The learners will also have a significant exposure to the Liberal Arts, particularly with notions of sustainable development, human rights, and ideology from the Grade 9 Canada in the Contemporary World curriculum. (Manitoba Education, 2009). Having said this, experiences at WEE School take into account that learners come from a variety of environments and contexts, and as such, there are no prerequisites per se. As will be noted, the educators will assess prior learning and the pre-existing experience of each learner to ensure that each subsequent experience is educative.

The Milieus, Resources, & Learning Experiences (Tyler & Schwab)

> *References to community suggest a third body of experience which should be represented in the curriculum-making group: experience of the milieus in which the child's learning will take place and in which its fruits will be brought to bear. The relevant milieus are manifold, nesting one within another like Chinese boxes (Schawb, 1973, p. 503).*

Prior to leaving for the Experimental Lakes Area, learners, educators, parents, scientists and technicians come together as a group to actively engage for the purpose of developing the learning experience. Immediately, the learners are aware that all adults, including their parents, are actively involved in the learning community and that all adults are viewed as elders, mentors, and co-learners. As well, the learners realize that there is an expectation in terms of personal interaction with the entire community - the scientists, technicians, and educators expect and demand professional behaviour, that of a researcher. Ideally, the learners pick up on this immediately, and begin to communicate with the elders in a professional and engaged manner. The parents are involved at the onset, as they will be responsible for providing support to the learners while they are away from home and by engaging the learner in the literacy necessary for transformation to occur. By literacy, parents will be asked to engage in pre-activities which seek to introduce the learner to some of the texts that will be read as a community and also to some of the content as outlined by Orr. It is critical that parents become part of the learning community and that the learners come to each rotation prepared with some of the basic literacy.

At this preliminary meeting, the learning community discusses the eight-week experience about to unfold. The scientists discuss the research projects they are currently exploring and

begin to engage the learners in why ecosystem research is paramount to creating sustainable communities. The learners are then asked to think about what research questions they might develop during their time at ELA. For the most part, most learners cannot begin to create these questions, as their experience is limited in terms of the landscape of ELA, experiential and project-based learning, the notion of whole ecosystem research, and the consequence of their own actions on certain ecosystems. (This level of thinking depends on how many rotations each learner has already completed.)

It is also at this point that the educators introduce a text that the entire learning community (learners, educators, parents, scientists, cooks, etc.) will read together in order to begin to develop an understanding of the concept of systems thinking and for the group to engage in a reflective conversation about their individual and collective relations and connections with the systems on which they depend. The texts are also chosen to provide an opportunity for learners to imagine the plight of other species and systems and to begin to develop and environmental empathy. The choice of text is chosen from, but not limited to, the following texts:

- Peter Denton's *Gift Ecology* (2012) - Systems thinking, the limits of technology, environmental ethics.
- Fritjof Capra's *The Web of Life* (1997)) - Systems thinking, basic principles of ecology, energetics.
- Rachel Carson's *Silent Springs* (1962) - Ecology, Systems thinking, Environmental ethics.

- Ernest Callenbach's *Ecotopia* (1975) - Steady-state economics, sustainable agriculture, energetics, appropriate scale, carrying capacity.
- Aldo Leopold's *A Sandy Country's Almanac* (1949) - Environmental ethics, systems thinking.
- Bill McKibben's *The End of Nature* (2006) - Environmental ethics, systems thinking.
- Vandana Shiva's *Making Peace with the Earth* (2013) - Environmental ethics, carrying capacity, laws of thermodynamics, basic principles of ecology, steady-state economics.

Learners will also engage in a variety of works of fiction which look at how humans relate to nature and how various ideologies can either nurture or destroy the environment. For example, reading groups might form around novels such as *Heart of Darkness (*Conrad, 1999), *Lord of the Flies* (Golding, 1954) , *1984* (Orwell, 1987a), *Brave New World* (Huxley), and *Animal Farm* (Orwell, 1987b). Other reading groups might want to look at the tragedy of the human soul and the search for meaning by engaging in *Hamlet (*Shakespeare, 2012), *Oedipus (*Sophocles, 1991*)*, or even *Death of a Salesman* (Miller, 1977). The elders can help the learners make meaning of their research and embeddedness in nature by contemplating, through literature, their role within it. Through dialogue and democratic discourse, reading groups and learning communities can use stories as a means to make sense of the particularly ecosystem and how they might find meaning within it. For this to happen, there must also be time for learners to simply be at peace within the ecosystem and to simply be in awe. This reflective practice will be critical to the development of their ecological literacy.

Furthermore, indigenous elders from the ecosystem will engage the learners in stories and teachings related to the land, air, and water. Learners will be able to develop a sense o f their colonial impact on the ecosystem and begin to develop a better sense of who they are within this reality. Learners might begin to read Boyden's (2013) *The Orenda* or King's (2012) *The Inconvenient Indian* to gain an historical understanding of how this territory was once respected and revered. The learners then may want to move from fiction to more in depth understandings of how indigenous peoples were systematically removed from the land by the Canadian government through Daschuk's *Clearing the Plains* (2012.)

These texts are chosen because they simply do not create a dichotomy between the natural sciences and the humanities. Rather they are interdisciplinary works which place value on scientific knowledge while pushing the reader to consider individual and collective responses to our relationship with the planet.

On departure day for the ELA, the learners, parents, elders, and educators gather at the departure point. The departure point is a central location agreed upon by the learning community that identifies with their anticipated experiences, hopes, fears, and questions. This might manifest itself in a launch from the Forks, the ancient aquatic crossroads for people in this region, the transition zone between the prairie, boreal forest, and Precambrian Shield in eastern Manitoba to represent transition in self, or from the core of the city. Each of these departure locations will be dependent on the collective experience of the learning community. The process of leaving has meaning, and as such, represents a change in direction, a decision, and a path to another destination. The learning community is conscious of this decision and the commitment it is

making. The learners are venturing on a quest, a journey, and a mission. Understanding where they are rooted is critical for any transformation.

Once the learners arrive at ELA, they will encounter the overbearing landscape that is the Precambrian Shield. This includes countless unspoiled lakes, towering coniferous trees, and the ever-present granite, jutting out from cold, tea-coloured, and pristine lakes. Learners are shown to their rooms, small cabins along the shores of a lake with common kitchens, lounges and meeting rooms. They are then asked to take the day to explore the flora and fauna, gathering samples to amass their own encyclopedias to gain an understanding of the ecosystem on a larger scale. Depending on the year, this might involve blueberry, raspberry, and saskatoon picking, but will also involve the analysis of the different trees, plants, fungi, and insects in the immediate area. At night, the learners will compare their encyclopedias, using Leafsnap for example, to begin to identify the variety of species which exist and depend on each other.

Following this brief survey of the ecosystem, the learning community, including learners, educators, scientists, technicians and support staff, will come together to discuss expectations for the eight-week experience. These expectations revolve around eating, bathing, and general etiquette issues that arise when people live together. These are not deemed as top-down rules, but are values and discussed by all members.

Finally, at the end of the day, the learning community will come together to engage in a daily dialogue that is intended to have learners reflect on their experience each day while thinking deeply about the knowledge they have gained and research questions which will begin to develop. During this time, generally following dinner, the community will also discuss the text they are reading, listen to guest lecturers, and take time to reflect on their blogs.

On these blogs, all members of the community will answer the following questions on a daily basis:

1. What science did I learn today?
2. What did I learn about myself as a scientist today?
3. What did I learn about human activity and consequences on systems today?
4. What did I learn about myself as a co-inhabitant on this planet?
5. What did I learn about my purpose on this planet?
6. What did I love about today? What did I hate about today?

Members of the community can share or not share elements of their blogs with each other and comment on each other's learning and growth. Following each day, learners and elders relax alone or together and take time in order to re-engage.

Following the initial day, the learners then embark upon a weeklong shadowing of the scientists on current research projects at the ELA. These projects include understanding lake eutrophication, the effects of nano silver input in lakes, effects of change of input levels on lakes and watersheds, and the monitoring of lake recovery from former experiments. Learners, in pairs, shadow scientists and technicians, both in the field and the lab, and gain the hands-experience in terms of data collection and analysis. The scientists and technicians, also spend time, as there is often time floating in lakes or driving out to remote research stations, discussing the implications of whole ecosystem research and how it relates to the larger questions of human existence on this planet. In these conversations, the learners and the elder are able to create

meaningful relationships through authentic dialogue focused on whole ecosystem research for the purposes of generating meaningful action.

Alongside this hands-on acquisition of research skills, the learners will engage in the rigorous acquisition of scientific knowledge. This involves facilitated talks on basic concepts such as limnology and water stratification, hydrology, fish species, and whole ecosystem manipulation. When the students arrive, the lead scientists provide an overview of the research area, taking the learners out into the field, but also using time each night to speak about the specific content knowledge required for this type of whole ecosystem research. Additionally, each Wednesday, members of the ELA research community provide discussion circles on their research and how it fits into the "big picture"; that is, how their research helps us see our place within a complex network of systems and how this research drives policy towards sustainability.

As the initial week progresses, each day the learners are pushed to think about their own research questions. Initially, the goal is to foster an environment where the learner will find this a difficult and will reach points of disequilibrium based on their lack of experience not only within the specific ecosystems, but also in terms of the understanding ecology. The educator, through collective dialogue each night, will encourage the learners to think about issues related to their own lives that are affected by human actions on water and whole ecosystems.

During this initial week, the learners also prepare for the arrival of younger learners from the local communities and begin to develop a series of stations around the ELA whereby they can explain to their younger peers about some of the research and process which occur at the research station. As such, the older learners become the educators and are able to develop their own skills by engaging with mentees. On the day of the tour, the older learners lead their groups

through a variety of experiences, discussing the importance of whole ecosystem research, the impact of this type of research on public policy and the importance of extensive knowledge of ecology and research methodologies.

Following this initial week, the students then embark on a three-day canoe trip through the ELA to allow time for reflection on the knowledge and skills they have gained throughout the first intense week and also to think about their research questions and how they might fit into creating a sustainable world through action. Through this process, the students become keenly aware of how dependent they are on the Earth, and there is an opportunity for growth in terms of their individual experience with the Precambrian Shield and the boreal forest. As they paddle, portage, fish, and work together to navigate in a remote part of North America, the educator begins to enter into dialogue with the students about what they have learned over the past week. Through the reading of their text, personal reflections, and the nudging of the educator, the learners begin to identify philosophical, ecological, and societal problems related to human behaviour and the associated consequences. They begin to ask important questions, such as: "What will be the effects of climate change on our water systems?", "How can we mediate the global use of phosphorus?", "What are the impacts of certain synthetic substances in our watersheds?", etc. As they paddle from lake to lake, the learners are able to wrestle with these questions and define their research problems and questions.

When they return to the research station, the learners are then able to enter into conversations with the lead scientists and technicians about their research problems and subsequent questions. The elders are able to further probe and help the learner shape their questions and lead them through the practicalities of conducting whole ecosystem research.

Throughout this second week, the learners begin to read extensive research in their evolving area of interest, while at the same time traveling with the scientists and technicians out to research sites. These quiet times together out on the field provide the learners and the elders with an opportunity to enter into authentic dialogue about ecology, learning, our purpose on the planet, and about movements towards creating sustainable communities.

Through the subsequent weeks, the learners begin to conduct their research, using the ELA elders for support, but they gradually become autonomous students of the ecosystem. The learners are now fully engrained into the research facility community and subsequently present their initial findings on Wednesday nights, discuss notions of systems thinking with elders while washing dishes, and engage in the critical reflective dialogue around campfires in the late evening.

As the weeks progress, the learners set up their experiment, collect data, analyze the data in the lab, and begin to develop hypotheses about what the research is suggesting and how these early findings might warrant social and political action in the future. During the evening dialogue, the learners take turns reflecting on their research - successes, challenges, and how it addresses or does not address the consequences of human action on a variety of systems. The group then speaks, via online video link, to researchers across the globe who have transformed their conclusions into public policy, advocacy, and further action. Each day, the learning community is able to speak with the likes of David Suzuki, Bill McKibben, Vandana Shiva, Fritjof Capra, David Orr, James Hansen, and a myriad of other members of the world community who are able to articulate their findings into a global dialogue about the fate of all species on the planet. Learners will be asked to develop their own narratives of the boreal forest. They will be

tasked with creating stories of how systems relate and then share these with their peers. This is intended to develop the environmental empathy required to avoid an ecophobia.

As the research projects begin to come to a conclusion in the last week, the learners begin to think about how their findings and their new understanding of the interconnection of multiple systems can be launched into the world for the means of societal transformation. With the educator, they begin to contemplate who needs to hear their research findings and how to frame their research for the appropriate audience. The learners, with guidance from all the elders, begin to compile and articulate their research findings into a meaningful form and select who might actually benefit from listening to, reading, or seeing the results. The learners then leave the WEE School and head back to their families to further reflect on their experience, their findings, and their future action. The parents act as a new sounding board, and help shape the message and action of the learner. Over the next few weeks, a natural pause between WEE School rotations, the learners then take their findings to the streets and inform the public, levels of government, universities, their peers, etc. about our collective relationship to the critical and complex systems to which we share this planet. They write white papers, present to legislative bodies, create media campaigns, and host conference in order to share their knowledge with the world. Their findings might lead to policy papers, to the development of theatrical plays, to the creation of non-fiction, or to further research.The learners have gained the skills and abilities to change their communities as they have possibly transformed themselves. With each new rotation, the learners become better equipped to mitigate the challenges of human activity on this planet.

The Teachers (Schwab)

> *Another required body of experience is knowledge of the teachers. This should include knowledge of what these teachers are likely to know and how flexible and ready they are likely to be to learn new materials and new ways of teaching (Schwab, 1973, p.).*

The educators for this experience, much like the school itself, look very different then how we might conceive traditional teachers. They are ecologically literate themselves. As such, they are able to predict the consequences of human action, they make the invisible visible, they understand the first law of thermodynamics, they understand that the Earth sustains all, and they are all advocates in their communities for sustainability, justice, and equity. The educators at WEE School are in continual praxis and are engaged in the practice of making life on Earth better for all. Further to this, the educators have a tremendous amount of experience with a variety of ecosystems, are highly educated in ecology and scientific method, and are outstanding at creating meaningful relationships with learners.

Much more than this, the educators see themselves as part of the learning community, as learners. They do not position themselves as the only source of knowledge, but work to use the experience of the learners to create greater experiences where growth can occur. The educators do not presume, assume, or indoctrinate. Rather, they observe, ask questions, nudge, inspire, and challenge the learners to ask deeper questions, develop a thirst for knowledge, and develop the imagination and empathy required to see the world as a series of interconnected systems.

The teachers must be advocates for nature and must be accustomed to being in nature for long periods of time. Educators must lead by example and demonstrate that they are not only

stewards of the environment, but also able to live within the confines of it. By this, they must have experience in the backcountry, be able to navigate lakes, rivers, and oceans, and have experience in multiple ecosystems.

Educators must also exhibit a high degree of environmental ethics, demonstrate global citizenship and cosmopolitanism. Teachers must be curious themselves, critical thinkers, and have a thirst for reading, knowledge, and for new relationships with people and the planet. They must understand the carrying capacity of the earth, the laws of thermodynamics, and understand their place within the complex web of all systems. Thy must be perpetually asking, "What then?"

Curriculum Making (Schwab)

> *Each representative of a body of experience must discover the experience of the others and the relevance of these radically different experiences to curriculum making for a partial coalescence of these bodies of experience to occur (Schwab, 1973, p. 502).*

As Dewey's theory of experience suggests, understanding the experiences of each learner is critical to the design of learning experiences which provide opportunities for growth and transformation. Similarly, educators who are designing the learning experiences for the learners, including all educators, scientists, staff, and technicians at each whole ecosystem research facility, must understand and discover the experience of each other, as educators and colleagues, and other fields of knowledge. The educators come together prior to an eight-week rotation for a week to engage in informal and formal conversations about how and why we learn and teach. They examine the subject matter outlined by Orr and the criteria of experience put forth in

Chapter 3 and discuss how these outcomes might be met and how their individual and collective skills sets might help this achievement.

Similarly, the educators must enter into dialogue with the student participants to understand and contemplate the experience of each learner. Learners are contacted at the end of the week-long planning by pairs of educators who interview each other about their past experiences. The educators are then able to think about what learning experiences could be designed to help the learner grow and transform based on her skills, knowledge, and experience on the planet. The curriculum and subsequent experiences are then designed based on the experience of the learner, the experience of the educators, scientists, and technicians, and based on the outcomes/criteria.

Assessment (Tyler)

How can the effectiveness of learning experiences be evaluated? (Tyler, 1949, p. 104)

The purpose of any summative assessment is to investigate if the learning experiences actually contributed to meeting of the learning objectives. Formative assessment seeks to provide learners and educators with feedback throughout an experience so as to improve learning and teaching. Wiliam (2014) argues that "even when instruction is well-designed and students are motivated, increases in student capabilities are, in general, impossible to predict with any certainty" (para 1). In this regard (and it should be noted that Wiliam focuses mostly on formative assessment), the assessment at WEE School seeks to assess at its core whether the learner has gained the body of knowledge as indicated by Orr and described above, whether or

the attitudes and behaviours of the learner have changed, and the criteria set out in Chapter 3 specifically those criteria outlined by the Centre for Ecological Literacy. What is assessed essentially is if the learner is ecologically literate. This assessment is done at several points by the learner and educators, but usually at the end of a significant experience or at the end of the rotation. The assessment of all participants will be conducted to assess the general and specific outcomes mentioned earlier. (See Tables 4 and 5.)

Formative learning assessment. With this type of assessment, learners will be asked at the beginning of each rotation to set goals for themselves based on the subject matter and the criteria for experience as outlined above. Through their blogs, or online journals, learners will reflect on their goals and what they experienced on a day-to-day basis. As previously outlined, they can share their entries with the rest of the group or choose to have it as private conversation between an educator and themselves. The learner must ask herself how she has begun to understand the specific learning outcomes and how these might lead her to be able to achieve the general learning outcomes. The educators will also draw the learners into dialogue to help them see where gaps in knowledge exist and how these gaps might be mitigated.

Formative diagnostic assessment. This type of assessment seeks to provide the learner and educators with ongoing glimpses into the progress of the learner so that gaps in skill and understanding can be bridged appropriately and at specific points. At the ELA, following their week of shadowing scientists, learners will be assessed on their understanding of the key areas of knowledge as outlined by Orr. Learners will be interviewed prior to the departure for the canoe

trip to see as to what extent they have gained a comprehension in any or all of the fields. The educators then provide a narrative report to the learner and the parents, indicating how the learner has achieved her goals and the goals of the programme. At no point are grades ever given out at WEE School, but as the Met School does, narratives are used "not to rank students or compare them to each other, but to help each student understand what he or she must do to meet his or her own learning goals and needs" (Littky, 2004, p. 157). The educators are able to assess what the learner has gained and how she has grown in the initial week and to begin designing learning experiences to foster further growth and transformation.

Benchmark/ interim assessment. This type of assessment is employed prior to the development of a research question and subsequent research projects. Learners are asked to give exhibitions of their learnings on the Wednesday night when the return from the canoe trip to talk about their learning and what their research question might be for the coming weeks' work. The exhibition format provides the educators and elders with the opportunity to hear the learner clearly articulate how she has achieved the specific and general learning outcomes (or not) and how this comprehension has led to her questioning about how she is connected to the specific ecosystem she is situated in. The exhibitions are streamed in real time so that the parents are able to witness the learning of their children as well as participate in providing sound feedback to the learning community. The exhibitions also provide all the elders at the ELA or given rotation location an opportunity to work together and assess each student so that appropriate and constructive feedback is provided and so that educators are able to design effective experiences in collaboration.

Lastly, the exhibitions are a way for mentors within the scientific community to offer authentic feedback on the learning and potential research of the learner. As all research facilities will have visiting researchers and scientists, learners will be presenting on Wednesday evenings to renowned experts in their fields, who can engage in adult conversations, and as Littky (2004) suggests, "the interaction between the student and the audience creates a whole new level of communication where the student is at the centre but is also receiving input from everyone about his or her learning" (p. 166).

Summative assessment. Summative assessments will seek to ensure that the entire WEE School programme and individual rotations are achieving the outcomes. The final praxis projects will be assessed at the conclusion of each rotation to determine if the learning experiences of the programme allowed the learner to achieve the general and specific learning outcomes. During the last week of each rotation, learners will have to produce a praxis proposal to the educators and prepare for an exhibition at the end of each rotation as to their learning, research, and findings. Learners are not obligated at the end of each rotation to take immediate action, but they will need to perform a Take Action Project at least once in their rotation. This flexibility allows each learner to achieve the learning outcomes at her or his pace while allowing the educators the opportunity to design experiences which might help the learner achieve the outcomes in subsequent rotations. Following the submission of the white paper and the performance of the exhibition, learners and educators sit down together to discuss the respective learners' learning and create a narrative of the last eight weeks. The narrative is then written by the educators who then share the final draft with the learner and parents. The narrative speaks specifically to the

outcomes prescribed by WEE School, by the educators, and by the learner. It comments very little on if assignments were handed in on time or whether the learner works well with others, but focuses on what has been learned and how attitudes and behaviours have changed. The educators and elders, as a group, then confer with each other and ask themselves if each individual student has achieved the following:

- Has the learner developed empathy for all forms of life? What evidence do we have for this?
- Does the learner embrace sustainability as a common practice? What evidence do we have for this?
- Is the learner able to make the invisible visible? What evidence do we have for this?
- Is the learner able to anticipate unintended consequences? What evidence do we have for this?
- Does the learner understand how nature sustains all life? What evidence do we have for this?

The educators then determine, based on the evidence they have gathered, to what degree the learner has developed an ecological literacy. This level of literacy is communicated with the learner and the learner and educator develop goals for future progress, growth, and areas of research in future rotations. It is critical of all members within the learning community to appreciate that learning is a process and that this process does not end with a final report card or test.

Learner tracking. This type of assessment is critical to ensuring that the designed learning experiences actually contribute to the closing of the two gaps and that students do develop an ecological literacy. When the general outcome of an educational experience is to transform the learner and for attitudes and behaviours to change, it is critical that the learner is tracked for the entirety of her life. Kornelsen (2014) recently tracked some of his students ten years following an experience he designed in Costa Rica. While he was looking at outcomes based strictly on global citizenship, he was struggling with whether or not the experiences he fostered actually did what they were suppose to do. In the context of WEE School, following graduation, learners will be contacted on a yearly basis by educators from their experience (until the learners outlast the educators) to not only establish the relationship gained throughout the cycle of experiences, but also to see if attitudes and behaviours have changed sufficiently to bring action to communities. Simply put, do the newly ecologically literate learners consistently make decisions and take action consistent with this literacy? These yearly interviews will also seek to inform the educators on how to alter learning experiences and can also serve to bring the past participants in as mentors to the programme.

Learner Tracking also serves to recognize the need to assess the long lasting impact of WEE on the greater community. Does participation in this program lead to increased ecological literacy within the individual and has this translated to ecological literacy building within the community? Similarly, it is only with Learner Tracking that the programme and the elders can check their own efficacy. While traditional educational systems retract after graduation , the WEE program recognizes that the true outcome is life-long attitudinal and behavioural change - change that will benefit the environment and influence the life choices of the individual. The

program and the elders and mentors within the program cannot assess their own work without extending assessment practice beyond lifecycle of the 8-weeks.

Curriculum assessment. As Tyler (1949) argues, a major focus of assessment should be on whether or not the curriculum itself achieved its objective. In this general sense, all educators, elders, and learners need to assess whether or not the collective experiences within the curriculum resulted in the achievement of the general learning outcomes and essentially if learners did in fact develop an ecological literacy. All community members will come together following the rotation and will reengage in the general specific and learning outcomes. Community members will be provided time to reflect on challenges and successes and what resources might be required to ensure that designed experiences are organized properly and meet the criteria for experience. Community members will reflect not only on the criteria of experience and the learning outcomes, but also on the curriculum model to examine whether or not all three are working together to foster a learning environment whereby an ecological literacy is attained. The data collected from these sessions is then carried into the design of the following rotations.

Conclusion

Zadina (2014) argues that learning "literally strengthens and increases the connections between neutrons and dendrites. As you learn, you grow more dendrites and synapses and increase your network of information" (p. 18). She goes own to posit that the greatest determinant of learning is the "learner's existing neural network," or rather the experience of the

learner (p. 19). Wiliam (2014) argues that “if learning is viewed as a process of making associations between stimuli and responses,” then it is really not possible to determine how much will be learned and to what extent. He goes on then to suggest that if this is the case that as educators we must establish “what has been learned” and take “appropriate and remedial action” (para 1). The WEE School experience is designed to capitalize on the experience of the learner so that educators can design appropriate learning experiences which can lead to changes in attitude and behaviours, personal growth, and transformation. Learning is treated fundamentally as a process and much of the onus is on the learner, through the support of elders and parents, to engage in the local ecosystem, to become curious about her role within it, and to take meaningful action that will resonate throughout her life. This is the essence of WEE School.

Chapter 6

Bridging the Gaps

> *Ecological education means changing (a) the substance and process of education contained in the curriculum, (b) how educational institutions work, (c) the architecture within which education occurs, and most important, (d) the purposes of learning. (Orr, 1994, p. 33)*

In Chapter 5, a utopian-inspired curriculum was outlined that claimed to foster an ecological literacy through a criteria of experience and a curriculum model and that claimed to address the two knowledge gaps. This curriculum was created, in part, by looking at what other educators are doing throughout the world and by establishing a set of specific criteria for whether or not these programs inspire the types of experiences which invoke ecological literacy and allow to address the two knowledge gaps. The same process should be carried out for this proposed curriculum whereby the question must be asked: Does this curriculum do what it suggests it does? In order to do this, we must look at each criterion and determine whether or not WEE School, and specifically the ELA location, adheres to the criteria of experience, ultimately fosters an ecological literacy, and bridges the knowledge and the knowledge-action gaps.

The Learner Develops Empathy for All Forms of Life (Criterion 1)

Nussbaum (1993) argues that there are three capacities that all global citizens possess. These capacities are the ability to use Socratic reasoning, knowledge of the world, and what she describes as the narrative imagination. It is this last capacity that is of interest with this criterion. The idea of a narrative imagination, or empathy, is paramount to the transformation of the learner into an ecologically literate agent of social and ecological change. Can the learner imagine the plight of another human or species and is this imagined idea turned into compassion? Appiah (2010) suggests that a central characteristic of a cosmopolitan is to understand his or responsibility to ensure that every person, and in this case, all species, have access to all things essential for a decent life.

At the WEE School, learners become intimately aware of the impact of human activity on ecosystems throughout the world through their own curiosity, but also through nightly community-based lectures and discussions. The learners' minds are opened to the impact of ecological destruction on communities of people, on specific species, and on whole ecosystems through the research of their elders and peers. They begin to question the inequitable distribution of resources throughout the world.

At ELA, the melding of the natural sciences and the humanities allows for the learner to develop this empathy from a variety of entry points. If we take for example the scientists and the learner in the boat discussing lake stratification, the learner is able to imagine the ongoing difficulties that fish species might experience as they attempt to find fewer nutrients. Similarly, the learner may develop empathy for all forms of life through reading and listening about the plight of those who have been displaced by climate change. They can then imagine what it might

be displaced as an ant or zooplankton in relationship to the compromise of an ecosystem. This imagination is dependent on a thorough understanding of how the systems within this specific ecosystem are intimately related to each other and how its survival is dependent on the learner and community embracing sustainability as the guiding principle of human life.

The Learner Embraces Sustainability as a Community Practice (Criterion 2)

The WEE School is dependent on the notions of community, collaboration, and interdependence. As the learners begin to develop an appreciation for and gain direct experiences as to how all systems on Earth are interconnected, they are able to better engage in the human relationships around them. Parker (1998) argues that "when we are not dependent on each other, community cannot exist" (p. 142). This sentiment not only speaks to human communities, be it learning communities or otherwise, but also speaks to our relationship with systems. If we do not understand our dependance on nature, then we cannot foster a sustainable future.

With this in mind, all life at ELA is focused on creating and maintaining a sustainable community. Kitchens, washrooms, vehicles, and all practices are done so as to minimize human impact on the ecosystem. The notion and practice of sustainability becomes part of one's core. All human activity is accounted for in terms of consumption, waste, and impact on the local ecosystem. Learners soon come to the realization that life at ELA is different and major adjustments have to be made. Learners become instantly aware that their body waste must be composted and that they have a responsibility to help with this process. Learners quickly understand how grey water must be handled and that what goes down the sink will inevitably end up within the surrounding ecosystem. Sustainability at ELA moves beyond just waste and

consumption. Learners and community members understand that human interaction, reading and reflection, and meaningful work lead to mindfulness and wellness.

The Learner Makes the Invisible Visible (Criterion 3)

Through this experience, the learner now begins to speak and act with systems in mind. With new understandings of hydrology, climate, and ecology, they are able to easily see the connections not only between various systems, but through various disciplines. The learners have seen first-hand how climate change affects water flow, various species, and oxygen levels of water at various depths. The learners have witnessed the effects of phosphors on whole ecosystems and can speak to the devastating effects mercury has on all systems. Through their own research, the learners become connected with zooplankton, leeches, fish species, and all other organism with whom they share space. As with one of the Eagle Rock commitments, the learners have become stewards of the Earth, as they are able to visualize and articulate "the impacts of human behaviour," and how these impacts "have expanded exponentially in time, space, and magnitude, making the results difficult if not impossible to understand fully" (Goleman, Bennett, & Barlow, 2012, p. 11). The blinders have come off and through experience and an understanding of systems thinking, the learner is now becoming ecologically literate. He or she can travel to a variety of ecosystems and hypothesize about the effects of human activity and understand the implications of this activity.

At the ELA, experiences are specifically designed to have the learner delve from big to small. What I mean by this is that on Day 1, the learner is tasked with exploring the flora, fauna, and geography of the ecosystem. As their experiences deepen through the days and weeks, they

are able to look at smaller and smaller systems and organisms, either on-site or in the lab, and slowly make connections to see how fish are dependent on trees, for example. Expedition trips also impact the learner's understanding of how even the smallest systems and organisms sustain life. On canoe trips, the learner realizes how they are dependent on local food sources, on the quality of the water, on the energy from the sun, and on hydrological cycles. Being present within the ecosystem while engaging in discussions about the natural world slowly brings what was once unseen to the forefront of their minds.

The Learner Anticipates Unintended Consequences (Criterion 4)

Through a call to action, based on growth and a change in direction, the learner is now able to offer new knowledge to the world, but also reaffirms that humans cannot possibly predict implications of our activity. The WEE School experience allows the learner, for example, to create certain hypotheses about the introduction of nano materials into a specific lake. Understanding that we cannot fully understand the effects of the introduction of tiny pieces of silver via clothing and other products into our watersheds, the learner can hypothesize that these antibacterial entities might cause disruption to certain species within the food change. Students, as Goleman, Bennet, and Barlow (2012) suggest, can "adopt systems thinking and the 'precautionary principle' as guidelines for cultivating a way of living that defends rather than destroys the web of life" (p. 11).

In Rachel Carson's (1962) Fable for Tomorrow in *Silent Spring*, she warns, through narrative, that "a grim spectre has crept upon us almost unnoticed, and this imagined tragedy may easily become a stark reality we all shall know" (p. 15). Learners at WEE School, based on

the educative experiences and their immersion into systems thinking, now have an ecological literacy whereby they can predict the unintended consequences of human activity and avoid the grim spectre that is upon us, 50 years after the publication of Carson's book. We are in need of a citizenry that asks "what then?" prior to poisoning our planet. As Denton (2012) argues, our industrialized history has created what he calls the "mechanical metaphor" (p. 39). This metaphor has conditioned humans to create a "simplistic…understanding of natural systems," and presumes "an ability to understand and manipulate natural systems to suit human objectives" (p.39).The ecologically literate WEE School participant, based on inner growth and experiences, is now able to say "no, we cannot possibly understand the complexity of this miracle we call nature," and becomes defender of nature.

At ELA, the ability to anticipate unintended consequences will be reflected in student research, initially through hypotheses related to consequences when we alter inputs and/or outputs to ecosystems. Learners are then challenged through dialogue and reflection to take this skill and apply it to larger scenarios world-wide. Through experience, they can then begin to create policy and ways in which they can take action and ignite change within their own communities.

The Learner Understands How Nature Sustains Life (Criterion 5)

Goleman, Bennett, and Barlow (2012) argue that "you can recognize emotionally and socially engaged ecoliterate people by how they participate in everyday lives" (p. 16). They suggest that people who have an ecological literacy can be identified based on three factors: Firstly that they understand their place within a complex web of systems; secondly that they are

aware that these systems exist and how minor impacts can have devastating implications; and finally that ecologically literate people lead lives that in no way impact future generations to live in healthy environments (pp. 16-17). Participants at the WEE School are initially immersed in cultures and communities whereby every member of the community and every action of the community has nature in mind. From the food at breakfast, to sewage management, to the research itself, the learners immediately realize that the elders take into consideration all systems in regards to their individual and collective actions.

As the learners begin to relate to this modelling, their own research and questions allow them to fully understand how they are connected to zooplankton, various bacteria, and the plethora of leeches which inhabit the lakes. Their every action is based on sustaining nature, highlighting human activity that is counter to nature, and celebrating the connection they have with all species and systems within the web of life.

Palmer (1998) identifies a dichotomy between teacher-centered and student-centered learning environments (pp. 118-119). He suggests that both are not, as he calls, communities of truth as the former creates a hierarchical structure and the latter often becomes chaotic and meaningless. In the community of truth, the subject becomes central to learning and the relationship of the group. At WEE School, the subject is the Earth and all its systems - nothing else. As such that learning environment, as Parker suggests, “is characterized by the fact the third thing (subject) has a presence so real, so vivid, so vocal, that it can hold the teacher and students alike accountable for what they say and do” (p. 119).

At WEE School and ELA specifically, the intention is to track learners for the rest of their lives to be able to measure whether or not this understanding that nature sustains life informs

their behaviour in the long term. But it will be possible to assess at the time of the rotation as to whether or not they have achieved this outcome. Through the learner's writing, action, and the conversations with elders and educators, we will be able to determine if the experience of being immersed in a whole ecosystem coupled with self-reflection and dialogue results in an overall understanding of the learner's relationship with nature.

A Democratic Environment is Cultivated (Criterion 6)

The WEE School is fundamentally democratic, not necessarily to the extent of Summerhill (Neill, 1992) by which students and adults have equal votes when it comes to discipline etc., but democratic in the sense that the learner is free to participate in an active research environment. At the Experimental Lakes Area, there are certain variables which cannot be truly democratic: cafeteria menus and safety related to fire, wildlife, motor vehicles are not negotiable. But in terms of learning, the process is quite democratic. As Dewey (1916) contends, "A democracy is more than a form of government; it is primarily a mode of associated living, of conjoint communicated experiences" (p. 293). If we take his principle into consideration, the WEE School operates primarily on the idea that learners, researchers, staff, and visitors live together within the boundaries of an ecosystem and are all aware of the learning objectives. The community is focused on the pursuit of knowledge through curiosity and a need to move society to a closer connection to the biosphere and understand our impact on all systems. Learners are perceived as fellow researchers and they, the learners, begin to shed the shackles of "educational slavery", as Dewey points to via Plato's interpretation of slavery (p. 286). This bondage is traditionally imposed by formalized or traditional schooling experiences.

Through the gentle nudging and scaffolding of the teacher and mentors, learners soon come to the realization that the creation of knowledge through curiosity and sound research is fundamentally how democracy manifests itself through education. They are free to explore meaningful questions and are supported by elders to equip themselves with the necessary skills and content required for their research. They are the owners of their pursuit and must take ultimate responsibility for their conclusions and policy recommendations.

These democratic ideals are represented at Eagle Rock School in Colorado. Easton (2005) describes how the following key components of their programme foster democracy: through choice-making, through a proposal system, through leadership expectations, and through a program where everyone is a learner (pp. 54-56). WEE School has naturally evolved to incorporate these cornerstones. Learners have tremendous choice, not only in their research, but in how they wish to spend their time. Learners propose what they will research and how life at ELA should unfold. These proposals are taken under consideration by the entire community and then shaped and guided by elders and colleagues. Further, each member of the community is expected to take on some leadership, whether youth or adult and whether within the confines of field work or daily life at the research station. Lastly, all members of the community acknowledge that they are learners and this implies a certain amount of rigour, as outlined by High Tech High in San Diego (Connect Charter School, 2011), that is generated by the passion of adults who invite youth, as peers, to enter in real discourse. Eagle Rock School and Summerhill are contributors to this sense of democracy at WEE School. The student voice is equal to those of adults and all opinions are valued.

A democratic learning environment is also based on social interaction and dialogue. At ELA, learners are perpetually engaged in conversations with scientists, technicians, visiting scholars, and educators about research and policy creation and how these inform public discourse. At every meal, at remote research stations, in chemistry or fish laboratories, at Wednesday evening seminars, and around the camp fire, community members share ideas, skills, knowledge, and stories about whole ecosystem research and the reason it is done. The social interaction and dialogue also takes place between learners, who conduct research together, analyze data together, go on canoe trips together, and share their reflections related to the books they are reading, their writing, and their discussions on what it means to be ecologically literate. Learners will hopefully feel that the relationship they have with mentors is not hierarchical, but horizontal and based on learning, intellectual rigour, the pursuit of knowledge, and an immersion in nature itself.

Opportunities for Growth and Transformation Are Present (Criterion 7)

Dewey conceptualizes growth as "the characteristic of experience wherein experience itself expands in richness" (Peabody, 2010, para 1). By this, we can conclude that an experience is an educative experience when the experience leads to further constructive experiences whereby the learner has grown in terms of changed behaviour and attitudes. Educative experiences flow into each other and stimulate and massage new understandings of the world that are complex in nature.

The WEE School experience has growth as its essence. Learners are provided with the opportunity to be struck by the immensity of the landscape and the complexity of the ecosystem

itself. This experience unto itself provides opportunity for inquiry and wonder and moves learners to crafting their own meaningful research questions. In turn, these questions, through research, discussion, fellowship, and philosophical reasoning, begin to alter the learner's perception as to who they are within the biosphere. This growth is paramount to the development of an ecological literacy, and as Dewey (1938) posits, these growth experiences and the experience of growth influence "the formation of attitudes of desire and purpose" (p. 83).

Growth also occurs in dialogue. In the dialectic model prescribed by Freire, "the agents in the dialogue, not only retain their identity but actively defend it, and thus grow together" (Freire, 1998, p. 117). Education in this sense is completely structured on communication between equals, although differences exist (be it gender, age, class, etc.), these equals are able to progress ideas to new understandings based on new literacies. The WEE School is completely dependent on this intersection of growth and dialogue, whereby the learner is perpetually engaged in dialogue with colleagues, elders, and community members about their collective purpose. This growth then lends itself to the discovery of new purposes and new launching points for inquiry - a change in direction.

Specifically, learners at ELA are able to take theoretical understandings of energetics, the laws of thermodynamics, and principles of ecology and actually witness the relationship with a whole ecosystem. Learners are able to track fish, analyze climate data, observe eutrophication patterns, and observe water flow levels to in order to draw conclusions about the web of systems which sustains life in that area. From rotting felled trees to black bears, learners, often for the first time in their lives, observe how the boreal forest is a complex yet symbiotic series of organisms. Through this experience, the learner's perception of herself within this ecosystem and

the biosphere has an opportunity to be altered and she has an opportunity to be transformed. This transformation and change in direction then leads to important research questions and deeper experiences which are scaffolded by elders, literature, and interactions with place and people.

The narrative imagination is cultivated on a daily basis at ELA, where learners and elders read a variety of texts together to make sense of their direct experience with systems they have had throughout the day. As they read Denton's (2012, pp. 85-91) interlude, *Lessons from a Scrub Oak*, for example, the learner begins to imagine the life of a tree, of Denton's interaction with it, and what it means to be an indigenous organism in such a harsh climate. The learners are then challenged throughout their rotation to create their own stories and narratives about the boreal forest ecosystem. They are asked to contemplate the stories which exist in the ecosystem there are within and on which they depend. It is through this experience and reflection where transformation will hopefully occur and potentially be observed. This will hopefully lead to fundamental changes in attitude and behaviour and sustainable communities.

There is a Change in the Learner's Attitude and Behaviour (Criterion 8)

Equated with the idea of growth, is one of changing direction. By changing direction, we see the learner understand, through growth, that they have a unique connection with all species and systems on Earth. But the realization comes with not only a change in attitudes and behaviour, but with a call to action from within. As Orr (1994) suggests, traditional learning environments, those that are indoors, promote a certain climate of "passivity, monologue, domination, and artificiality" (p.67). As previously discussed in Chapter 4, he does indeed propose a new curricula, but Orr contends that the process of education needs to be readjusted if

learners are to become ecologically literate. The experiences at the WEE School are fostered in order to do the exact opposite of traditional schools - that is to promote dialogue, authenticity, and understanding of connectedness, and, fundamentally, action. This action, as we see with the development of public policy at the conclusion of one ecosystem experience, is an indication that the learner has redefined himself or herself as an agent for social and ecological change. As the students generate their findings of their study and begin to allow it to help them form public policy, they are transformed into advocates and activists on behalf of the planet. The rigorous process they have engaged in has allowed them to, as Freire would suggest, name the world in their own words. This agency, bolstered by way of system thinking, is a direct representation of their new ecological literacy.

At ELA, it is this change which is of the utmost importance. Prior to students arriving onsite, educators and elders are in the process of assessing prior learning, attitudes, and behaviours to see what gaps have to be filled and what educative experiences need to be designed. The central focus onsite is to immerse the learner in the natural environment, by having them understand the complex series of systems, and then for them to read, think, and write about this relationship. At the end of the experience, learners are then assessed summatively through their action projects and then tracked in subsequent years.

There are Interactions between Inner and Outer Conditions (Criterion 9)

An educative experience, according to Dewey (1938) arouses “curiosity, strengthens initiative, and gets up desires and purposes that are sufficiently intense to carry a person over dead places in the future” (p. 77). And as such, educators cannot simply rely on the internal

growth and experience of the learner; for as the inner conditions of the learner expand so to does the outer canvass on which the learner can now investigate. At the WEE School and other democratic institutions, there is a danger simply to focus on the learner internally. Through positive feedback loops (Davis, Sumara, & luce-Kapler, 2008), we can often render learning experiences as a collection of mediocre activities, as the educator and learner are pleased with the *perception* of positive outputs. For example, a learner might really enjoy collecting data in the form of tagging and following fish. As the educator, we might be inclined to have the student continue in this manner of the duration of the experience as the student is happy to watch fish and the educator is happy that the student is happy.

At the WEE School, however, the educators are able to recognize, through constant interaction with the learners and with collective reflection, that the outer conditions, that being the fish tagging, must be expanded for the student transform. The educator, through books, dialogue, lectures, and other tools seeks to draw the learner to a realization of how he or she is connected to the fish and the purpose for tracking the fish. The learning cycle is based on continuous interaction with a reflection on how they perceive their role in the world, with a primary experience (nature itself), with peers and elders, and fundamentally with a reflection on how the perceive the world following these experiences. This is followed by another primary experience. The learning from interaction, however, is dependent on an ongoing conversation onsite with peers and mentorship from scientists, technicians, elders, and educators.

Dialogue as an Essential Element for Learning (Criterion 10)

Rule (2009) posits that dialogue is emancipatory in nature (p. 926). In many schools, dialogue is a vertical experience, whereby information and knowledge are filtered down by way of hierarchy. From various models that were investigated in Chapter 5, such as Soundings, Eagle Rock, MET School, etc., dialogue between learners, educators, and elders happens on a variety of levels. As with these environments, so too at WEE School do the lines between teacher and student become blurred. Freire (1970) professed that through true emancipatory dialogue the teacher and students are "jointly responsible for a process in which all grow," and that "arguments based on authority are no longer valid." (p. 67). Education becomes a practice of problem posing where the educator becomes the elder and does not necessarily hold all the secrets.

Having said this, there is a great need for elders at WEE School and for the wisdom and experience they possess. As Illich (1970) suggests, "if the child is lucky, he is exposed to confrontation of criticism by an experienced elder who really cares" (p. 227). This is certainly the case at WEE School, as learners have the opportunity to work with cutting-edge scientists and technicians at dinner, in the field, during lectures, at the camp fire, and in day-to-day interactions. Similarly, the teacher is able to foster dialogue between learners during the evenings, as they come together to discuss their research, their readings, and their thoughts related to systems thinking. The teacher in this respect becomes less an authority and more a facilitator who ensures all voices are heard and respected.

At ELA, dialogue begins well before arriving onsite and continues years after the experience. Elders and educators prod, push, and foster curiosity with each learner to cause this

sense of disequilibrium. As a learner and scientist sit in a boat on Lake 227, the scientist demonstrates to the learner how to take oxygen and temperature readings at various depths of the lake. While the learner gains basic skills of "doing science" the scientist can then ask the learner why there are different temperature and oxygen levels at different depths. This conversation moves then from lake stratification to how climate change might affect the mixing of the lake and how this might affect fish populations. The conversation might move to energetics and how the sun's energy might be compromised through changes in climate as it attempts to provide energy to organisms within the lake. The learner and elder might then continue the conversation about how certain birds might be affected as they rely on smaller organisms or fish within the lake and so on. At this point, the learner is really struggling to make sense of how systems can be compromised in this manner and require time and space to reflect on this delicate relationship.

The Paramount Role of Reflection to Learning (Criterion 11)

Dewey (1933) explains the process of reflection as "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tend" (p. 118). The learners and teachers at WEE School will often come to points of cognitive dissonance or disequilibrium whereby they will need to make sense of the world. Coming to grips with the realization that we are all connected with millions of systems that are complex and fragile will require some extensive unpacking. Often in my practice, I do not allow enough time for learners to reflect on what they have learned or not learned, and this is an affront to them. As Zull (2002) posits, "reflection is

searching for connection - literally!" (p. 164). According to him, the brain needs time, especially for weak connections, to make sense of what we experience.

At the WEE School, reflection is a priority in all community members. The learners are provided with individual and collective space to make sense and make the connections necessary for learning and growth to occur. In terms of how reflection is fostered at WEE, much is borrowed from Zull, who argues that "the art of directing and supporting reflection is part of the art of changing a brain," and that "it is the art of leading a student toward comprehension" (p. 164). Comprehension needs to be nurtured and so learners are given time at night, on lakes, on runs, in boats, and in the ecosystem to make sense of what they learn. This sense-making then lends itself to an understanding of how they relate to all systems and the need to take action. Each night, learners are tasked with reflection on what they learned and what they encountered through their field experience, their reading, and their discussions with community members.

Praxis as a Key Element to Learning (Criterion 12)

Participants are immersed in a generative learning environment from Day 1. Learners are immediately thrown into the ecosystem and culture of the research facility. The praxis, however, comes with the curiosity that is developed throughout the initial days and weeks of the experience. It is through the creation of their own questions that education becomes liberating and the learners understand that he or she is ultimately in charge and responsible of the body of knowledge they seek to inform. Glass (2001) suggests that praxis as liberation is ever more needed in a world where "global economic forces and domestic politics press…public education towards even more narrow and conservative agendas," and that this trend justifies "poverty and

powerlessness" (p. 15). The WEE School broadens the agenda of education and allows all learners to pose their own questions and really examine how they fit within the big picture of the ecosystem.

Freire (1970) conceptualized praxis as "reflection and action upon the world in order to transform it" (p. 36). As such, the learners at WEE School take fundamental action by way of critical research - devoted to questions of ecology that have deep meaning for them and who they are. This action then leads to findings and inevitably a desire to make these findings public and have them heard by those who create policy. The learners are no longer passive agents who consume knowledge, but rather, are engaged in authentic, real-world, and arguably vital research that is designed to challenge the status quo. This process is ultimately how we become free and human.

Through their own research projects, learners become curious about their role in mitigating of the ecological crisis. They propose deep research questions and offer bold solutions. They are the tasked with articulating their findings to the public. They develop policy, make presentations, inform their communities back home and create action projects which seek to inform, educate, direct, challenge, and change society. Their very purpose at being at the ELA is to gain an intense knowledge of the natural world while contemplating ways of taking action based on this new knowledge. Learners come out of each rotation and develop action projects that take them to schools, trade shows, government cabinet meetings, and city committee meetings. Learners are compelled to design sustainability projects within their own communities related to their research. Other learners will feel the need to write children's stories, while others might become politically involved. This is the power of WEE School. Learners gain the

necessary literacy to recognize unintended consequences of human behaviour, propose solutions, and then take the action needed to affect real change.

Conclusion

The purpose of the inquiry in this thesis was to identify what gaps exist in terms of our ability to deal with the current ecological crisis effectively and then offer a solution within the context of the education. Two gaps were identified: the knowledge gap, our lack of understanding about the natural world and the crisis itself, and the knowledge-action gap, our inability to overcome paralysis once we have gained the appropriate knowledge. In identifying these gaps, I then asked how education might bridge these gaps. I proposed firstly a list of criteria of experience which I argue is essential for fostering an ecological literacy; a literacy which learners must attain if we are to create sustainable communities and societies. Secondly, I put this list of criteria in action by proposing a utopian-inspired curriculum located within the boreal forest at the Experimental Lakes Area whole ecosystem research station. It is my contention that if we are to bridge the knowledge and knowledge-action gaps, learners need to be completely situated and embedded in educative experiences which compel them to see how all systems are interconnected and how they are part of this complex web. Further to this, I argue that these educative experiences must lead to learner-driven action, transformation, and an ecological literacy.

The WEE School proposal and the example of the Experimental Lakes Area location are offered as an example of what a learner experience might look like. The WEE School is based on the criteria of experience drawn from Dewey, Freire, and he Centre for Ecological Literacy, on

best practices drawn from other programmes, and on curricula frameworks offered by both Tyler and Schwab. It is through this theoretical, practical, and pragmatic lens where WEE School can be deemed as a reasonable mechanism for fostering an ecological literacy amongst learners.

Firstly, the criteria of experience draws upon theoretical positions of how and why we learn. I borrow from Dewey in the sense that WEE School is based on creating educative experiences. By this all experiences seek to use the experience of the learner to generate further experiences where the brain can develop new or stronger neural networks. These experiences ensure that learning takes place within an open and democratic environment, where dialogue is central to learning, and where the learner's attitudes and behaviour change from gaining a deeper understanding of the natural world.

Coupled with this is the notion of transformation. The mid-section of the criteria of experience is drawn primarily from Freire and Nussbaum. It is in this section of the criteria where we see the marriage of the natural sciences and the humanities whereby the learners are transformed into global citizen through dialogue, reflection, and ultimately praxis.

The third and final section of the criteria of experience is based on the five practices of ecological literate students as offered by the Centre for Ecological Literacy. These five practices operate as general learning outcomes and direct the design of experiences and assessment. The three sections together operate as a continuum, informing each other, but also based on the principle that experiences must be educative, that they must lead to transformation and action, and that they must be based on the characteristics of an ecologically literate citizen.

Secondly, the criteria of experience borrows from and are informed by existing programmes. Using the criteria of experience as a means for programme selection, I sought out

curricula and experiences which adhere to one criterion or another. These best practices, from the MET School, Eagle Rock, and Northwest Passage School and others, were then embedded in the utopian-inspired curriculum at ELA. I attempted to select programmes which touched upon each of the criteria and then include elements of them in the WEE curriculum.

Lastly, in order to house the criteria of experience, the experiences themselves, and critical general and specific learning outcomes, it was important to develop a curriculum framework to house these educational theories and practices. For this framework, I borrowed from both Tyler and Schwab, as the former informed the need for an educational purpose, organized experiences, and rigorous assessment, while the latter calls for a balance between learners, teachers, content, and an interaction with the environment and a learning community.

I believe what I have done is create a starting point for a critical discussion on the purpose of education in light of the ecological crisis. This is more necessary than ever. I recently attended a panel discussion involving the four presidents of Manitoba's post-secondary institutions. The purpose of the panel was to postulate on the purpose of post-secondary education in this province. Not one of the presidents, nor anyone form the audience, saw the purpose of post-secondary education to help mitigate the ecological crisis or at the very least to provide learners with the necessary skills and knowledge to deal with the consequences. Now is the time, and perhaps we are running out of it, to enter into serious discussions about how we foster a new generation of ecological literate and global citizens. The WEE School curriculum, in my mind, is a platform to begin this discussion. I have offered a pathway by which learners can overcome the two proposed gaps and engage in critical action that is based on acknowledging

their role within a complex and awe-inspiring series of systems and an equally astonishing planet. There is hope at the foundation of this curriculum, as the paradigm is shifting.

In a rare and tranquil moment recently in my house, my wife and I were able to watch a movie. While the kids were tucked in their beds, we opted to take in the new Matt Damon film, *Martian*. Like many parents, we fell asleep halfway through - not a reflection of the film, but more so of our inability to stay conscious past 9:00 PM. We were, however, alert enough to witness that Damon's character clearly understood the first law of thermodynamics: Energy cannot be created or destroyed.

Damon was abandoned by his crew on Mars and he was forced to figure out how he could survive long enough until his inevitable rescue. He realized quickly that in order to sustain his life, he would need to channel the energy of the sun into growing food. As such, he employed the feces of his former crew mates to grow potatoes. There is energy in our poop which for the most part is a result of photosynthesis and energy from the sun.

Damon was able to grow enough food to survive, I think, as I succumbed to sleep. (I also have faith in Hollywood movie makers to ensure a happy ending.) But his botanical skills demonstrated to me just how miraculous life is and how precious and rare it is from our vantage point in the universe.

Understanding the first law of thermodynamics is one critical nugget of knowledge Orr suggests all students should have when they graduate. Other skills and knowledge include environmental ethics, carrying capacity, energetically, basic principles of ecology, sustainable agriculture, etc.

Are our students in Manitoba graduating with this knowledge? Are they ecologically literate when they leave the K-12 system? I suspect not, given the size of vehicles on our streets and as our consumption of fossil fuels increases each day.

Recently, I participated in the federal election. Many candidates, including myself, were chastised and ridiculed for agreeing with scientists and evidence which clearly suggests that most fossil fuels will have to remain in the ground if we wish to avoid catastrophic temperature changes and the subsequent fall out.

Opponents, pundits, tweeters, comment trolls, and even mainstream media mocked anyone who agreed with the scientists and who understood the first law of thermodynamics. The lashing out by critics demonstrated a genuine lack of ecological literacy in our society. At the time, during the summer of 2015, I was disillusioned and frustrated at the either the complete disregard of the science on carbon emissions or the reckless behaviour and willful blindness we were displaying. The gaps between our scientific knowledge of the ecological crisis and/or our ability to properly react to it, seemed to be widening.

But in December 2015 in Paris at COP21, there seemed to a collective and global understanding and political will to reduce the amount of GHG emissions. While many of the same pundits who mocked politicians during the federal election rolled their eyes at the consensus reached in Paris, for the first time in history, mainstream politicians and bureaucrats have recognized that if you dig fossils up from the ground and burn them, that there are consequences.

In the same vein, mainstream media has also begun to recognize the Orwellian-esque double think of those who suggest we can cut GHG emissions while still extracting resources out

of the ground and then burning them. In a recent article in MacLean's Magazine, Bruce Cheadle (2015) asked the question how Canada's current government might reduce carbon emissions while at the same time supporting the development of more fossil fuels. Cheadle argues that Mark Carney and Barrack Obama have even suggested that most of the fossil fuel sources must remain in the ground and that this new literacy is "simply stating 2015's middle-of-the-road orthodoxy."

Whether it is middle-of-the-road or other, the scientific fact is that burning more fossil fuels will create greater carbon emissions. The position that most fossil fuels on the planet will have to remain in the ground should not be controversial. Over the past few months, we have witnessed perhaps a revolutionary societal and governmental rethinking of how we wish to progress in the next few decades. It appears, on paper and through words, that we are indeed developing a greater ecological literacy. The question will remain if this will translate into significant action.

This utopian exercise is one that has attempted to create a forum by which we can begin to create schools that address the ecological crisis that is ever present and exponentially worsening. Tomorrow, the world will produce more carbon and greenhouse gases than it did yesterday. The Earth is heating up, the climate is changing, the oceans are dying, species are disappearing, and the very foundation for human survival is evaporating in front of our eyes. I have attempted to investigate the pedagogical and philosophical roots of our undoing so that I could begin to recreate a system by which students could become ecologically literate. As a practitioner in a traditional educational setting, I recognize that my students understand that driving an SUV is not a good practice for nature. And yet, they leave school each day in their

SUVs. I attempt to model what it means to be ecologically literate and do my very best to create educative experiences which cause the cognitive dissonance we all crave to help students grow and develop intellectually, emotionally, and spiritually. But for the most part, I fail.

The utopian experience I have proposed edges very closely to the possible. We can envision these types of educative experiences for our students, as there are examples, like those in Chapter 4, which attempt to immerse students in democratic and engaging learning environments. But for the most part, pockets of educators and schools attempting to create models of education which seek to transform students into agents of change are no match for the barrage of consumerism, malaise, narcissism, greed, and individualism that has rendered our society destructive at so many levels. Corporations and capitalism, as Zizek (2009) suggests, will not solve the problem of the ecological crisis (p. 172). In fact, the limits of capitalism, neoliberalism, and free markets are revealed with this crisis. Political and social structures are the only framework from which to address the fate of humanity. My hope is that education rests as one of the avenues for combatting the consumerism and narcissism.

The WEE School is my way of raising my hand and asking "what if?" I have attempted to toss out constraints associated with timetables, budgets, traditions, waivers, unions, egos, certification, superintendents, political trends, and other obstacles to a model that might position Manitoba as a leader in the development of ecologically literate citizens. What if students were educated in the field? What if students were able to ask their own questions about how the Earth works? What if students were supported by elders, experts, and caring adults who saw themselves as equals with the learners? What if students were immersed in learning environments that by their very nature were sustainable and acknowledged at every level the

intense connection of all systems in the web of life? This is my intent with this conceptual exercise.

My hope is that through an ongoing investigation of our students and who they are, we can use their experiences to create meaningful and transformative educative learning experiences whereby they come to understand the miracle of systems and the web of systems on this planet. Through these experiences and new way of thinking, they can then begin to attain the skills and abilities to make decisions and take actions with ecology in mind. And we can help them.

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