The Problem with Progressive Pedagogy: Systemic Challenges Enacting Environmental Sustainability Education

By: Barb Sniderman

Supervised By: Jose Etcheverry

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ABSTRACT:

This outlines theories for building a coordinated interdisciplinary school-wide energy sustainability program in a Toronto high school, and barriers to its success. It explores the intersection of eco and social justice, systems thinking, pedagogy in schools, and sustainable practices in business. To say it is a challenge solving real-world justice problems in a high school is an understatement. It requires ongoing support, communication and collaboration from all levels of the education system, which is tricky to coordinate, even in a small school. The aim was to prove that through progressive pedagogy, students learn curricular content and skills needed for a sustainable future by innovating ways to solve real life sustainability problems in energy in the local community. Local support existed in theory, but on a practical level there was a lack of time, budget, scheduling, communication and resources needed to put theory into practice, despite interest and willingness on the part of students, staff, and administration. This paper, then, is an outline of what not to do when designing progressive pedagogies, what to keep in mind for best practices, and options for designing integrated project and problem based pedagogy that teaches skills for the future. It outlines basic theories of systems thinking, sustainable business and justice work that focuses for this project on energy. It defines current policies on different levels of the education system in terms of sustainability in schools. It reveals the success and barriers of creating an interdisciplinary program through an educator's journal. And it outlines the key findings of the study, articulating multiple barriers on multiple levels of the system. It proposes communication linked to multiple viewpoints and systems thinking, and offers an example of adapting to barriers to make small gains despite them. It also offers recommendations for how stakeholders throughout the education system can advocate for systemic reform to integrate learning and innovating for a sustainable future within schools.

ACKNOWLEDGEMENTS:

In 1996 I had the good fortune to work with acclaimed documentary filmmaker John Walker. I was organizing a screening of his film, Tough Assignment, (Walker, 1996) about a

year in the life of four teachers at Oakwood Collegiate, a high school not far from where I grew up. A recent grad from Film School after one drop out failed attempt, I was wary of the institutionally oppressive atmosphere schools can support. I viewed the film with the audience, transfixed, horrified, and totally immersed. John surveyed the room, asking who, after seeing the film, would love to pursue teaching of some kind, and who would want to run screaming from the prospect. It was half and half, and the responses were passionate, definitive and polar. I sat shocked on the side of the teachers, learning something very new about myself in that moment. My own experiences, reinforced by Fredrick Wiseman's seminal documentaries, including his 1968 feature, High School, (Wiseman, 1968) had taught me to be wary of institutional oppression, and I was very surprised to find myself attracted to that kind of life. It was a long road, volunteering to teach literacy to street youth, facilitating film events and forums for discourse, building cultural education programming in Cambodia and Laos, before I decided to go into the profession in 2005. And so first and foremost I would like to thank my formative teachers in life and film and travel along this road for getting me to this place. Film and art became my training ground to creatively explore and converse about interesting things happening in the world. For this perspective I am grateful.

I immersed myself in the education world, changing schools multiple times before landing at my alternative home at City School in the Alt9 system. I was also teaching and building education programming at Hotdocs, and built a massive posse of peer educators doing excellent work. I also have taken around a dozen qualification courses, again finding resources and peers to bounce ideas around with, too many to mention here. I would like to specifically thank Ian Esquivel for supporting my interest in pursuing a Masters in Environmental Studies at the brink of reinventing our school mission and makeup. He is one of my most appreciated mentors, supporting out of the box thinking, activism in communities, cross curricular work, and creative education that is based on student interest and inquiry. I have a whole lot of fun teaching with him at the helm and on the sidelines cheering me on. I need also to thank the staff team at City School for supporting and accommodating my teaching this year in the context of building an energy program as academic research: Grant Fawthrop, Michael Gurgol, Joseph Ghassibe, Sarah Rier, Leah Mauer, Janice Blake-Johnson, Whitney Baker, Daniel Pitt, Ariel Platt and Matthew

Colquhoun each in their own way offered support for my efforts this year. Some dropped in to marvel at what we were making, some to deliver seeds, others to share food, invite engineers, plan field trips, or co-teach projects that were engaging students to be creative. It was all so appreciated, and I hope worthwhile.

I would also like to thank the good folks at Eco Schools for always taking time to consult, offer resources, and encourage me to take their qualification course in environmental education in the middle of teaching and healing and parenting and collating this research. It was well worth it, and solidified my understanding of ESE and options for educating for social and systemic change. Many thanks especially to Pam Miller for this work. Thanks also to Hilary Inwood for heading OISE's environmental education programming. I am grateful to have found two more mentors and peers whom think like I do and support this kind of work.

Finally, I would like to thank my peers and professors at York University's Faculty of Environmental Studies. Here I found the intelligent discourse and perspectives I was hungrily seeking, encouragement, active and fulsome feedback, and permission to dip my toes into all sorts of interesting ideas and projects. There are few courses and strands of the faculty I did not participate in, and I am grateful to have been able to study with and learn with and from a cohort as diverse and creative as any I could imagine. These were inclusive, engaged, participatory experiences, and not only did I feel welcome in the classroom communities, but my son was also often invited to participate when needed as well, and this sparked a passion for nature photography and art-making in him that I will forever cherish and support. Special thanks go to my advisor Sarah Flicker, supervisor Jose Etcheverry, POS reader Ellie Perkins and instigators of growth and creativity, Chris Cavanagh and Lisa Myers. I am so thankful and changed by my experience working with you, and am a better student and educator and citizen as a result.

FOREW0RD:

Why transform schools into an integrated paradigm working toward a sustainable future? The global assumption is that if something doesn't change soon, doom and gloom forecasts will get even more extreme than current trends. It could look something like this: Gather information. Find examples of schools and teachers who are doing great work. Wonder if some of it would be applicable to your local high school. Talk to smart people who can give good advice. Check with Eco Schools to see what local mentors and models are available. Enroll in grad school to learn more. Study the intersection of systems thinking, environmental and popular education, and business for sustainability to see if that combination can transform schools into sites for sustainable learning and innovation. Take extra courses in food sovereignty, energy and policy to further explore reforming schools as sites for real world problem solving. Build a community of smart people making inroads in all sectors. Conduct academic research to uncover theories about this kind of work. Articulate a hypothesis: interdisciplinary problem solving builds communities, teaches systems thinking, and fosters love and respect for environmental issues that can lead to action and advocacy. Design a research plan to test out the hypothesis. Test methods for measuring energy, integrating it into interdisciplinary learning, and quantifying research as a practice run. Get permission from school administrators to build an energy program to raise engagement and lower carbon and cost. Try it out for a year in a Toronto alternative high school. Fail at executing the program as proposed. Ultimately learn about systemic practical barriers that can get in the way of a good idea.

The takeaway: A conviction that the right combination of pedagogy, systems thinking, and real-world practical inquiry into innovations for a sustainable future can teach students to problem-solve better than the current generation running the school system. Also, systemic barriers to successfully applying this work in schools mirror real-world problems of actualizing large-scale reforms to mitigate the effects of climate change – there is great need and pressure to make change, but the system is entrenched in older models and resistant to easily implementing innovations.

This paper is about the challenges and insights gained from building an energy program in a small alternative high school to engage students experientially across disciplines in systems thinking and real life problem solving. Students worked on interdisciplinary, practical energy projects aimed at learning in, about, and for the environment, which encouraged critical thinking, multiple points of view, collective and creative problem-solving, communication and innovation. While the project failed to reap the anticipated large-scale gains, it served as a testing ground for making inroads toward a more integrated education system in need of radical positive shifts for sustainability.

Situating the Research and the Researcher:

As an alternative high school teacher in Toronto, I use pedagogical programming to foster engagement in eco and social justice, leadership and action. I know my students well, and work individually and collectively with them to engage in productive and creative opportunities to build communities, offer and encounter different viewpoints on complex issues, and create innovative solutions to personal, local and global problems.

With a background in film and documentary production, arts advocacy, and NGO work abroad I am a creative problem solver. I have built culturally based and community based literacy programming in Southeast Asia, and education programming in Canada using documentary films and filmmaking linked to curriculum. I use the arts to teach academic subjects and real world issues to spark exploration in the arts. Working in the alternative secondary school system, I have been lucky to immerse myself for the last decade in a community of peers who engage students in diverse, creative, and extraordinary ways. I am qualified to teach drama, social science, English, Indigenous studies, history, guidance, careers, leadership, visual arts, co-op, and environmental studies. My resume also includes teaching physical education, law, politics, and philosophy, and it is the norm to build new subjects into my teaching roster every year. Science and math, admittedly both useful and perhaps integral to easily building a school energy program, are two subjects I am not qualified to teach.

The nature of working in an alternative setting often dictates teaching multiple subjects within one class, at times different levels of the same subject, and at times different subjects made to intersect. This means the work must be structured, but flexible and creative. In a small school where there is mainly a single class teaching each subject, there is an opportunity to cater pedagogy to the students in the room, make cross-curricular connections, collaborate with peers teaching different subjects, and initiate whole school projects or themes, provided there is interest in collaboration.

Critically engaging in collective problem solving, community building, issues of scarcity, creativity, systems thinking, hegemonic power and the untapped potential of uncertainty with young people can spark active shifts in empowerment and innovation. City School has been working to embed this kind of work into programming for the last three years. Recently, the school shifted its mandate to include an unofficial, long standing culture of teaching eco and social justice and advocacy. This prompted restructuring new programming for grades 9 and 10 along with senior grades 11 and 12 at the 6-teacher, 120 student school. June 2019 will see the first cohort of grade 9 students graduate.

Pursuing a Masters in Environmental Studies was sparked by efforts to design a comprehensive action oriented environmentally focused culture for City School. This paper is the culmination of research conducted through the Business and Sustainability Diploma program partnership between the Schulic school of Business and York University's Faculty of Environmental Studies Masters Program.

Connection To My Plan of Study:

This paper was designed to examine the intersection between eco and social justice, systems thinking, and pedagogy through the lens of business for sustainability as components of my plan of study. These elements combined can help shift the way students learn, communicate and solve problems in order to be better equipped as they graduate to take on the burden of adapting to the deepening pressures of mitigating climate change.

The fields of eco and social justice encompass multiple disciplines and approaches. This paper helped me to gain a broad perspective to incorporate issues into my teaching. I was able to introduce an annual theme across the curriculum, within the pedagogies of multiple grades and courses with energy as the focus throughout the school year. I was able to work with students to study the complexities of issues, theories and debates around energy, and devised plans for solving problems within individual classes and as a collective. I learned key factors in lowering carbon use for energy through efficiency and making the shift toward renewables. This included studying behavioural tendencies for energy use and brainstorming how to shift them, as well as analyzing structural practices, and redesigning for efficiency. I also learned to find alternatives for implementing behavioural and structural change to reduce carbon-made energy use and cost for it in schools. Any justice work involves understanding the barriers to justice in a given field, and this is political work. With this paper I gained an understanding of current policies and the history of these policies. Understanding current policies to determine why systems are in place enables action and is a key part in enabling a push for systemic change. I also learned different ways of advocating for climate justice to spark critical problem solving by seeking models for personal activism and as exemplars for students doing similar work.

This paper helped me to learn the theories and practice of systems thinking at a level where I can integrate it into my work, in order to initiate systems thinking to engage in problem solving for systemic, paradigm-shifting change. This paper allowed me to learn key theories of this complex ideology to use and teach to students to engage in problem-solving to achieve change, making pivots in systems that are currently (under) functioning, and coming up with out-of-the-box solutions. I have been able to connect systems thinking with theories of change and pedagogy.

Through my research into pedagogy, I have learned how to better foster engagement, curiosity, problem solving, love and respect, and the ability to advocate for those without a strong voice and ally with those working toward eco and social justice. I have gained a deep understanding of the theories and practice of teaching pedagogies that support anti-oppression education, cultural understanding and community building; and environmentalism. This paper allowed me to engage in multiple pedagogies I call

"progressive pedagogies" (PP) or "environmental sustainability education" (ESE). These pedagogies help learners gain agency to work on equalizing some of the structures that oppress. I have learned the practice of community building and play as part of pedagogy that aims at providing tools for advocacy to students for themselves, their communities and beyond. In order to push at hegemonic power, people need to build allies to gain perspective, understanding and solidarity. Through work on this paper, I learned pedagogical tools to build strong communities among diverse students. Encouraging people to engage with their local environment fosters a love for and connection to it. This leads to a desire to advocate for environments in their communities and beyond, and I have learned current practices to do this effectively for my work in schools.

Finally, this paper has allowed me to use my insights in the context of business and political models for sustainability by recognizing how entrenched we are in unsustainable hegemonic power structures. Productivity and growth are at the heart of these systems, and our economic and business models reinforce and reflect the paradigm of progress that is depleting our ability to shift to more sustainable methods of existence. In making this visible, we can push boundaries, and depart from the norm, while understanding how to quantify success in the language of business, capitalism and profit and reporting that the ministry and boards work within.

We are entrenched in an unsustainable hegemonic power structure. We are depleting resources, witnessing mass migration, violent outbursts and terrorist aggression. Eco and political systems are destabilizing. Degradation and destruction are the norm. In making these realities visible, we can see where to push boundaries, and depart from the norm. Productivity and growth are at the heart of these systems, and our economic and business models reinforce and reflect the paradigm of progress that is depleting our ability to shift to more sustainable methods of existence. This paper allowed me to learn to address systemic shifts in the language of productivity in reporting and success. I have learned to read and quantify success in the language of business, capitalism, profit and reporting that the ministry and school boards work within. Understanding the language of corporate productivity has enabled me to understand the current paradigm, where tensions are pushing for new systems, and where the points of traction lie within the education sector. Through this paper

I have learned what innovations gain support, what factors hinder success in pushing for positive change, and how the system helps or hinders new cradle to cradle progress. I learned about teaching these trends to young people to get a sense of where the future is heading and also to build programming in a school where creating and using cutting edge practices is part of the learning experience. In initiating innovative pedagogies toward positive change, resistance is inevitable. With this paper, I learned how to move beyond zero sum negotiations with students, staff, and administration.

Finally, I learned how to qualify and quantify my research to be easily understood. This paper allowed me to achieve a deeper understanding of all of these elements of justice, systems theory, pedagogy and business for sustainability, which are the key goals summarized in my plan of study.

INTRODUCTION: WHY SWIM AGAINST THE TIDE?

Embarking on progressive pedagogies for education for environmental sustainability is a little like sucking and blowing on a (reusable, environmentally friendly, non-plastic) straw at the same time: will and policy and intention on every level of the education system support it, but lack the coordinated infrastructure to allow it to happen. This paper is structured to be guideline for teachers, educators, support workers, community members, administrators, school board representatives, and ministry policy makers to reveal and push against the challenges educators currently face, on multiple levels of the system, while teaching for a sustainable future in schools.

The basis of this research revolves around marrying social and climate justice, systems thinking, pedagogy, and business and sustainability practices with comprehensive energy programming as the focal point where they intersect in a school setting. For example, it is possible to measure use of energy and efficiency gains made in schools, engage in interdisciplinary learning, and make a case for cross-curricular, integrated, project-based work that builds communities by seeking multiple viewpoints. My work practices real-life problem solving for a sustainable future in schools to model how to do this in life.

This paper is structured to provide: 1) an outline of the project, including a summary of the multileveled barriers to administering a progressive education system that supports sustainable practices. This work is done through integrated, real world, problem-based, project-based, systems thinking, environmental and social justice action oriented, innovation and inquiry-based pedagogy in schools – what is called, for the purpose of this paper, "Progressive Pedagogy" (PP) or Education for Sustainability and the Environment" (ESE). It offers potential next steps for enhancing sustainability through progressive pedagogies, systems thinking, and environmental policies and practices in education; 2) A brief analysis of theories that support progressive pedagogy, painting a picture of definitions and currents of thought on the business case for progressive projects in schools, the impetus for using systems thinking as critical problem-solving, multiple options for using progressive pedagogy and environmental sustainability education, a policy review of the education system, and an analysis of how the education system functions; 3) An outline of the case study project, building an integrative energy program in a Toronto high school, outlining the proposed project, how it went, what was learned, and the challenges of enacting PP and ESE that hindered its ultimate success; 4) A summary of findings, including an overview of the research, main findings, and areas for further research; and 5) Recommendations for next steps in restructuring the education system to enable schools to be potential sites for engaged learning and innovation, examining the structures of schools, curricular guidelines, and PPs that can help usher in sustainable change for the future as part of its systemic makeup.

In short, lack of integrated local support of administrators, teachers, and the learning community along with systemic barriers relating to lack of integration of policy on different levels of the system make it challenging to conduct progressive pedagogies. Attempting to do so building an energy program in a small Toronto high school is comparable to with society's slowly developing readiness to make radical shifts to curtail the forecasted devastations of climate change: it is hard to get everyone to agree to work together for the same goal. Hopefully, however, insights into where this project failed to produce desired effects will provide opportunities for good work to emerge as the system catches up to the innovations of individuals trying to push it in the right direction.

Guideline: 10 Examples of Pedagogical Choices for ESE:

What follows is a brief guideline driving pedagogical choices made for this project and case study. It is by no means comprehensive, but rather a short checklist for teaching environmental education for sustainability as a guiding principle in my own teaching practice that can be adapted, edited, and added to for other contexts in other schools.

	Method of Pedagogy	Application in a School Setting
1.	Systems thinking cross-curricular projects	In this case, measuring and reducing energy use and cost through behavioural and structural changes and innovations for clean sources. Other examples of this kind of work include: Skateboard design, production and sales (Oasis Skateboard Factory, 2018), comprehensive bike programming (Central Toronto Academy, 2018), and food programming (Ritz, 2018).
2.	Problem-based learning	Posing a problem, such as: "How can we reduce our energy consumption in the school?" as a catalyst for learning and collectively exploring different options and methods of working toward solutions. In this example, leadership was in ideal class to set up this question.
3.	Project based learning	Projects have tangible outcomes that can be shared. In this case building a bicycle blender to serve food; creating a food program; and growing plants in the classroom were projects City School focused on. Potential projects might include themes around energy, water, land, resilience, resistance, waste, ecosystem preservation, etc. Projects can also be based on annual school themes.
4.	Inquiry based learning	Focus is on developing the skill of inquiry and resilience through trial and error and relationships within and beyond school walls. This method builds on models of success to foster innovation. It would take a radical shift to embed in systemic expectations for teaching, as it is student-based

		inquiry and makes lesson planning and unit planning less teacher-based and easy to plan ahead of time.
5.	Place-based learning	Focuses on connection to and interaction with place, and living things. This is easily embedded in Indigenous studies, science, and physical education, but requires curricular, board and school support and rethinking to more fully integrate into social sciences, arts, and English courses.
6.	Relationship and community building	This is important for engagement for any educator, but building relationships with the self, the classroom community, the school and neighbourhood and outside world promotes systems thinking, access to and interest in differing viewpoints, and connections beyond the digital realm. This can be done through sharing food, art showcases, community research and projects, and mentorship partnerships with community members and younger students.
7.	Making connections between mental and physical and environmental health	Interdisciplinary programming reinforces getting outside, getting connected, watching ecosystems over time, and connecting health to more than human beings. It promotes systems thinking and awareness of self and healthy practices of resilience. This can span across the curriculum as well, but requires integration and support to make it a school-wide focus.
8.	Arts-based learning	Using the creative process to understand ideas fosters innovation. Connecting real life problems with artistic expression allows the artist to be exposed to complex ideas to explore through the arts, and allows those innovating for solutions to find a voice while exploring different forms of communication and expression. Cape Farewell is an interesting example of getting climate scientists and artists together for the common goal of steering popular support

		toward sustainable goals. (Cape Farewell, n.d.)
9.	Justice advocacy	Using the classroom as a site for action is a potent way to engage students in what they believe are important issues. Offering differentiated opportunities to act on issues and see what impact their actions have is empowering active citizenship. Students initiated positive change in their food programming when given the permission to act.
10.	Pedagogical philosophy – theme-based work	Consider constructing relationships with self, conflict, resistance and innovation into grade-specific course designing within schools across the curriculum. In this way, freshmen year students in all grades would explore personal identity. Once they reach second year of high school, they study history and civics and learn about conflict and how it occurs and has played out. By third year, they can examine different methods of resolving conflict while learning through social sciences, politics and philosophy. By graduating year, students have the foundation to learn in the context of thinking outside of the box and inventing potentially new paradigms to address conflicts.

Exemplars: How do we know this kind of transformational pedagogy can work?

Popular examples in the world where we are seeing educational and environmental reform include the Green School in Bali which has comprehensive structures and learning that are all sustainability focused (Green School, 2018), Centro Educativo Mbaracayu which empowers girls to become skilled at technical engineering for sustainability (Equator Initiative, 2018), and Stephen Ritz and his Green Bronx Machine creating the business of greening new york by teaching planting, cooking, green wall installation, and charity work into his South Bronx school (Ritz, 2018).

More locally St. Marguerite d'Youville in Hamilton focuses on energy and waste reduction, outdoor classroom and a butterfly garden, Queen Elizabeth High School in Edmonton,

Alberta has an INNOVATE program that integrates community and students in real life problem solving, global initiatives, participate in transforming their structure for sustainability. (CK Staff, 2015) In Toronto, David Suzuki Secondary School lives up to its own namesake and is certified in Eco Schools, Green High Schools, Eco Schools Gold, and Habitat 2020. Their structure, landscaping and career initiatives and star guest speaker series have set them apart in terms of innovative sustainable education. (Europe mostly, Bali, schools doing wonderful Eco School innovations. (Crozier & David Suzuki SS, 2018)

Further, Canada's Truth and Reconciliation Commission recommendations "to redress the legacy of residential schools and advance the process of Canadian reconciliation" (TRC Canada, 2015) is proof a system is able to make shifts, however messy, toward better practices. These recommendations are shifting new strides in curricular and board restructuring to support the 99 recommendations of the TRC. This is not only proof transformation, while slow, can happen, but that the time is ripe to uproot unhealthy and obsolete practices.

CHAPTER 1: REASONING FOR IMPLEMENTING PROGRESSIVE PEDAGOGY FOR SUSTAINABILE THOUGHT, PRACTICE & INNOVATION:

Climate Change: The Need for Increasingly Radical Action

In our current social and ecological climate, we are poised on the brink of making decisions that can help or hinder our future generations' ability to thrive. Systems we have in place are not working fast or well enough to sustain us much longer. New ways of thinking, communicating, functioning and collaborating need to happen to turn current projections of doom around. There has been, for some time, incontrovertible evidence that humans are in part responsible and at large carry the burden of mitigating the deleterious affects of climate change (Pachauri, Mayer, & Intergovernmental Panel on Climate Change, 2015). Global temperatures are rising, oceans are warming, ice sheets are shrinking, glaciers are retreating, snow cover is decreasing, sea levels are rising, arctic sea ice is declining, extreme events of

weather are increasing, and the ocean is acidifying. This will affect climate with temperatures continuing to rise, agriculture to shift to longer seasons with less frost, changes in precipitation, increased droughts and heat waves, more intense hurricanes, rising sea levels, and an ice free arctic. (NASA, 2018) In Canada, forests are seen as "among the most vulnerable" and arctic ecosystems are threatened by melting ice sheets and alpine glaciers. Younger generations face increased disease, fresh water shortages, smog, and an economic system that will shift to mitigate the effects of climate change as inaction continues (D. Suzuki, 2018).

Lack of Action:

"In a nutshell, climate change occurs when long-term weather patterns are altered — for example, through human activity. Global warming is one measure of climate change, and is a rise in the average global temperature". - David Suzuki (D. Suzuki, 2018)

There are natural causes for climate change: The sun warms earth. Some heat bounces back into space and some insulates around the earth. The most important gas in this is Carbon Dioxide. Carbon is stored in everything. It is released as things burn. It also occurs with variations in the Earth's tilt, the shape of the orbit, or variations in solar activity. Mostly, however, there are human causes to climate change: Carbon is released as carbon dioxide as we burn fossil fuels and cut down trees. Today's atmosphere contains 42% more than it did in the pre industrial age. We have released so much carbon dioxide and other greenhouse gases like Methane and Nitrous Oxide that the atmosphere is now thick and heat trapping. This is making everything get warmer and more extreme. (Climate Central, 2009)

Effects of climate change are getting more and more extreme. The cryosphere (frozen water on earth) is melting, rising sea levels, exposing dark ocean waters to absorb more sun, and heating the ocean at greater rates. Weather is getting more extreme as heat waves, storm surges, droughts and wildfires intensify. Oceans are getting hotter, expanding and becoming more acidic and cause higher sea levels, corals are stripped, and carbon dioxide ends up in the oceans, dissolving shells. Now oceans are 40% more acidic than they used to be. Climate change poses a threat to agriculture as farmers struggle with weather and water supply, attack

from weeds, disease, pests and all this leads to reduced yields. Warmer, polluted air affects our health as the increased formation of ground level ozone triggers asthma, smoke from wildfires degrades air, heat causes death, and warmer water contaminates drinking water and fosters bacteria causing diseases. Infrastructure and transportation are at risk. Hot weather, flooding and other extreme weather events damage infrastructure, put heavy burdens on electrical supplies and disrupt how we travel and commute. (NASA, 2018)

In the natural world ice that Arctic animals need is vanishing and polar bears struggle to survive. Coral and shellfish are suffering when Heat stresses algae that nourish corals and provide their vibrant colors, then leave, and the corals starve or bleach. Acidic oceans affect calcium and shells. Coral may not have enough calcium to grow. Forests are more prone to deadly infestations. Milder winters and longer summers allow tree-killing insects to thrive. Trees weakened by drought have lower defense mechanisms. (EDF, 2018)

Global politics, for the most part, reflect how - not if - we as an interconnected globalized world will change our trajectory toward more sustainable practices to support life on the planet for the long-term. In 2015 nations around the world came together to create the 2015 Paris Agreement (Agreement, 2015) which has outlined structures for participating nations to create time-sensitive sustainability goals and implementation plans to slow down and reverse the amount of carbon released into the atmosphere by 2030. These targets correspond to the United Nations Sustainable Development Goals that clarify climate change as one of the global initiatives set forth to "end poverty, promote prosperity and well-being for all, and protect the planet" (Agreement, 2015). In a groundbreaking event, nations, including Canada, committed to working globally to reduce and ultimately reverse the amount of carbon dioxide entering the atmosphere in order to try to curb projections for increased chaos and devastation beyond effects of climate change listed above. While pundits (Monbiot & Prescott, 2007) and politicians (Gore, 2009) have been warning of the need for drastic global reform for years, the systems in place are slow to curb the flow of oil and production that we are accustomed to. Despite overwhelming evidence, we as individuals, communities and nations keep our heads in the sand, largely driven by our globalized easy access consumer economy, and a tendency to hope the warning signs will simply go away. (Rand, 2014) The longer we wait to shift the way we function, the more

costly and stronger the devastating effects will be on our ecosystems and social systems and health systems, and we are already seeing projections of extreme effects come to fruition. As pressures and temperatures rise, climate change is increasingly linked to violence, and the goal is to mitigate the cultural and global ramifications of all of this. (Solnit, 2014) We have, in essence, reached the moment where there is no longer time to wait and see.

A Question of How to Proceed: Snapshot of the Political Climate in 2018

We are currently situated on the brink of systemic change. Structures are in flux, not quite sure which option to lock onto in an effort to move away from the carbon economy. Newly elected Ontario Premier Doug Ford has just announced the cancellation of multiple environmental programs including the e-car rebates, (Bickis, 2018), the greenON program that handed out free smart thermostats, and nearly completed energy programs in wind, and solar (Canadian Press, 2018). He has also vocally announced his intention to resist both carbon tax and cap and trade, and removed references to sustainability in all policy documents. Electric and hybrid cars are currently on the market, but access to charging stations and financial incentives for making the switch have not yet reached the consumer or infrastructure tipping point (Gladwell, 2002) for enticing new buyers to choose green cars (Buchanan, 2017). Community gardens are popping up in multiple urban neighbourhoods, with vast networks and supports (Sustain Ontario, 2013), but it is unclear if these comprehensive programs will continue to be supported by the Ford government. The political zeitgeist after international resistance last summer to the Dakota Access Pipeline seems to be shifting support from fossil fuel expansion to finding alternative energy options and structures, but economically driven political decisions to keep building pipelines persists (Kheraj, 2018). The Canadian Government cited economic reasoning for recently approving and buying the Kinder Morgan Pipeline, despite protests by indigenous and environmental activists. (Livesey, 2018) Donald Trump is still in office, creating shocking statements and policies daily, forcing citizens, media, and other nations to remain in a constant state of reactivity (Adams, 2018). In short, multiple energy, transit and food systems are in flux worldwide and locally, and entrepreneurs and scientists are scrambling to get a piece of the new renewable pie. However, little has gone to scale, despite some very interesting potential solutions already being explored (Hamilton, 2011). With the current political economic

leaders choosing money over environmental or social justice, and carbon over sustainability, negative patterns may continue for some time, and the later it gets, the more costly for all.

Snapshot of Policies & Resources Linked to PP & Sustainability in Schools

National Government Initiatives:

The council for ministers of education in Canada have responded to UNESCO's decade for education for sustainable development outline for 2005-14 by agreeing to incorporate themes into different formal and informal forms of education and report on them to the United Nations Economic Commission for Europe (UNECE). In 2008 a working group was formed to coordinate, enact and enable collaboration, encourage curricular reform, and establish as a leader in education for sustainable development in the world. (Council of Ministers of Education, Canada, 2018) Learn Canada 2020 became a three page-declaration to incorporate education for sustainable development within different educational programs across Canada along with a commitment to themes of literacy, aboriginal education, post-secondary capacity, official languages, learning assessment programs and performance indicators, and education data and research strategy. (Council of Ministers of Education, Canada, 2008) An undated version outlining province by province how this will happen reveals Ontario's working plan:

> "The Ministry of Education has not developed any specific provincial guideline for educating for sustainability. However, the concepts and principles of sustainability are integrated throughout some of the provincial curriculum documents including Grades 1-8 Science and Technology, Grades 9 and 10 Science, the History and Geography program for Grades 7 and 8, and the Canadian and World Studies program for Grades 9 and 10." (Council of Ministers of Education, Canada, n.d.)

In short, Canada is asking provinces to devise their own way of addressing sustainability in education, and reporting progress to the national level without providing much support.

Learning for a Sustainable Future: National NGO

Learning for a Sustainable Future is a non-profit Canadian organization that promotes sustainability within the Canadian education system by promoting the knowledge, skills, values, and practices needed to integrate the principles of sustainable development into the curricula, policy, and teacher education and beyond. Learning for a sustainable future provides comprehensive, current, and usable resources on all levels of the education system. (Learning for a Sustainable Future, 2018a) Resources include: Resources for Rethinking – a database for curriculum-based lessons and resources for teachers (Resources for Rethinking, 2018b); Ecoleague: Linking Education to Action – community and school based community action projects (Resources for Rethinking, 2018a); Step Outside for Learning – three times monthly guides to highlight for schoolyard and neighbourhood environmental learning opportunities (Resources for Rethinking, 2018c); Our Canada Project – an interactive map of ideas for sustainability actions (Our Canada Project, 2018); Sustainability and Education Academy – SedA – supports to integrate sustainable development into all aspects of the education system(Learning for a Sustainable Future, 2018b); Education for Sustainable Development (ESD) Canada – A network supporting systemic change in all education systems toward education for sustainable development. LSF's latest comprehensive document is Connecting the Dots: Key Strategies that Transform Learning – a guide for how to teach sustainable development linking learners to place, to each other, to action and skills building, through the categories of learning locally, integrated learning, acting on learning, making real world connections, considering alternative perspectives, inquiry, and sharing responsibility for learning. (Kozak, Elliott, & Learning for a Sustainable Future, 2014)This document supports tangible examples of the kind of pedagogies for sustainability this paper is advocating for.

Provincial Ministry of Education Initiatives:

The Ontario Ministry of Education has a policy on environmental education in Ontario Schools. It is primarily promoted through a single policy document: Acting Today, Shaping Tomorrow. (Ontario & Ministry of Education, 2009) This document, created before the Paris 2015 Agreement, outlines very unspecific ways schools in Ontario can provide education through a series of goals and outlines on how the ministry, boards and schools can actualize them. Goals include understanding of connections to each other, the world, and

living things; increasing engagement through environmental projects that are linked to communities and community action; and increasing the capacity of educators to lead programming and practices. While the goals and strategies are moving in the right direction, at this point these policies are not integrating among the different levels of the educational system.

Curriculum documents reveal specific criteria in multiple courses to address sustainability issues in the secondary curriculum and there exists a document that articulates where to find these recommendations. It is not, however, embedded in overall expectations and likely ignored by many educators as not mandatory work. "Standards for Environmental Education and the Curriculum" is a document that outlines a focus on community, knowledge, perspectives and actions in environmental education. (Queen's Printer for Ontario, 2008) The curriculum documents for environmental education in the primary (Ontario Ministry of Education, 2017a) and secondary (Ontario Ministry of Education, 2017b) sections of education also provide a map of where to find environmental education in course-specific curriculum guidelines across the spectrum of classes offered. These documents outline where, in course-specific ministry curriculum guidelines, there are opportunities to teach and learn environmental education principles and practices.

The ministry promotes environmental education through publications and resources as well. Most are based on the suggestions brought about by the 2007 document Shaping Our Schools, Shaping Our Future (Bondar, Ontario, Working Group on Environmental Education, Ontario, & Curriculum Council, 2007), a report headed by research by Dr. Roberta Bondar that included 32 recommendations for building environmental education into Ontario's school systems. Discussion and recommendations revolved around environmental education policy, leadership and accountability, curriculum, teaching and resources. It is intelligent, comprehensive and integrated in scope and vision. Ready, Set, Green is a 2007 document published by the Ontario Ministry to offer teacher-created resources in direct response to the recommendations in the Shaping Our Schools document (Ministry of Education, 2007). It highlights environmental education in action with specific examples of what schools are doing across Ontario under the categories of competitions,

change agency, leadership, and community ambassadors, and offers manuals, lesson plans, resources and contact information for more learning.

There is an opportunity for secondary schools to offer program training for specialist high skills major in the environment, forestry, energy, agriculture, horticulture, and landscaping. (Ontario Ministry of Education, 2018a). Speak Up Grants are offered by the Ontario Ministry of Education and support projects that make a difference in schools and can be linked to green initiatives and active engagement in environmental action. (Ontario Ministry of Education, 2018b)

There is also an energy database on conservation in Ontario schools for administrators that outlines the Utility Consumption Database (UCD) tracking 5,500 buildings with the Green Clean Resource Guide, (Ontario Ministry of Education, 2010) outlining how to encourage boards and workers to build teams around green practices, even if they are not mandated by the boards. The Green Schools Resource Guide which provides a blueprint and examples of how to design and build an energy efficient high performing school. (Ontario Ministry of Education, n.d.)

It should be noted that the ministry of education in Ontario, under the new premier, is already making drastic changes to overhaul the curriculum. Decisions to revert the new sex-ed curriculum back to the 1998 version that did not address our interconnected web-based world occurred within the first month of Ford in office. Given his strong anti-environmental campaign platform, and early slashing of environmental programming in the business sector and cancellation of supports for purchasing electric cars, it is useful to note that the current education and sustainability initiatives in the ministry may also follow suit and be less of a focus in the coming years. Already the link to the ministry website for details on specialist high skills major options in schools is unavailable. It is not clear if this is because it is under revision or in need of repair.

Local School Boards: Toronto District School Board (TDSB) Initiatives

The Toronto District School Board (TDSB) outlines its vision for learning for education and sustainable development on its website as commitment to have more than 60% of schools

fitted for solar rooftops, 100% of schools involved in organic recycling pickup programming; 100% participation in Eco Schools certification, and involvement in a three year energy conservation and demand management program. (Toronto District School Board, 2018). Policies include adopting UN concepts of sustainable development, developing and supporting curriculum for environmental literacy, board and classroom modeling; measuring success, acknowledgement of climate change, reduction of greenhouse gases, increasing greenery on grounds, educating in, about and for the environment, and setting a framework to do all of this. (Toronto District School Board, 2010b) The board released a series of action plans in 2010 for long term, short term and structural shifts including energy planning to reduce greenhouse gases for buildings and other structures reduction of fleet emissions, install solar, greening grounds, save in garbage pickup, trade carbon credits, create an advisory committee and complete annual reports. (Toronto District School Board, 2010a) There is also policy on green cleaning, or use of sustainable practices, chemicals and products that are certified EcoLogo. (Toronto District School Board, 2013)

Schools submit reports in the form of School Improvement Plans annually to the board. This is based on self-assessment. At City School, sustainability and justice are a main focus, but this is a voluntary decision made by the school community, and not mandated by the Toronto District School Board.

Eco Schools is a resourceful, comprehensive part of the TDSB that offer an accreditation program for all schools. It addresses greening schools in terms of what is taught, and how schools and grounds are structured for sustainability, and its programming focuses on waste, energy, leadership, grounds and community building. It offers resources, guides, instructional videos, ideas on teaching, planning events, and campaigns for PP and ESE. (Toronto District School Board, 2014) While the board is registered as stating all schools are partaking in the program, participation is voluntary, and individual schools and educators decide how involved they will be in raising their school status toward platinum, which is very time consuming and a great deal of extra curricular work.

College and Federation Initiatives:

The Ontario College of Teachers (OCT) outline standards of practice that include commitment to students and student learning, professional knowledge, professional practice, leadership in learning communities and ongoing professional learning. (Ontario College of Teachers, 2018b) Ethical standards are care, respect, trust and integrity. (Ontario College of Teachers, 2018a) These standards are guides used in teacher training and professional learning. While ESE can fit well within these standards, it is not articulated or mandated specifically.

While advocating for fairness in workload distribution, the Ontario Secondary School Teachers Federation (OSSTF) has no mandates to support educators doing ESE in schools.

Teacher Training Initiatives:

There is now a strand of teacher training for environmental education qualification and three levels of additional qualification (AQ) training for working teachers. This is becoming a growing part of basic mandatory teacher training, currently in five Ontario schools, and these AQs are currently partially subsidized for teachers working in the TDSB.

School Initiatives:

Schools are currently required to submit reports on school directed initiatives through school improvement plans, but sustainability is not a mandatory focus.

Teacher Initiatives:

Educators are often leaders in schools to drive sustainability and eco initiatives, but this is volunteer work and resources, time, professional development release time and support are all at the discretion of individual administrators at schools.

Student Initiatives:

There are multiple potential opportunities for students to lead initiatives toward sustainability within individual classes, as part of an Eco Schools team, as part of whole school initiatives or events. Grants like the Ontario Speak Up Grant offer support for school initiatives, but do not necessarily dictate these are for sustainability. Support for student-driven work again depends on individual educators and administrators on site.

CHAPTER 2: THEORETICAL FRAMEWORKS - A BRIEF ANALYSIS

The theoretical framework for determining best educational practices for sustainability comes from finding methods that best represent and rationalize my work, and combines theories of energy, sustainable business, justice work, systems thinking and pedagogy that can intersect directly with teaching environmental education for sustainability in schools. What follows here is a brief overview of these frameworks in this context.

Energy as a project for Pedagogical Innovation – Rationale

Theories on energy efficiency and renewables are in constant evolution and flux. They are outdated as technologies transform to keep up with the demand for new systems, but the infrastructure, as yet, has not decided which way to go. Ontario is ahead of the game, having eliminated coal from the energy system long ago. There is strong access to hydro, but the province is still working with nuclear energy and financing plants. Canada is still funding new pipelines as clean tech companies vie for opportunities to go to scale with cleaner systems including solar, wind, biofuel and geothermal. Combinations of these are gaining popularity and traction, but conversions of these cleaner energy sources to electricity are still outliers to the prevalent oil and gas systems currently in place.

Mark Winfield, (Winfield & Koveshniova, 2009) Peter Love, (Love, 2015) Alan Meier, (Meier, 2009) and Christina Hoicka (Gliedt & Hoicka, 2015) provide a fulsome overview of how energy works in Ontario, in relation to the policies in place to enforce efficiency. Winfield is prolific in terms of analyzing decisions made and pushing the boundaries of policy makers by questioning the political motivations behind some decisions regarding environmental policy. Love, an efficiency innovator for decades in Ontario, has worked with and for governments and agencies striving to find doable ways to get people to use energy more efficiently. Meier maps energy for ease in understanding and working to shift the system. Hoicka investigates motivations for energy projects, whose findings reveal efficiency work is often financially motivated, whereas renewable choices are based on initiatives. Texts on renewable energy are even more quickly outdated, but Godfrey Boyle, (Boyle & Open

University, 2012) Lester Brown, (Brown, 2009) and Hermann Scheer (Scheer, 2007) have been helpful as guides on current options, outlining the trends, the technologies and the potentials for differing kinds of renewables.

Tom Rand, (Rand, 2010) Tyler Hamilton, (Hamilton, 2011) and the MaRS 101 training for startups have sparked creative thinking on how to restructure, create and consume energy, as have numerous conferences in Canada and elsewhere that address climate issues. UN policies (United Nations, n.d.) and REN 21 (REN21, 2018) are venues for gaining up to date information on best practices and trends linked to more seismic shifts and government support.

Trends in the TDSB and Ontario ministries of energy and education have been examined for policies that support sustainability. This comes through working in a Toronto high school (City School, 2018)through the Toronto District School Board (Toronto District School Board, 2018) the ministries of the Environment (Climate Change Action Plan, 2016) and Education, (Ontario & Ministry of Education, 2009) (Ontario Ministry of Education, 2011) and through work with Toronto's Eco Schools programming. (TDSB Eco Schools, 2018)

The Business of Sustainability in Schools: Efficiency & Cost to Motivate Progressive Pedagogy

The delay in the transformation toward sustainable systems in the food, energy, education and other realms is largely economic. We are entrenched in an unsustainable hegemonic power structure. We are depleting resources, witnessing mass migration, violent outbursts and terrorist aggression. Eco and political systems are destabilizing. Degradation and destruction are the norm. Productivity and growth are at the heart of these systems, and our economic and business models reinforce and reflect a paradigm of progress that is hindering our ability to shift to more sustainable methods of existence. The more we want our consumer comforts, the harder it is to shift to take only what we need. In our globalized economy, we can access easily what we want, and the system is set up for us to keep wanting more.

For example, steering the way we use energy as a city, province and country depends on both shifting our behaviours toward efficiency and the cost and methods of moving toward renewables. So far no one system has won out against the ease with which we still pull carbon out of the ground. At some point, there will be a tipping point (Gladwell, 2002) where doing this becomes too financially, if not environmentally costly to continue and finding options to replace it become more urgent. This transition becomes more urgent the longer we wait to choose and implement a cleaner direction, because the effects of climate change will demand expensive resources to respond to, and the cost of responding to the degradation of our ecosystems will rise as well. For now, we remain in a holding pattern as startups and renewable companies vie for the big contracts to go to scale.

Young people today are operating on a different paradigm than generations before, and have unique qualities that can usher in systemic shifts toward sustainability. It is considered a duty to make the world a better place; millennials use technology, work and voting power to articulate concerns about the economy, terrorism, and social justice. (Hutt, 2016) In Canada, young people are more diverse, connected, socially engaged, and educated, but are also more challenged with social exclusion, cyber bullying, mental health issues, obesity, and finding full-time work. They live with their parents, are digitally connected, less likely to vote but more likely to be socially engaged, volunteer, give to charities and participate in sports, arts and cultural activities. They are more educated and more in debt as a result. (Statistics Canada, 2018) There is also more focus on skilled trades and colleges after secondary school, to enter the workforce before attending university. Involvement in collective problem-solving, eco justice causes, technological innovation, and working and learning in, about, and for the environment is an easy fit for a cohort hardwired to take on the burden of the future through technological and social means, and provides skills to enter vocations that will support them.

The hypothesis is that education is where new paradigms of thinking should and can start, and a pathway to this is to design integrated education systems that utilize pedagogies to promote creative relevant problem solving, systems thinking, community engagement and communication within and beyond classroom walls to innovate options for restructuring for long term sustainability. Education is currently placing a large focus on supporting STEAM

courses (science, technology, engineering, recently added arts, and math) to engage students in learning skills they will need for their adult futures. This focus is based on projections of workplace and economic need for the coming years. By engaging students in progressive pedagogy, thinking creatively to see local community results, schools can design home grown, community-centred renewable sustainability innovations. They can learn through solving the problems on a small scale what the world is grappling with on a larger scale, and these can be potential research and development sites testing options for best practice. In this way, schools engage in the important work innovating for renewable and sustainable energy, food, waste, policy, arts, economics and justice work, while students are earning credits to graduate and gaining skills for working in the world they are growing up in.

Economics is a major barrier for systemic change, but can also drive traction for change. It is easy to find ways to leverage and sell education that promotes "profit" in the current system by raising energy efficiency and lowering cost, and raising marks and attendance and lowering recidivism. The aim here is to simultaneously embed the inclusion of eco and social justice concerns around what is considered "cost and "profit" for a sustainably long term into the argument. Building progressive pedagogy that achieves this makes a persuasive case for teaching for a sustainable future in schools.

Consumers are beginning to sway toward the zeitgeist of sustainability and purchasing more products marketed as eco friendly. Selling eco is becoming a profitable endeavour. However, producing truly environmentally sustainable products can be more difficult and costly, so companies often skirt the line between being sustainable and saying they are. There is also a growing pressure to build a new kind of business plan that incorporates environmental degradation and renewal into cost and profit margins. Fair Trade entrepreneurs are leaders in this work. (Fairtrade Canada, 2018) Business strategies for sustainability can be measured along a continuum between confronting core issues, engaging stakeholders, transparency and accountability and deflecting responsibility, appeasing stakeholders, and masking relevant issues. The five levels of the business sustainability continuum are Denial; Defense; Isolated; Embedded and Transformational. (Valente, 2016) By operating, reflecting on, and teaching this concept transparently in schools, it can become a generational game-shifter to move to more a more sustainable global system.

The Ontario education system currently operates within a business model, focusing on quantitative data for evaluations of students, schools, and standardized testing. Schools and boards compartmentalize subjects, strands of curricula, and expand on finite checklists for educators to adhere to. Emphasis and resources are often diverted more to STEM courses that will prepare students for the workforce and economy than to soft subjects like arts and social sciences and language studies. There are persuasive arguments to suggest this kills creativity and individuality and creates a society less active in democratic engagement. (Robinson, 2007)

Ontario schools, then, are currently at an isolated level of sustainability on the continuum, making inroads into strategy and operations. On an administrative level, reporting and structural shifts are affecting energy use, building solar rooftops on schools, retrofitting lights and heating, and purchasing cleaning supplies that are more eco friendly and less toxic. Documents at the ministry and federal levels also report an interest in shifting toward sustainable education through curriculum and pedagogy, and board initiatives like Eco Schools offer comprehensive opportunities and exemplars to do so. However, to shift toward more progressive levels of embedded or transformational sustainability practices in the school system would require more integration between the research and mandates of federal, ministry, board, school, teacher training, and student expectations and evaluations. At this point, work in education for a sustainable future is more voluntary or optional than mandated, and thus schools are slow to be sites for systemic change.

If the education system allows, adopts, and encourages progressive pedagogy for a sustainable future and embeds it into the curriculum and policies, the benefits will encourage triple bottom line profits (Colbert & Kurucz, n.d.): save on costs, increase sustainability through ethical practice and use of materials, and create cradle to cradle processes that are self sufficient. In education, this means raising student engagement, marks, and attendance; promoting innovation, technical, and communication skills for a different kind of workforce; increasing savings and efficiency of non-renewable resources; and adopting innovative ways of accessing renewable sources as well. This way, schools could potentially be sites for research and development rather than lags in the system, and could promote new kinds of

thinking for a different generation of problem solving. In some places, such as the Southside Bronx greening program, this is happening in extraordinary ways. (Ted Talk, 2012)

Eco and Social Justice:

Eco and social justice work has multiple entry points in education. Work on energy for this project includes exploring options for conservation and efficiency through structural and behavioural shifts, and exploring the sticking factor of emerging renewables to shift the system. Much of today's current innovations will be soon obsolete, and it is hard to predict what new system will prevail. It seems the work should come from the top down, but while politicians and leaders devise a plan, good work can also happen from the bottom up. There are hundreds of places for information on what active citizens who are taking the initiative to conserve can find. Grassroots organizations and high public figures like David Suzuki (D. T. Suzuki & Boyd, 2008) and the Toronto District School Board's Eco Schools initiatives (TDSB Eco Schools, 2018) are two that provide family and kid-friendly DIY ideas for conserving energy.

As mentioned above, the heft of the push for creative ways to advocate to reduce our carbon footprint is the most necessary but least 'sexy' aspect of rejigging our energy system: efficiency. Insight into the structure of Ontario's energy systems, where traction can be made is also useful for justice work. Ontario's elimination of coal and access to hydro positions the province at an advantage, even if the need for an overhaul of the system is pending and ripe for inquiry and innovation. Renewables are the more flashy option for energy reform, primarily through wind, solar, biofuel and potentially geothermal capture. This area is under constant revision, designs are shifting wildly, as cost, makeup and size fluctuate before a product can make it to market or scale, which also makes innovation an exciting project to embark on in schools. Godfrey Boyle's work on outlining options for renewables is a decent overview that is not yet obsolete (Boyle & Open University, 2012) and Tom Rand's glossy but comprehensive work on how energy systems work is also useful. (Rand, 2010) The Pembina institute (Pembina Institute, n.d.) and Corporate Knights (Hamilton, 2015) publish more up to date opinion pieces on businesses making headway with clean tech innovation. They provide a critical lens with which to view emerging options, and offer a reliable references to current trends. Bill McKibbon provides the Canadian nuts and bolts of fossil fuel challenges as well. (McKibben, 2014)

Understanding why policies are slow to shift even if the need for drastic changes to mitigate carbon production dictate otherwise, is also a focus of justice work. Policies on climate change, the environment, conservation, and food sovereignty are areas to push for better systems. Debates on

climate change revolve around which science to believe, why policies are slow to shift despite the scientific proof of need for action, and how to communicate to ignite action. James Hoggan sufficiently outlines what the facts are and why people aren't talking about it more. (Hoggan & Litwin, 2016) His work is blunt about how frustrating it is to break into the system to engage people in the all-in need for drastic reform. Tom Rand's work looking at the psychology and sociology of inaction helps to illuminate why, despite the comprehensive evidence of need for reform, we are still not globally responding to climate change, as we should. (Rand, 2014) While Rand sits on the more urgent side, Fraser Institute's Kenneth Green is less worried (Green, 2017) on opposing sides on the imminence of climate crisis through their ongoing CBC Debates. (CBC, 2014) Tim Flannery offers a comprehensive game plan for how to make climate change issues and facts more widely talked about and acted upon. (Flannery, 2015) Canadian Environmental Policies and their historical backgrounds are outlined well through the work of Mark Winfield (Winfield & Koveshniova, 2009), and food policies are detailed through decades of advocacy work done by Rod MacRae (MacRae, 1999). These lenses are helpful in understanding and helping students to be aware of the machinations of government policies in how they reflect environmental advocacy for real people.

Justice work is expansive, diverse, and broad reaching, and spans multiple disciplines and crosses multiple theoretical frameworks for advocacy, anti-oppression, community building through feminist critical theory, eco and social justice, and differing worldviews. Feminist theorist work in anti oppression, advocacy and community building reveals Audre Lorde is a leader in articulating the need for intersectionality of feminist activism from the lens of a black lesbian woman through her essays and poetry. Her work is a call for an end to denying difference and the simplistic view of binary power systems. By denying race or sexual orientation (or age, or health) as a defining factor in a woman's experience, Lorde believed feminism was less empowered because it worked within similar power systems to the patriarchal system of hierarchies. (Lorde, n.d.), Donna Haraway critiques the lack of situating women within society and the feminist movement as complicit in the hierarchy of hegemonic patriarchal power in all aspects of society. She calls for coalitions based on affinity rather than identity, potentially responding to the divisions of intersectional group identity formation in emerging, divided feminist movements. (Haraway, 1988) bell hooks is an outspoken scholar who has influenced my understanding of the intersectionality of race, class and gender through education, media, sexuality and art with a focus on community to combat white, male, patriarchal, capitalist oppression. (hooks, 1994) Eco feminism in the form of working with plants and trees is informed by the works of Vendana Shiva, who is a leader in advocating for the inclusion of women in helping to dismantle the patriarchal capitalist practice of monopolizing seed production for profit and the elimination of suicide seeds, lack of ease for diversity in farming, and the pervasiveness genetically

modifying food as viable market products. (Shiva, 2005) Wangari Maathai was also a pathfinder in empowering women to plant trees to transform the politics and ecology of Nairobi and subsequently her efforts took hold in other parts of the world. (The Green Belt Movement, 2017) These currents of thought have influenced how I can provide insight into different viewpoints to look at complex problems in the classroom and introduce systems thinking by helping students to examine things from these lenses.

Eco and social justice warriors examine the imbalance of power and how it permeates our environment, economic system, and capitalist culture of profit in unsustainable ways. George Monbiot (Monbiot, 2016) is the leading prolific international ecological pundit presenting climate justice issues with palatable and persuasive arguments through print and video, while David Suzuki (David Suzuki Foundation, 2014) skirts issues of science, culture and policy pushing in Canada in similarly effective and multi platform ways. Naomi Klein (Klein, 2008) is the local and international popular critic of our hegemonic profit-driven economic system that maintains structures of power that are depleting resources and keeping peoples from maintaining autonomy. Her Leap Manifesto (Campbell, Klein, & Lee, n.d.) supports alternative options toward redesigning our global economic infrastructure toward more sustainable and collective justice work.

In terms of race and privilege, Paul Carr and Darren Lund delve into asking who should do critical work in researching race in schools. (Carr & Lund, 2007) Kuan Hsing Chen makes the persuasive argument that imperialism is at the hegemonic root of racist underpinnings. (Chen, 2010) Thomas King, (King, 2003) Richard Atleo, (Atleo, 2005) and Susan Dion (S. D. Dion & Dion, 2009) lay the groundwork for a body of work decolonizing Canada and Canadian schools by telling stories to bridge worldview gaps, analyzing how stories representing culture play out in the real world, and providing a deep analysis of how to unweave colonial power that is ingrained in teaching and learning and texts and language respectively. This compliments and informs my work as an educator strongly dedicated to modeling justice work by embedding it into programming, creating safe spaces for people to coexist, and advocating for school-wide programming to highlight justice work and activate our own.

Systems Thinking: Transformational Perspective Pedagogy for Sustainability

Systems thinking is a paradigm for consulting multiple viewpoints to solve complex sustainability problems. There is a clear need for a paradigm shift in how we mitigate complex problems like climate change. This requires a progressive way of reading systems, understanding how they work, predicting potential changes over time, and mitigating

harmful responses. Projections demand new potential ways to curb carbon dioxide at faster rates than we are currently moving. Governmental decisions are working against meeting our targets set out in the Paris agreement. Thinking in systems allows policy makers, communities and individuals to work from the top down and bottom up respectively to help transform consumption of carbon and make systems more resilient to the pressures we put upon them. Young people will benefit from this way of seeing the world. Practicing this form of thinking in schools while solving real world problems can better prepare millennials to handle the increasingly complicated future they are inheriting.

What is Systems Theory?

Systems theory describes patterns of relationships. All complex systems, like the environment, energy, weather, ecosystems, operate in circular relationships. They are self-maintaining until external forces pressure them to change. When they reach a tipping point, (Gladwell, 2002) things get can get unpredictable and amplified, and researchers may not be able to predict what happens when it reaches that edge. There is a need to allow for this kind of nonlinear uncertainty, which requires analysis across disciplines, multiple viewpoints, and an ability to adapt to accommodate unpredictability. (Kay, 2008) With systems theory, there is no divide between science and social science, interpretation is integral to observation, and choice is based on value judgments. It is more about finding interconnections and reflections on boundaries than universal truths. Humility, openness, and seeing information as incomplete are part of this. (Midgley, 2003) It is easy, then, to see how systems thinking is an important tool is understanding and living within our fast changing, unpredictable world as a result of climate change.

In complex systems and problems, it is confusing if problem-solvers don't take responsibility for creating the parameters of the story. Systems thinking involves collectively deciding what makes up a system in order to understand where its boundaries lie and what happens when the system is pressured to change. Researchers can then determine where the tipping points of change lie, and how to work around the natural feedback systems to optimize the health of the system and avoid reaching the breaking point. They can also find ways to create new constraints on systems too far gone to regenerate to their original states. (Allen, Tainter, Pires, & Hoekstra, 2001) In other words, systems thinking provides a framework that

incorporates complexities and uncertainties of systems and human values into problem solving. Building this framework into how students learn seems inevitable in the context of today's complex and near to breaking point world systems.

Systems thinking applies to environmental, political and social contexts, and is seen as issue-driven science for new problems that show uncertain facts, disputed values, high stakes, and urgency – like climate change weather patterns, forest fires, drought and floods. Policy today, in the context of climate change, requires this kind of understanding. This "post-normal science" is a way to manage, accommodate and adjust for surprises in the natural world, as opposed to controlling it. It is future thinking, with uncertainty embedded. In our globalized world, moral influence is expressed through activism, and the power of information sharing allows people to find practical means to improve their environments through social media. Systems thinking is progressive and openly reliant on technology and modeling, but also uses, harmonizes, enhances and validates traditional knowledge, transparency, and ethics in solving complex problems. (Funtowicz & Ravetz, 2003) Students inheriting these complex problems need to be more, not less inclusive in how they solve them, more adaptable and less forceful in understanding the tensions and breaking points to foster resilience.

Systems Models to Predict Future Outcomes and Potential Solutions:

It is important to envision the complexity of interconnected relationships and multiple perspectives through graphs and models. (Horan, 2002) Modeling potential outcomes makes the case for allowing for multiple points of view, humility in creating imperfect boundaries and knowing that any model will not show all the potential interconnected elements of a system. (Sterman, 2002) De-impiricizing science is the challenge, as modeling systems attempt to qualify what is being measured by paying attention to who is measuring and creating the boundaries with which to look at a system. Self-reflexivity is a key element in this process, and creating interdisciplinary scenarios for solving problems enables this to happen.

Systems Thinking as Tools for Social and Eco Justice and Problem Solving:

Understanding systems in this way also allows for an ability to place pressures on those functioning in harmful ways. This applies to ecological systems (Meadows, 2008) and also social systems that affect policies on social and eco justice and climate change. (Easterbrook,

2011) Ecosystem management during rapid change, like forest fire or flood response, requires this type of complexity modeling to envision potential scenarios and protect vulnerable areas. (Parrott & Lange, 2013) It can also be used to predict scenarios for social and political systems to gage tensions in communities, urban centres and societies at large.

Systems Thinking for Resilience:

Resilience is the flipside of vulnerability and is a conceptual tool to deal with uncertainty and future change. Resilience thinking is the capacity to absorb disturbance and retain aspects essential to a system in order to evaluate hazards holistically and adapt to them. This is done by living with change and uncertainty, nurturing diversity, combining types of knowledge for learning, and creating opportunities for self organization. Knowledge, partnership, and sharing skills and abilities are essential to resilience work. (Berkes, 2007) Students today need this ability more than ever in our changing world, which makes for a strong argument to teach systems thinking for resilience in schools.

If we are destroying the places and ecosystems that support us, how can we make them self-sustaining and resilient, given the pressures humans are putting on bio-systems at an increasing rate? The trick is to anticipate that change as part of the process of adaptation, and to negotiate potential and possible responses to shifts as part of the plan. If systems thinking exposes social inequities, poverty and degraded ecosystems using multiple disciplines and viewpoints, it can also lead to locally rooted innovation, collaboration, and resolution. Understanding power structures and relationships informs levers for implementing change, so communication and planning for resilience revolves around understanding power imbalance in society, and this can lead to further knowledge and action. (Charron, 2012) There is a need more than ever to see an interconnected web of parts if we are to maintain a sustainable future, but some of our social policies and systems are stuck in old mechanistic paradigms. It is time to advocate for a more inclusive way of seeing the world and solving problems, even if there is doubt those in power will change fast enough to avert disaster. (Capra, 1990)

Making the Systems Approach Case for Sustainability and Education:

The case for systems thinking in schools is that it provides a context for problem solving in our increasingly complex world that is inclusive, holistic and subjective. It veers away from

an empirical, scientific, one-right answer system that has been failing to incorporate environmental concerns into our globalized world. Inclusion of marginalized voices incorporates environmental and social concerns rendered invisible by the scientific lenses used to make human lives easier and more convenient. Knowing how to examine, chart, and predict potential futures when pressures are put on a system will teach us to live with uncertainty, see wider boundaries for system requirements for health and sufficiency, and advocate for broader gains. Systems approaches give voice to the globalized South who profit less from current systems and suffer more as a result of them, and speak for species with no voice to articulate their vulnerability. It helps young people recognize pressures pushing against human and more than human worlds within the systems they are part of. By incorporating systems approaches to learning, young people learn to go beyond current and past limited views of climate problem solving.

Progressive Pedagogies: Teaching ESE

Pedagogy for action is education's role in promoting sustainable change. Teaching a generation to think differently enables capacity to initiate and follow through on radical shifts the global community requires. By modifying how pedagogy is structured, schools can be a potent pathway toward a more sustainable paradigm. Students can learn to adapt and innovate by solving real problems the generation has inherited as a result of pressure from past inaction. A brief overview of some progressive pedagogies connected to sustainability follows. These pedagogies help students hone skills to think creatively, understanding multiple perspectives and engage in problem solving through collective conversations across disciplines.

Environmental and Sustainability Education: A brief overview of its beginnings

Currently, Environmental and Sustainability Education (ESE) is defined as: "The transmission, growth, and application of environmental knowledge across all sectors of society. Such learning is essential for the cooperative building of an ecologically literate and sustainable society, and for the decision-making and behavioural choices required to maintain a healthy environment. Environmental and sustainability education encompasses all types of education across sectors of society, leading to this common goal." (EEON.ORG, 2003);

Key moments in the ESE movement include early seminal reports: Rachel Carson's DDT research sparked environmental activism, (Carson, 2002); Donella Meadows' "Limits to Growth" in 1972 outlined a finite amount of worldly resources and timeline for depletion (Meadows & Club of Rome, 1972); the Belgrade Charter first introduced an international framework for environmental education to raise awareness, increase opportunities and new patterns of behavior (UNESCO, 1975); the 1977 Tibilisi Declaration influenced the world's environmental education goals and categories of awareness, knowledge, attitudes, skills and participation (UNESCO in co-operation with UNEP, 1977); and the Brundtland "Our Common Future" Report of 1987 responded to UNESCO's training and educational congress by defining sustainable development within the categories of common concerns, challenges and endeavors. (Brundtland, 1987)

The 1990s brought more comprehensive and globalized justice-based work to the forefront: Caring for the Earth (1991) aimed to improve human quality of life while sustaining ecosystems, translating practices based on 4 pillars: respect and care for community of life, ecological integrity, social and economic justice, and democracy, nonviolence and peace (International Union for Conservation of Nature and Natural Resources, United Nations Environment Programme, & World Wide Fund for Nature, 1991); Principles of Environmental Justice (1991) declared the first National People of Color Environmental Leadership Summit that define justice in terms of reaffirming the sacredness of the earth, affirming the rights of all people, demands for equity (National People of Color Environmental Leadership Summit, 1991); Agenda 21 (1992) emerged from the Rio Earth Summit with an action plan for sustainable development that included a focus on education (United Nations Sustainable Development, 1992); and The Earth Charter (1992) follow-up to the earth summit through a decade long participatory process declared values and principles for a "just, sustainable, and peaceful global society in the 21st century", based on the same pillars as Caring for the Earth. ("The Earth Charter," 1992)

Since these seminal texts, multiple disciplines have emerged to intersect with the early tenets of environmental sustainability education. The list below outlines pedagogies that compliment and define multiple options for administering progressive pedagogies for ESE in schools.

A Brief Overview of Options for Progressive Pedagogies

Arts-Based Education: (see also Popular Education and Eco-Art Education)

Arts education and practice is linked to learners with higher levels of achievement by fostering a sense of achievement and purpose (Fiske, 1999). It can be linked to creative problem solving that has impact on social engagement (Helguera, 2011) and individual and community based justice work (Marino, 1997). This connects to sustainability by using the creative process to solve environmental problems, and to communicate problems and solutions through expressions of art.

Community-based Learning: (see also Place-Based and Land-Based Learning)

Pedagogy can connect learning to communities, history, culture, heritage, literature and the environment. It ties instruction to local politics, statistics, habitats, etc. and uses local experts as resources for learning. People learn by actively engaging with their community, and go beyond the walls of their classroom, often extending into forms of action or activism that involves community. (Great Schools Partnership, 2014) Diverse opportunities include quests (Glazer, 2004), quizzes detailing how communities function ("Knowing Your Place," 2002), interventions (Trickett, 2009), collaborative arts activism (Kallis, 2014), creating visions of a better society (hooks, 2003), and collective food growing and sharing (Welsh & MacRae, 1998). It is progressive in negotiating differing perspectives on tensions and problems felt within communities, and addressing social and environmental concerns.

Eco-Art Education: (see also Arts-Based Education)

Art and environmental education connect to develop engagement, integration of knowledge, skills, disciplines, awareness and advocacy in, for, and about the environment. (Inwood, 2015). Creative expression enables students to understand, engage with, and problem solve issues linked to a sustainable future.

Eco-justice Education (see also Environmental Justice)

Eco-justice Education:

> "is connected with the need to reduce the impact of the industrial/ consumer dependent culture on everyday life while at the same time ensuring that people are not impoverished and limited in terms of equal opportunity; the five aspects of eco-justice … include: (1) eliminating the causes of eco-racism, (2) ending the North's exploitation and cultural colonization of the South (Third World cultures), (3)

> revitalizing the commons in order to achieve a healthier balance between market and nonmarket aspects of community life, (4) ensuring that the prospects of future generations are not diminished by the hubris and ideology that drives the globalization of the West's industrial culture, (5) reducing the threat to what Vandana Shiva refers to as "earth democracy" – the right of natural systems to reproduce themselves rather than to have their existence contingent upon the demands of humans." (Martusewicz, Edmundson, & Lupinacci, 2011)

Eco-justice education can be seen as a purpose of education for moral and civic engagement (Orr, 1991) or duty (Haluza-DeLay, 2018) to understand, brainstorm and design a more sustainable paradigm.

Eco Justice can also include:

Bioregionalism - a desire to live within and contribute to a region's natural community, flora, fauna, geology, climate, and water features defined by the system and community and not geographical or political lines (Bioregional Congress, n.d.);

Deep Ecology - a belief that the living environment as a whole has the same right to live and flourish as humans, and revolves around long term deep questioning of root causes of environmental concerns (Drengson, 2012);

Ecofeminism - a re-examining of values that have sustained power imbalances that have fueled the environmental crisis. (Russell & Bell, 1996)

Ecological Education:

"If we want children to flourish, says educator David Sobel, we need to give them time to connect with nature and love the Earth before we ask them to save it." (Sobel, 1996). Emotional attachment to ecological systems can spark active engagement in protecting them locally and farther afield. Being in the environment, students develop empathy for all life forms, embrace sustainability as a community practice, make the invisible visible, anticipate unintended consequences, and understand how nature sustains life. (Goleman, Bennett, & Barlow, 2012) This can be done through local ecological investigations (Krapfel, 1999), and engaging in cultural explorations of ecology (Smith & Dilafruz, 1999).

Education for Sustainable Development (ESD):

People learn content through various pedagogies, societal transformation is understood through local and global citizenship, and critical systems thinking, collaborative decision

making and responsibility for multiple generations are competencies practiced. (UNESCO, n.d.)

> "ESD empowers learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society, for present and future generations, while respecting cultural diversity. It is about lifelong learning, and is an integral part of quality education. ESD is holistic and transformational education, which addresses learning content, and outcomes, pedagogy and the learning environment. It achieves its purpose by transforming society." (UNESCO, n.d.)

ESD requires participatory learning and teaching methods to empower behavioural changes, critical thinking and collaboration. (Learning for a Sustainable Future, n.d.)

Environmental Education (see also Sustainability Education):

Education about, for and in the environment is the key to a sustainable future. EE contends that engagement and connection are sparked by less structured inquiry that comes from being in the environment. (Weston, 2004). It taps into naturalist, conservationist, problem solving, systemic, scientific, humanist, value-centred, holistic, bioregional, praxic, socially critical, feminist, ethnographic, eco-educational, and sustainable development currents. (Sauve, 2005) It "promotes an understanding of, rich and active experience in, and an appreciation for the dynamic interactions of: The Earth's physical and biological systems; The dependency of our social and economic systems on these natural systems; The scientific and human dimensions of environmental issues; The positive and negative consequences, both intended and unintended, of the interactions between human-created and natural systems." (Bondar et al., 2007)

Environmental Justice (see also Eco-justice Education)

Environmental justice is a "social movement, and a theoretical lens, that is focused on fairness in the distribution of environmental benefits and burdens, and in the processes that determine those distributions… concerned with both the 'fair treatment' and the 'significant involvement' of poor, racialized and indigenous communities in environmental policy and natural resource development decisions that have typically resulted in those communities bearing more than their "fair share" of environmental harms." (Scott, 2014) In the context of education, environmental justice is education for action that teaches skills to understand power systems that lead to injustice and navigate to push for more sustainable and equitable changes. (Hammond, 1996)

Environmental Science

Environmental science studies the effects of natural and unnatural processes, and interactions of the physical components of the planet on the environment. (Environmental science.org, 2018). It integrates an interdisciplinary approach to study and solution finding for environmental systems.

Environmental Studies

Institutions define environmental studies differently, but it is understood as an academic field that explores human interaction and relationships with natural and human made environments to solve complex problems. It is interdisciplinary in nature and includes politics, economics, philosophy, ethics, social sciences, justice, planning, education, arts, activism, science, sociology, law, planning, and other fields together. It can include multiple modes of research including quantitative and participatory and qualitative, and can aim for advocacy, liberation, inclusion, and compassion. (Kaza, 1999)

Experiential Learning:

Based on the foundations of Kurt Lewin and John Dewey, experiential learning focuses on action and reflection, experience and abstraction for a holistic experience of learning between the individual and environment. It is a process of discovery through doing. (Kolb, 1984)

Inquiry Based Learning:

"Inquiry-based learning is an approach to teaching and learning that places students' questions, ideas and observations at the centre of the learning experience. Educators play an active role throughout the process by establishing a culture where ideas are respectfully challenged, tested, redefined and viewed as improvable, moving children from a position of wondering to a position of enacted understanding and further questioning. Underlying this approach is the idea that both educators and students share responsibility for learning." (Scardamalia, 2002) This posits the educator as provocateur, and the student as a member of a responsible learning community with integration among disciplines. (Ontario Ministry of Education, 2013)

Land Education and Indigenous Ways of Knowing:

Land and place centred education considers the role of Indigenous, post-colonial and decolonizing viewpoints in the contexts of historical and current colonization in education on and in relation to land. (McCoy, Tuck, & McKenzie, 2017) There is benefit to exploring climate change and environmental problems from multiple viewpoints, and insights through indigenous ways of knowing are often left out of the conversation. (Kawagley & Barnhardt, 1999) There is an increasing volume of literature that helps to bridge cultures in education. (Aikenhead & Michell, 2011) Historical recognition for now settler-run places, like Toronto are rich with Indigenous histories not yet uncovered in the mainstream. (Sandberg & Rawat, 2013) There are systemic attempts to educate teachers on approaches to Indigenous perspectives. ("Indigenous Perspectives Education Guide," n.d.) Resources and research is growing to help move education in schools more responsibly toward reconciliation through the ministry (Toulouse, 2008) and school boards, (D. S. D. Dion, Jonhston, & Rice, 2010) and through community projects, (Burgess, n.d.) and teachers' federations (Wallace et al., 2012) in order to address the calls to action of the Truth and Reconciliation Commission of Canada. (TRC Canada, 2015) There has been a critique of anticolonial education and how it does or does not fit with environmental education initiatives. (Battiste, 2005) These perspectives have been historically left out of ecological education paradigms. (LeFay, 2006) Indigenous world-views and land education are seen to correlate with aims to educate for sustainability, and have been increasingly (but not inclusively) consulted and supported by non-Indigenous environmental advocates. (Hammond, 1996)

Outdoor / Nature-Based Education (see also Place Based Education)

Learning in the built and natural world takes into account intersecting nature, culture, experience, connection, wonder, stewardship, communities, differing perspectives and ecosystems, (Wattchow & Brown, 2011). This can reveal the dynamics of power amongst differing perspectives, and who (or what) has and does not have a voice. (Newberry, 2012) Multiple resources for teachers provide an opportunity for students to care about their environments in order to recognize when they are strained, and to advocate to sustain them. (Grant & Littlejohn, 2014)

Place-based Education (PBE): (see also Outdoor / Nature-Based Education)

First hand contact and connections between nature and culture in natural and built

environments, including all human and more than human inhabitants fosters deep connection. PBE provides a sense of relationship to place, exploring human impacts, using systems thinking to understand the interrelationships that maintain ecosystems. It "immerses students in local heritage, cultures, landscapes, opportunities and experiences, using these as a foundation for the study of language arts, mathematics, social studies, science and other subjects across the curriculum. PBE emphasizes learning through participation in service projects for the local school and/or community." (Promise of Place, n.d.) It is "about both the natural and built environments. The history, folk culture, social problems, economics, and aesthetics of the community and its environment are all on the agenda.... [O]ne of the core objectives is to look at how landscape, community infrastructure, watersheds, and cultural traditions all interact and shape each other" (Sobel & Orion Society, 2013) PBE makes a place more 'knowable', increasing motivation to stay longer, and transform learners from 'story-seekers' to 'thoughtful participants'. (Curthoys, 2007) Pedagogies include partial to full immersion in communities, (Glazer, 2004) and attention to relationships between settler and indigenous connections to place. (Seawright, 2014)

Popular Education:

Popular education, developed by Brazilian educator Paolo Freire in his seminal book "Pedagogy of the Oppressed" (Freire, 2000) involves community based movements for social change and transformation by challenging existing power relationships, learner centred methods, and valuing the knowledge and experience of the learners. (Bernard, 2002) Often using art (Marino, 1997), or storytelling (Stone-Mediatore, 2003), (Razack, 1998), or play (García Lorca, Maurer, & Di Giovanni, 2010), (Lugones, 1990), (Mohanty, 2006), (Macdonald & Rachel, 2000) as a means of collective understanding, popular education explores intersectional barriers (hooks, 1994) and responses to power (Starhawk, 1987) with the aim toward transforming oppressive states toward more equitable structural systems. It heavily relies on community participation (Horton & Jacobs, 2003) and personal reflection or praxis – practice and reflection of it, (Foucault, 1997) in the context of collective action to spark deep learning. (Ledwith & Springett, 2010) By nature, popular education is an advocacy education for the under-represented or oppressed, be this through race, (Srivastava, 2007), (Kelley, 1999) colonialism, (Battiste, 2000) (King, 2003), (Simpson, 2008), poverty (Lerner, 1999), gender, (Rebick, 2009) sexual orientation (Lugones, 2007) or other

reasons. This creative community based resistance education is situated in place and local power dynamics, and justice work translates easily between the human and more than human worlds, working toward social and ecological sustainability.

Problem-Based Learning (PBL):

PBS is facilitated problem solving based on a complex problem with no single correct answer. Students collaborate to identify what they need to solve a problem, through self-directed learning, application of knowledge and reflection on effective strategies used. Goals include development of skills in flexible knowledge, effective problem solving, self-directed learning, effective collaboration and intrinsic motivation. (Hmelo-Silver, 2004) PBL has reported links to critical thinking development (Tiwari, Lai, So, & Yuen, 2006) and addresses the imperative to develop complex problem solving to invent new paradigms for sustainable change.

Project-Based Learning:

Project based learning features projects that are central to or are the curriculum; focus on questions that drive people to engage and struggle with concepts and principles of a discipline; engage in constructive investigations; are student driven with a sense of autonomy; and comprised of real life challenges. (Thomas, n.d.) The driving question leads to authentic, situated inquiry, collaborate with community to find answers, scaffolding learning new technologies, and creating tangible products to share the fruits of efforts. (Krajcik & Blumenfeld, 2014) It is formatted as inquiry based, skills building, problem solving, creative, and community building. "From gleaning new, viable technology skills, to becoming proficient communicators and advanced problem solvers, students benefit from this approach to instruction." (Bell, 2010)

Social Justice Education:

Teaching and learning involves tackling discriminatory policies and practices where students actively advocate for social justice. (*Narratives of social justice educators*, 2014). This can include resisting the effects of our globalized economy (Apple, 2010), pedagogies for social change (Freire & Freire, 2014), resistance practices human rights (hooks, 1994), antiracism (Srivastava, 2007), and decolonization (Razack, 1998).

Sustainability Education (SE):

A transformative learning process for students, teachers and school systems to use new ways of thinking for economic prosperity, responsible citizenship, and restoration of healthy living systems we depend on. (Cloud Institute for Sustainability Education, 1995). There are numerous resources for this kind of work, (Kozak et al., 2014) including building gardens as pedagogy (Williams & Brown, 2012), and modeling sustainability through individual role models, and school facilities and operations, governance and culture. (Higgs & McMillan, 2006) The focus on integrating head, hands and heart as an organizing principle helps to work toward trans-disciplinary study (head), practical skill sharing and development (hands), and translation of passion and values into behaviour (heart) through sustainability education. (Sipos, Battisti, & Grimm, 2008) This work connects to power relationships and anti oppression education. (Mitchell, 2010)

Progressive Pedagogy: Choosing Options for ESE – An Analytical Takeaway

The options for teaching PP and ESE are exhaustive and ever growing as new research emerges. The aim is to clarify best practices for teaching for a sustainable future: As such, it is optimal to give young people opportunities to practice using tools to solve complex problems. This involves creative, innovative learning in, about and for the environment in order to feel it is something worth advocating for. Inquiry based, locally situated, community driven work that permeates how students think about their environments, communicate different perspectives to understand a bigger picture, and follow their curiosity to probe deeply will resonate and engage. The goal is to create learning that empowers people to take ownership of their inquiries to solve real-world problems, and prompt tangible action. Pedagogy that develops practical and communication skills, and builds and connects learners to larger communities works toward sustainable goals for the future. Through this work, in whatever combination works for the situation, students, families, educators, administrators, academics, school boards and the Ontario ministry of education can make pivots toward potential pathways to make room for more sustainable models of thinking, working, learning and teaching.

CHAPTER 3: CASE STUDY – CITY SCHOOL ENERGY PROJECT - OUTLINE, JOURNAL & KEY LEARNING

The context of my research is to learn, practice and provide examples for others to transform schools into sites for positive sustainable innovation and change. The energy project at City School was a first attempt at creating curriculum designed to push the boundaries of the education system toward solving some of the climate change problems we face in the near and distant future. What follows is a journal of what the research revealed throughout implementation during the school year 2017-18, and a record of the reasoning, design, methodology, time frame, process and key learning analysis of this attempt.

The Proposed Project Outline Rationale: Energy Problem-solving as Pedagogy for Sustainability

This is a moment in history when assuming there is unlimited growth, supply, resources, potential for profit, and ease in living, like past generations, is no longer an option. All sectors are feeling strain and required to make drastic shifts toward renewable energy and carbon reductions. Solutions on how to do this remain hard to fathom. Engaging students in the process of identifying the complexity of the problems and collectively designing innovative solutions helps not only to reach sustainability goals, but empowers a generation to think more broadly about the short and long term future. Building this kind of work into learning makes schools relevant, encourages skill building, and provides opportunities for exciting options beyond a classroom setting. Climate change is a key catalyst for the need for systemic change. Building a local, doable, creative programming through community cooperation can set the stage for students to think creatively and work collectively. Playing up individual strengths, problem solving by measuring tangible results, and becoming empowered and engaged in issues that pertain directly to their future are part of the process.

City School is embedded in a City of Toronto owned building that shares space with The Waterfront Primary and Middle School, St. Stephens Daycare, and Waterfront Community Centre. As such, there are no school grounds, but the Harbourfront Music Garden and

wetlands are just outside the door, Little Norway and Little Ireland parks are within one block, Fort York is a ten minute walk as well, and there is an extraordinary view of Lake Ontario from each of the classroom windows. It is also directly beside the Island Airport, and a site for ongoing construction building the tunnel, upgrading the bike lanes in preparation for PanAm games, and creating the underground subway, and students and staff have advocated for safety and clean air linked to the work done in the area. (City School, 2018) There is an ongoing, excellent working relationship between City School and the Waterfront school, annually engaging in anti bullying drama initiatives, storytelling programs, and an eco-mentorship summit where high school students lead workshops for the younger students in course-specific ways. Both schools use the community centre gym, café, and dance studio, and the shared space offers opportunities for community arts and music and outdoor initiatives. There is a music studio and weight room available at nearly no cost to students as well, and multiple opportunities for volunteer work within the building. It is also a site where building mandates differ, and custodians cater to both City of Toronto and TDSB standards in maintaining the space. Ease in communication and negotiation around who uses shared space has historically been dependent on the personalities of the stakeholders present in a given year.

Energy Project: Design

The initial proposal for research was to build a school wide energy project for the 2017/18 school year at City School. Three levels of engagement were proposed to interweave setting goals for efficiency and use of clean energy, systems thinking as a theoretical framework, and progressive pedagogies as a means to build communities and creatively problem-solve. Stage one involved inquiry connecting the individual to ideas of energy and encouraging calculation and assessment of personal use and expense. Stage two moved toward collective problem solving within the school community, designing integrated school-wide programs to promote efficiency through behavioural and minor structural adjustments. The final phase transcended beyond the classroom to innovate gaining access to clean or renewable energy sources and inviting the broader community to engage in the learning and fruits of the work.

With the new cohort of young students in the school, and a vision of building a culture of eco and social justice advocacy, administrators and staff easily granted support. The aim of

the project was to make pivots in the school that could act as a model for wider reforms within the system and society. It was proposed to promote practice in problem solving, creativity, community building, systems thinking, and interdisciplinary approaches to learning. These skills help students find new solutions to challenges they have inherited from conflicts created by functioning in an unsustainable paradigm.

The project was designed to build replicable curriculum that structures interdisciplinary learning around how we consume energy through measuring, behavioural and structural shifts in use, and experiential problem solving to create innovative renewable options. By empowering students drive the process of discovering collective solutions, it was anticipated that they would continue to use these skills for greater good beyond school contexts.

Embedding the energy project in course lessons across grades, subjects and cohorts fulfills the common goal to use the school mandate to teach eco and social justice as an ongoing motivator for problem solving, and administer progressive pedagogies concurrent with the research into best practices for ESE. At the outset of the proposal, it was not yet clear which courses I would be teaching.

Energy Project: Methodology

The initially proposed research included a self-reflective journal of progress, interviews with willing students and teachers commenting and reflecting on the effectiveness of the project, and the creation of peer reviewed, adaptable and usable curriculum outlining the project and incorporating student and peer feedback. The project evolved into this policy paper that outlines the barriers to effectively implementing the originally proposed project, the process and journal of outlining what transpired when implementing an energy project in a Toronto high school, and an analysis of findings, next steps, and recommendations for future success.

Energy Project: Timeframe

The timeline worked in conjunction with the school year, with submission of final work at the end of July.

What follows is a journal of the experience, outlining the barriers to successful completion of the project as proposed, explaining how and why the interviews and curriculum creation

for distribution did not happen. This overview will provide inside look at the real issues that teachers face when trying to implement practical solutions.

The Proposal in Action: What Transpired – A Monthly Journal of the Process

August: Planning

In late August I received my timetable for the school year. I was assigned 6 classes, three per semester, and volunteered to take on the role as lead of Eco School initiatives. Courses included English literature (grades 9 and 10), integrated arts / visual arts (grades 9 and 10 and 12), and leadership (grades 11 and 12) for the first semester, and Indigenous and cultural studies (grades 9 and 10), English and Literature Studies (grades 11 and 12) and drama (grades 9, 10, 11, and 12) in the second semester. I envisioned introducing energy as individual self-understanding and expression in English and art classes, and more literally as a project to engage through inquiry based learning in leadership class. I planned to engage students in inquiry-based pedagogy to get them to think about and respond to notions of energy through literal and metaphorical interpretations. I designed questions for the Eco School team and leadership class that posed challenges related to energy efficiency and proposed finding ways of measuring energy use, and devising behavioural and structural ways to conserve. I designed opportunities for students to engage in debates on how to solve efficiency problems and how to design renewable programming within the classroom. I made space for opportunities to experiment with creative design.

I had done similar work through an energy grad course and could guide some of the explorations with a sense of some clear and tangibly positive outcomes in mind, measuring energy use in the school, researching more efficient lighting and calculating the cost savings for exchanging bulbs and putting computer labs on timed power bars. I knew the savings would amount to at least $5,000 in a year, and that science and math classes could be involved in the exploration. I also dreamed of creating solar and bicycle powered charging stations in the school, with no idea how to do this work, excited to propose it and see how the expertise in the building might mobilize to make it happen. I wanted to remain flexible in order to stay true to my goal to encourage inquiry based learning, but had some excellent strategies and structures in my pocket at the start of the year.

Then I met the students and staff, and the project became an exercise in adaptation:

September: Shifts in School Culture

Before the students arrived, it was clear that the entire culture of the school had shifted. I had taken a year away from teaching to pursue academic studies, and it was a shock to the system to return to a drastically different environment. Of the six staff members at the school, I returned to only one familiar colleague, a social science teacher with a course load that was ideal to intersect with energy programming. I was informed early on that participation in new program collaboration for this school year would be difficult. There was a new science/ math teacher and a history /politics / English teacher who joined the teaching team the year I was away. Both were excellent educators who were learning to teach new subjects in new contexts at the school, interested but challenged to find the time to build cross curricular programming. The long-standing math/science teacher and the art / science teacher were both on sick leave, replaced by wonderful but also heavily burdened long term occasional teachers scrambling to create programming for last-minute jobs. The on-site guidance counselor and administrator, who was responsible for school planning, scheduling and budgeting decisions, was also new to the school, replacing a colleague on a year long leave teaching enriched programming in Europe. By day one it was clear the project would revolve solely around courses I was teaching along with Eco Schools initiatives, rather than be a whole-school, interdisciplinary project.

Historically, school administrators at City have been my greatest allies in designing and implementing creative programming. The person currently on leave in Europe was a great champion of my work, and of shifting toward a mandate for eco and social justice as the underlying theme for the evolving school. We had done cross-curricular work, and together built a positive school community and vibe, having our students mentoring little kids, hosting talent and art and info sessions, and devising out-of-the-box ways of helping students thrive. It was this colleague who supported my originally proposed energy project and advocated for it with the off-site administrators, agreeing to be my on-site supervisor for the internship requirement associated with my degree. He encouraged me to maintain contact with staff and students during my year studying, and I was able to conduct

preliminary research for various classes in the school with his support. It was a blow to hear he would be away for the school year I was to return and conduct my research.

The new school administrator supported the project as long as it didn't require undue extra work, money, time or resources for others on staff. Time during staff meetings to discuss the project, explore options, and inform the new staff of long standing practices to easily model behaviours in order to maintain a platinum Eco School status was no longer available. It was clear environmental advocacy was no longer a priority, and maintaining the eco culture of the school felt like my sole responsibility, with other staff working in their silos trying to keep up. I found ways to get information across with individual teachers grateful and supportive of the work, but the structure of the school had shifted away from working in the context of collective input, multiple viewpoints, and encouragement to work outside of the parameters of a single classroom.

I also met the students who, as a collective group, were dramatically different from the community of learners I had known earlier. The degree to which younger students suffered mental health issues was shocking. Many had anxiety so pronounced they would not go outside for lessons, or attend field trips designed for experiential learning. Few were doing work at home, and attendance was sporadic. I needed to adapt by administering lessons in single-class units to assess understanding and learning.

In response, I shifted the thematic focus of my classes for the first two months toward building skills and strategies to support mental health and wellbeing, addressing energy peripherally. At the island day get-to-know-you kickoff field trip, we made salad rolls, and discussed informally the difference in energy between eating barbeque burgers and heavy meat and bread versus vegetarian fare. The school wide art activity was to create a huge mural answering the question: "What gives you energy?" This was on display in the main hallway for the first half of the year. In leadership class, we did community-building exercises directly taken from systems thinking activity books, and systems thinking was explicitly taught as a way of working with others toward a common goal. Energy programming at the start of the year was clearly evolving into something less grand, less interdisciplinary, and less student based.

October: Finding a Groove

By October, classes were in full swing, but still focused on health and wellbeing as driving themes. We were building communities in the classroom, but students began seeing attendance as a flexible option. It remained difficult to plan lessons beyond single class units.

The snack program also changed dramatically from previous years, offering single-serve individually packaged snacks with little nutritional value. This was a shift from monthly breakfast clubs and daily fruit and vegetable snacks programmed in previous years. It was the only option provided, with no staff or student consultation. In response, my Leadership class focused on a class-wide project to improve the food program in the school rather than work on the originally planned energy programming for October and November. Small teams developed healthy recipes and weekly prepared meals to feed themselves and the rest of the school breakfast. Collectively students took responsibility for weekly orders for supplies for daily snacks. Advocacy work was embedded in the project, as well as skills building to conduct surveys, communicate proposals, research vegan options, calculate cost, and calories and weighing cost and benefits of buying local and organic produce. I tied this into energy by prompting reflections based on how food is produced and processed and absorbed in the body, and exploring local versus imported goods and notions of sovereignty.

English classes did creative writing journals answering a series of questions around building characters and plotlines based on different kinds of physical and emotional energy characters experience, which was expressed through creative and journal writing.

In late October the Eco School kickoff began our formal eco school teamwork. There were strong members with diverse and engaged ideas around what to do to make and keep the school culture focused on the environmental standards we were used to. While gathering over lunch hour was akin to herding cats, it was easy for me to engage individual students in projects that interested them and to help them to follow through and find their allies.

November: Building a Team

Early November was when the Eco School Team finally got into gear. Attending the kickoff in October, there were a handful of faithful students interested in doing excellent eco advocacy, and open to exploring programming around energy. We planned for the year,

conducted a waste audit, held recycled battery bake sale drives, and planned school-wide clothing swaps. This was all low profile, but I managed to let everyone I encountered in the school, students and staff alike, aware of what we were doing and planning in an informal way.

In late November I introduced a device to measure energy output for all the plug-in items in the school. A consistently disruptive student took on independent responsibility for the task, spending several days recording calculations for computers, monitors, and other appliances in different classrooms. The Eco team volunteered to share the task of counting different numbers and types of light bulbs to calculate the energy they used as well.

The new staff ushered in a new dynamic that clearly influenced structural shifts in the school. Monthly school meetings to update students, make announcements, and give students and staff voice to address needs in the community no longer happened. Communication to the whole school was no longer possible. Announcing opportunities, introducing new initiatives, daily reminders, and showcasing good work posed a challenge. Announcements ceased when the PA system broke and for much of the school year information was disseminated solely within single classrooms.

December: Holiday Season

Through December the culture of the school resembled nothing I had encountered as a teacher before. A large percent of students were conducting independent study projects to earn credits rather than attending classes, and many relied on online postings of assignments rather than interactive instruction. Attendance was at an all time low, but those in the school were doing excellently, and established strong relationships with each other and staff in order to build skills and excel. Much of my work was spent encouraging people to come into the building for one on one instruction to help people catch up or keep up before the end of the semester. I was working more with individuals than building communities, because there were often too few students present consistently to keep together. I focused on keeping the classroom a safe and encouraging place for anyone to come to at any time, regardless of how much or little they had been present or producing work.

Because engagement and attendance was so low, the focus shifted to finding individualized themes students could relate to rather than lead a collective group through energy programming.

Students maintained their responsibility feeding the school, hosting bake sales and making art. The art teacher collaborated with me to explore sustainability and environmentalism through art. A handful opted to do this, choosing to create eco and energy focused tee shirt designs, while others chose different topics that interested them.

Despite efforts to use available alternate options, the winter feast was served using single serve, disposable Styrofoam, paper, and plastic plates and utensils. It was again abundantly clear I could focus on sustainable efforts solely within my own classroom.

January: Scramble for Marks

January was a scramble focused on exams and culminating projects and helping students earn their credits. The Eco School team did their best to record results for audits, but much of the energy data collecting remained unfinished as students prioritized work for marks. The student tasked with recording energy appliances lost his data. Calculating light fixtures was put on the back burner. The math class, originally interested in helping out, was busy with exams and no longer available. To promote success for attending and non attending students, I opted for open ended, student driven culminating tasks rather than my originally planned projects created to apply learning to an energy context. Tasks were individualized, and I spent much of my time coaching students one on one.

Two students in leadership class took up the challenge to do energy work for their final projects: one student designed a way of harnessing energy from a stationary bicycle to charge mobile phones and laptops, and submitted an excellent and doable proposal and plan for execution. While I was able to procure a donated stationary bicycle, the other equipment requested was not approved, and the project remained unfinished. Within a few days, rambunctious students broke the tension belt on the stationary bike. The innovator student offered to repair it, but requests for parts went unanswered, and it remained in the hallway with no tension as an entertainment piece for energetic students. I engaged the class in

inquiry-based problem solving to figure out how to fix it, despite lack of access to tools and materials. Some made attempts, but in the end it was left undone.

The second eco friendly student applied for a Speak Up grant from the Ontario Ministry to green the school with plants to provide food and oxygen. She got what she asked for, but by the time the funds arrived, early in the second school semester, she had transferred to a different school. I ended up managing the program she had proposed, embedding it into class work in an indigenous studies course I was teaching in the new semester.

February: A New Semester

The new semester brought a fairly new student body to the school along with different courses to teach. Drama, Indigenous Studies and Senior English classes presented opportunities to revisit energy programming. Staff members were now familiar with each other, how the school was run, and my work. Several were open at this point to working with me on energy initiatives, but the schedule did not make this easy, with little time to convene to plan, and few opportunities to bring compatible classes together.

English class was devoted to following Canada Reads (CBC, 2018), which focused on the theme of one book to open one's eyes. The two most popular books were set around issues of climate change, and there were opportunities to directly address, analyze, and debate issues of sustainability and energy in the class. In drama we explored body language and expression through different prompts around energy. Indigenous studies directly linked to the energy project, as we started by examining indigenous activism around water protection and pipelines.

I was also mentoring a student teacher actively involved in creating and delivering engaging units. Connecting to the energy project pushed the boundaries of the student teacher's comfort zone, so the project was put on hold for classroom purposes.

The Eco Schools team picked up the energy audit but had to begin again, since many of the original team members had graduated, transferred to other schools, or lost their work. This made it difficult to reengage. I provided some numbers from my own research and encouraged working with math students to calculate efficiency. This did not come to

fruition, as the math teacher, now returned from leave, was interested in the work, but focused more on catching up and connecting with students than collaborating.

The Eco School team, however, had plans. They recognized significant energy savings if we used power bars on timers that turned off at night for school computers. One student prepared a budget and submitted a proposal to the administrator, eager to see tangible results. It was initially approved.

March: In Like a Lamb

March brought innovation and implementation to the school's energy programming – perhaps by sheer will.

My health was not good. By March, I had an injury on my foot that made it difficult to function or work, and was scheduled in April to have surgery to relieve the pain. This meant that the energy project needed to go into high gear if it was going be completed.

I followed up on the power bar project. A month after initial approval, we were informed there was no budget for the purchase.

I focused on new projects, and requested the release of funds from the Speak Up grant to green the school. I purchased different kinds of seeds to grow food in the classroom and embedded this in lessons on sovereignty in Indigenous studies. Students planted 70 seeds using seed starter kits, and were given the responsibility of watering and documenting the growth of the plants. The daily ritual included watering, photographing or drawing their progress, and the tiny class community was inspired and engaged in the work, making connections to their lives, the course, and the energy work we were learning about.

My student teacher was also an expert on plants, and led the class on expeditions of the grounds, finding and explaining traditional medicines we took cuttings of and also started to grow in the classroom. Things were beginning to blossom. Students were learning, engaging and sharing diverse knowledge. They were creative and coming and suggesting new ideas. The strike at York University, however, cut the student teacher's momentum and planning

short, just as I was planning my leave and hoping the student teacher could take the ball and run with it while I was away.

Through luck and association, our school was offered last minute tickets to see Al Gore and Premier Kathleen Wynne speak at a highly publicized pre-election gathering to highlight the importance of environmental advocacy in politics to young voters. We were allowed to invite the whole school. Very few were interested or willing to go and after much work, coaxing, calling parents, and encouragement, I brought a hefty sum with me to sit in the front row of a highly publicized event. Gore outlined his newest text as a guide for creating grassroots eco activism and 25 students were enriched, engaged, activated and influenced by the event. We were also provided with copies of the book to use at a text in the classroom / or to give to students directly.

I found another fun project to focus on: building a bicycle powered blender. Intrigued by the possibilities of using kinetic energy from bicycles, I asked around to see if anyone knew of any programs to hook bikes up as energy sources. The Eco Schools leader sent an instruction manual to build a blender powered by a bicycle. We were hooked. Learning took shape mostly through anecdotal conversations rather than formal educational classes or team meetings. With student help, I learned to use online forums to get the things needed. I located donated or inexpensive items, drove all over the city picking them up, enlisted a friend to help cut the wood, and asked students to help put it all together. This blender bike was the first instance of my envisioned energy project in action. Students who were least engaged in classroom work rallied to do the hands-on nuts and bolts taking apart of the blender, attaching a rack to the bike and figuring out how to hook it up to a stationary stand. It started with two students, and built. People saw what was happening and how into the work they were, asked about it, checked the instructions, and joined in. Students outside my classroom joined in when they heard cool things were happening.

Because the leadership program from last semester had ended, the food in the school snack program regressed to its old unhealthy ways. A colleague teaching a course in food and nutrition picked up the ball, and began talking up afternoon smoothies as a pick-me-up to connect the disciplines and benefit multiple classes learning in the school. Engagement of

the people who chose to participate was higher than expected, and included students that didn't engage in school in other ways very easily. These students asked for permission to work on the project as part of other classes they were taking. I was able to negotiate providing opportunities to earn a credit in the process of this experiential learning.

We finished by the end of March. We even brought in an engineer cousin of mine to help the final building. It was a little wonky, but in the end it worked with a little finessing. We made two rounds of smoothies and fed everyone who wanted one in the school. It was cool. Students who didn't participate were amused and appreciated the healthy snack. Students who did participate were enormously proud of themselves. Teachers were impressed to see the hardest to reach students so engaged.

April to June: Healing at Home

From April to mid-June I was home healing from surgery and work on the project was complete. I had to adjust my schedule for interviews to accommodate my healing process, and the TDSB policy allowed no interviews in June. I was no longer able to access the feedback needed for completion of the project, and faced revising the nature of the research. Despite the small but significant successes, the program as intended felt like a failed experiment. Rather than create a model for other schools to do good work, I had encountered multi-leveled barriers to success at every turn. I had learned more about what gets in the way of PP than what kind of success it can render in student engagement and energy reduction and conservation.

When I returned in mid-June to work, I discovered that our Eco Schools status had been demoted from platinum to gold for the first time in more than a decade. Staff and students and auditors hadn't seen or reported on the extent of the work done in my classroom and beyond with the project to address our work with energy, food, waste management and greening the school. Students and staff were aware of the work, but not how to record or report it to the wider community and auditors. This was remedied with a quick telephone call and update to the website, but served as a reminder that our eco advocacy had not yet permeated the language and culture of the school.

To sum up, the experience of building a progressive pedagogy for ESE in school did not proceed as planned. Barriers to achieving predicted outcomes were many, and included: 1) lack of support through school structures: finding time to plan or schedule cross curricular opportunities was prohibitive; creating a culture of interest and engagement and promoting the project through meetings and announcements with the whole school didn't happen; creating cohesion as a staff to support the work was challenging; funds to support the program were de-prioritized; and participation was seen as a burden rather than a pedagogical opportunity; 2) lack of staff autonomy and release time for inclusion in the project: Four staff members indicated an interest in working with me on the project once it was up and running, but time constraints and school structures made it difficult. Lack of time in staff meetings to discuss the work, and lack of flexibility in scheduling made challenging, and opportunities were lost because there was no time accessible during the school day to develop a plan; 3) lack of school culture to support engagement: students who were disengaged were not encouraged to return to the classroom or to advocate or ask for what they needed to from teachers. Student participation in any school initiative was a challenge as a result. Because of low attendance, learning had to be designed for single-class segments, making focusing on complex problems in a fulsome way difficult to do.

Energy Project: Analysis of Outcomes

In the end, we built an energy program and achieved part of what it set out to do. It was not done as a whole school initiative, but rather on a smaller scale, and included members of the school but not beyond into the wider community. It also engaged individual students more through unofficial channels than planned programming. It was delivered within single classes or Eco Schools initiatives instead of reaching the student body at large as intended, and was less interdisciplinary as a result. The lack of ability to communicate projects and successes to the whole school relegated projects more locally within a single classroom and via student and teacher encouragement and engagement. It also engaged fewer students in systems thinking, as it was difficult to engage multiple people to provide different viewpoints at one time until working on the blender bike. Engagement was high for those who participated, and this came in unexpected ways. Some of the proposed ideas that came from students were not supported, which was discouraging for students who ultimately decided to drop out

of the program, some who transferred schools as a result. Promised resources were not provided and, as a result, interest fizzled away.

However, students were empowered to find their own resources and learned skills in the process for grant writing, and advocating for what they wanted to change in programming in the school. In one case, a student who received a grant transferred schools before reaping the benefits of it; so the initiative became teacher-led until incorporated into another class activity.

Pride in achievement was minimized by lack of cohesiveness in programming and the need to relegate it to the Eco School club rather than part of curricular learning. We engaged in energy work through writing in English, art making in whole school events, food programming in Leadership, movement in drama, growing food in indigenous studies, energy audits, battery drives, and innovation planning in Eco Schools; we placed orders for reducing land fill with food programming, and growing food; we made efforts with recycling programming; we calculated efficiencies and requested timer sensitive power bars for computer labs; we built a bicycle powered blender to make smoothies.

Ultimately, we did what we set out to do, mostly, but learning was on a far smaller scale than planned and not as interdisciplinary as hoped.

Energy Project: Key Learning

Key learning is that from the top down and bottom up, integration and cooperation across levels is imperative for creating and administering progressive pedagogy for ESE.

From a policy standpoint, ministry, board, federations, teacher training and schools are not working in sync to integrate sustainability education into practice. There were few structures in place to encourage the design of progressive pedagogy, even in an alternative school that has the potential to be far more flexible than larger mainstream facilities. Because there was no impetus contractually for the admin, teachers and the board to extend an allocation of time, resources, flexibility and encouragement, none was provided.

Had the ministry mandated sustainability programming be part of School Improvement Plans, it would have been easier to gain administrative support for a mandated goal. Had the federations, colleges and board ethically and contractually embedded ESE into standards of practice, and had the ministry embedded ESE in overall expectations for courses, all teachers would have jumped on board. Had Eco School participation and support by staff been part of the expectation of teachers, colleagues would have welcomed the design of this project and been more open to participating. Had the student contracts, signed at the start of every year through registration, included a clause more specific than agreeing to adhere to the eco culture of the school, and articulated an expectation that some of the volunteer hours are allocated toward eco initiatives, student buy-in would have been higher. Had the structure of the school programming allowed for project development at staff meetings, regular communication of information to students through monthly meetings and announcements, and a venue for input from the community about how to proceed, the project might have been more substantially successful in community building, garnering multiple viewpoints, and being inquiry-driven.

Building a program like this from the ground up is burdened with the need to build a team of support from all levels in order to succeed. In essence, challenges of enacting progressive pedagogies like the one proposed in this paper are based on the fact that each level of the education system is operating in isolation of the others. The lack of expectations from the top down to hold levels responsible for their role in working for sustainable education reveals a superficiality in commitment to actively shift the system in a timely way. In simple terms, the education system is currently paying lip service to the policies it is reporting to be steering. Ultimately, for this project, the outcomes reflect the barriers society faces on a larger scale working toward more innovative and progressive practices.

CHAPTER 4: CONCLUSIONS

Overview of the Research:

Coordinating interdisciplinary programming for school-wide initiation of systems thinking through an energy project geared to solving a real world problem for sustainability requires integrated ongoing support and communication and collaboration from all levels of the education system. In this case study, the intention was to work on a local level to push against ministry and curricular lags in teaching environmental education for sustainability. While support existed on a theoretical level locally, on a practical level there was lack of support in terms of the time, budget, scheduling and resources needed for the school to put theory into practice, despite interest and willingness on the part of students and other staff. These unforeseen barriers are areas to address and require time and negotiation if this kind of progressive pedagogy is to succeed.

Main Findings:

Under current conditions, working toward teaching for a sustainable future is a burdensome task. Research indicates this is the way to go, but the structures in place do not yet support it. Until this is made a mandatory aspect of professional teaching and learning through curriculum, school planning and reporting, administrative vision, expectations of practice for educators, and time and money is allocated for planning wide-scale initiatives, barriers will likely continue to hinder widespread positive shifts. Modifications and reforms based on not having the solutions, but on creating the conditions for all stakeholders in the education systems to come up with them as they go, and allowing for them to have breathing room to gain traction as we turn the ship around could potentially lead the way to making great inroads in the right direction.

Currently, ministry and curriculum documents suggest but do not mandate sustainability efforts through boards or schools. While the ministry is set on making changes on par with the 2015 Paris Agreement, implementation is not yet trickling down to educators in fulsome ways that are easy to adhere to. The ministry and boards stress the need for energy efficiency and transition and individual schools devise and report efficiency plans through individual

school improvement plans (SIP)s. Accountability, however, is not enforced, and this work is currently theoretical. The board and ministry are currently working on shifting contracts to add solar roofs on schools, purchase more efficient bulbs, and purchase less toxic cleaning supplies, but this is not yet transparent or incorporated into learning strategies or curriculum expectations.

In the ministry, there are multiple documents in support of education for sustainability. It is improving, creating updated documents that embed environmentalism and sustainability into the curriculum across disciplines. However, there is a lack of direction mandating ministry, board and school improvement plans support and report on progress teaching and practicing sustainability initiatives. While ministry documents are impressive on paper, they are not enforced or adhered to.

Learning about sustainability is done primarily through science, technology, engineering and math (STEM) courses, which offer units on ethics and conservation and information on how energy works. The lion's share of eco advocacy comes through Toronto Eco Schools at the TDSB and Ontario Eco Schools everywhere else in Ontario. These organizations offer ideas on how to embed eco awareness in the classroom, green the grounds, conserve energy, manage waste, and build leadership opportunities. With formidable resources and supports, Eco Schools is an extraordinary resource for teacher and student ESE work in schools. Involvement is voluntary, and very time consuming, making it difficult to initiate school wide programming, gain full staff participation, and compete with other clubs and sports offered in schools. Board sanctioned release time for eco initiatives is approved by administrators at specific schools, based on individualized priority. Eco Schools is an excellent resource for doing good work, but while participation is mandated, progress toward best sustainable practice is not, and voluntary participation by teachers and students enables people to opt out easily, relegating the services, initiatives and resources to a low priority status.

There are multiple school board initiatives in the TDSB that support sustainability, including retrofitting schools, revisiting contracts for energy supplies and cleaning supplies, and building solar roofing into planning. Digital options for learning and submission of work are

proliferating the teaching and learning landscape, and it is easier to purchase recycled paper and recycling boxes to minimize waste. Unfortunately, school improvement planning does not require schools to work on sustainability initiatives, nor does the board provide feedback for schools that are doing good work. While educators are granted release time for environmental PD at the board level through Eco Schools, budgetary support for innovative sustainability programming is at the discretion of individual schools who often prioritize other things. Contracts for supplies in the board are becoming progressively sustainable, but are often behind the curve in terms of using the least toxic things to reduce carbon footprints, while prohibiting schools to use the best, and often less expensive products available.

There has recently (in the last five years) been added a strand of teacher training for environmental education qualification and three levels of additional qualification for practicing teachers. They provide excellent instruction, resources and build communities to share best practices. However, environmental education and sustainable practices for teachers are not yet embedded into all teacher training programs in Ontario as either a mandatory course or as topics embedded in all courses offered in teacher training schools, and so teacher candidates are not mandated to learn and perform pedagogies that support ESE or curricular engagement in, about and for the environment. Currently there are five institutions embedding ESE in teacher training. Sustainable practices are also not currently part of the criteria teacher educators or teacher mentors at practicum school sites use to evaluate pre-service teachers.

Federations like the Ontario Secondary Schools Teacher Federation (OSSTF) and the Ontario College of Teachers (OCT) represent and provide standards for all teachers in Ontario. As such, these agencies hold great potential to reach a wide membership and influence educators toward progressive pedagogies for ESE. However, there are currently no expectations for teaching for a sustainable future in standards and ethical practices for all teachers. There are also no expectations for members to be involved in environmental or sustainable initiatives as part of contractual obligations. As such, teachers and custodians can easily opt out of participation in Eco School certification programming and other ESE initiatives.

In the TDSB, Schools are required to participate in Eco Schools certification programming, but not to progress toward platinum status. This is not a mandatory focus. Schools have the potential autonomy to support structuring programming, budgeting, timetables, and flexibility to allow for interdisciplinary work, planning for large-scale programming, and grounds consultation and design, PD and development time. This access depends, however, on the individual administrators and their priorities. Schools on board with sustainable initiatives do excellent and innovative things, and those who are not are restricted in what they are able to achieve.

Some educators are progressive in terms of embedding sustainability into their teaching as a transparent and intentional model for citizenry, but sustainability work and membership and involvement with Eco Schools is voluntary, and thus it is easy not to buy in or take the time to do or support this work. It is often the case that teachers have interest in engaging in ESE work, but since it is considered an extra responsibility, overburdened teachers often lack the time and resources to participate.

Students are keenly interested and engaged in learning, understanding and debating issues around sustainability and themes addressed through ESE. There are multiple opportunities to connect learning of virtually all courses to sustainability through students learn, how they learn, practices that are modeled in schools, and choices they make to present what they know. However, students are not mandated to adhere to Eco School initiatives, buy in, or practice sustainable ethics in schools. Because teachers, schools and boards can opt out of making practices part of learning, students also can opt out of embedding sustainability into their daily lives and that of their communities.

Building interdisciplinary projects that build communities using systems thinking and multiple viewpoints is a difficult endeavor if the system is set up for this kind of work to fail, or at least not thrive. There is little support in terms of time, funding, and flexibility in schools for the effort it takes to design and implement this kind of work. Progressive pedagogies for ESE, despite the research that shows they are useful, engaging, and encourage advocacy for sustainability are hindered by the systems they are built to support

and help thrive. By illuminating these structural barriers within the education system, it is possible to place pressure on them for future projects like this one to thrive.

Areas for Further Research:

Areas for further research include:

- Support for development of local programming in schools
- Support for interdisciplinary local teams to co-design sustainability curriculum.
- Creating, finding and distributing hands on resources across curriculum (ideally embedding in curriculum documents)
- Unit and lesson planning with templates for interdisciplinary work
- Developing a library of the tools, skills, scheduling, and budgeting required to build these kinds of programs, accessible to teachers and administrators beyond science or STEM
- Creation of multiple sustainable themes for interdisciplinary programming (food; energy; justice; water; indigenous sovereignty, etc.)
- Research agencies and resources that can influence reform for sustainability in the curriculum and policies in schools
- Finding opportunities to access funding for resource development beyond local school administrative allocations
- Influencing curricular reform to be more flexible around interdisciplinary projects

CHAPTER 5: RECOMMENDATIONS:

If the key to sustainability education is to embed the paradigm of needing to learn for a sustainable future in classes, classrooms and schools, using and fostering the skills required to do this should be modeled and practiced in schools and supported by all levels of education. What follows are some recommendations on how to integrate sustainability into multiple levels of the education systems to enable progressive pedagogies:

Policies: Integrate policies among different levels of the education system

Make viewing policies with a critical eye part of the curriculum

1. *Include reviewing and analysis of Ontario Ministry policies on education, energy, food, economics, arts, and innovation into the overall expectations of subject-specific courses in the curriculum:* If students are to be critical systems thinkers, embedding the policies that inform their ability to work toward sustainable practices and inform the lens with which they see the subjects they are learning is integral. Making these accessible, transparent, and part of the process of learning supports building active citizenship.

Create accountability markers for sustainable practice at each level of the system

2. *Have boards, administrators, teachers and students accountable for their work and efforts to make sustainability a priority in schools:* This includes being part of board contracts, school SIPs, Course outlines, School mandates, parent committees, classroom practice, unit planning and student research and work. It also includes having boards accountable to the ministry and the ministry accountable to the federal level of government regarding sustainable practices.

Review & Reform Curriculum To Update Skills & Content for Sustainability

Embed ESE into Overall Expectations in All Subject Specific Courses

3. *Feature ESE in overall Ontario Ministry expectations of subject-specific courses in the curriculum across subject programming:* Curriculum documents hide ESE content into specific expectations for courses. These are guidelines for programming, while overall curricular expectations are mandated. Teachers will adhere to overall expectations and teach ESE in their courses if it is part of the curricular criteria.

Promote Systems Thinking in Overall Expectations

4. *Promote systems thinking as part of overall Ontario Ministry expectations of subject-specific courses for learning skill sets across subject programming:* Critical analysis through a sustainability lens is important for all disciplines, and embedding it into curricular expectations will ensure this happens.

Feature Communication, Problem-Solving, Interdisciplinary Integration in Curriculum

5. *Modify subject-specific Ontario Ministry curriculum guidelines to reflect an updated reality for a new generation:* Students are in more need of honing skills to communicate, problem solve

through multiple lenses, have mental health strategies, live under the stress of lack of work and high debt, be less independent, and more social, media savvy, and technologically dependent.

Enable and Encourage PP

6. *Integrate inquiry-based learning, ESE and interdisciplinary projects into curricular design:* Providing templates and ideas for interdisciplinary work requires allowances in the system for budgeting, scheduling and promoting PP, which requires more flexibility in programming than is currently practiced.

Teaching Practice: Integrate ESE in Teaching Standards, Expectations & Training

Ontario College of Teachers Standards of Practice

7. *Embed a commitment to teach ESE in teaching standards of practice:* Place a clause in Ontario College of Teachers standards.

Teaching Federation Contract Agreements

8. *Embed a commitment to teach ESE in contractual agreements:* Mandating ESE into teaching practices rather than encouraging educators to volunteer these initiatives will make traction. This can be achieved through work with the Ontario Secondary Schools Teachers Federation as well as the primary school, custodial and administrator unions.

Ongoing Teaching Practice and Appraisals

9. *Add sustainability content, skills building, and regular reporting to maintain current standards into School improvement plans, board membership, and teacher appraisals:* There are ongoing standards of practice that educators update annually, including workplace safety, police records, and safety practices for students in need of emergency or ongoing care. Ongoing sustainability practice can be updated similarly. Create standards of responsibility for sustainable practice, monitor them regularly, and provide concrete feedback follow up with mandatory further training if needed, based on performance. Educators can report to administrators, who can report to boards, who can report to the ministry.

Teacher Training

10. *Embed ESE work in teacher training for course specific and overall planning and pedagogy:* Ontario recently extended teacher training from one to two years. This change allows time to develop and incorporate a mandatory course on environmental education training for all

in-service teachers, and also integrate an ESE focus on course-specific qualification learning so that new teachers are trained to structure ESE and progressive pedagogy into all programming. Teacher training schools in Ontario are beginning to do this, but currently it is not the overall ministry standard.

Eco Schools: Integrate Participation into the Mandatory Practices of All Schools

Integrate Eco Schools as the Go-To Within and Across the Curriculum Documents

11. *Make Eco Schools the epicenter of support to roll out the environmental mandates and programming options:* If Eco Schools were included in the curriculum as a resource for educators to find ideas, examples and exemplars, it has the potential to reach a broader audience and provide more widespread PD, workshops, lesson and unit plans, model school tours, projects, school wide assemblies. Acknowledging all school staff understand the principles and guidelines for high Eco School status should be a mandatory part of teacher training, and annual board wide programming and school improvement plans.

Eco Schools As the Consultant and Liaison between School and Board Initiatives

12. *Designate Eco Schools as consultant for eco initiatives:* Eco Schools has the potential to extend beyond being a small section of the board to becoming the epicenter of support to roll out the environmental mandates and programming options for all levels of the education system. This is where all levels - students, teachers, administrators, and custodians – can find exemplar supports, and a resource to find and share information on best practices. It is also where site-specific schools can gain information on how they can advance in their sustainable practices.

Designate All Schools as Eco Schools and Mandate Moving Toward Platinum Status

13. *Mandate all schools aim to rise to the status of platinum Eco School within the next 5 years:* Have Eco Schools facilitate support in programming for schools that need it. The point is not to punish schools lagging, but to support raising the standards of all schools, especially those underserved by the system, in a timely way.

Eco Schools Can Be A Communication Hub to Share Ideas

14. *Position Eco Schools as the hub for disseminating information:* Provide a forum for communicating examples of how to do this through web-based lesson plan shares, videos, and facilitated model school visits. While it has excellent resources, because educators often work in isolation within their schools, communicating easily with other

educators doing similar work for sustainability would be helpful. Eco Schools could create a forum for teacher-created exemplar supports, and there are multiple ways it can act as a go-to point to find and share information on best practices.

Connect Eco School Status With Student, Teacher, School, and Board Reporting

15. *Mandate the expectation that all schools actively progress toward platinum status Eco School through annual reporting through student agreements, teacher appraisals and annual SIPs:* Remove voluntary options for participation, and mandate all schools be made accountable through school administration that trickles down to involvement with all staff and students to work toward higher status within a timely manner that works within or surpasses the provincial and federal goals for 2030. A key aspect of this is having administrators support and promote ESE as part of the culture of the school, embedding it within the teaching and learning experience rather than treating it as an add-on.

Local Programming: Allocate time, funding & research for PP project creation

Education NGOs Can Support Research for PP and ESE

16. *Encourage funding for NGOs that connect students with sustainability work:* This could take the form of scholarships for skills training, bursaries for private companies to work with schools and students, forming hubs that connect schools and students with companies working in sustainability, and opportunities for students to provide a voice to policies that govern their interaction with sustainability and training. It can also promote co-op and internship opportunities for students.

Schools Can Support Research for PP and ESE

17. *Provide incentives for schools to become research sites for developing PP and ESE projects:* This can occur through partnerships between faculties and teacher training experiences, as well as board and community partnerships.

Innovation Beyond the Classroom: PP and ESE integrated into the workforce

Bursaries & Scholarships for Schools to Work with Innovators & Entrepreneurs

18. *Create funding support through all levels of government to enable dialogue between research in schools and private sector entrepreneurs pursuing environmental innovations:* Enable students to help define solutions to problems they face in their schools like energy programming by encouraging

partnerships for research programs for sustainability through financial bursaries and scholarships.

Link Private Sector with Student Co-Op and Internships

19. *Encourage partnerships through Co-operative education, internships, and other potential connections to connect private sector businesses and start up companies with schools:* While options exist for individual educators to facilitate co-op and internship opportunities with specific schools, encouraging this through board, ministry, city and community partnerships could make it a more widespread practice.

Offer Financial Incentives for Businesses to Work with Students for Sustainability

20. *Provide government financial incentives for businesses that work in sustainability to partner with students and schools:* If federal, provincial and local governments offered financial incentives for students to learn skills working with and learning from innovators in sustainability, providing financial support for this kind of mentorship and skills building would enable widespread practice.

Allow Sustainable Schools to Test New Products Outside of Board Contracts

21. *Create riders in board contracts to allow individual schools to test economically and ecologically competitive products without pushback:* Technologies are shifting more rapidly than the systems are changing, which means access to more eco friendly and inexpensive materials are slow. This is a way to see if emerging products might sway the system and integrate activism by trusting and rewarding highly participant schools.

Allow for Innovation Using Non-Contract Materials in Schools

22. *Reward high achieving schools with platinum status by allowing them to push innovative change and experiment with non-contract materials:* Innovative projects can become potential models for board-wide implementation if successful, and access to materials becomes a hindrance if schools are prohibited from use because of board contractual obligations.

APPENDIX:

APPENDIX A: Potential Projects that promote progressive pedagogy for ESE

There are countless examples of thematic complex sustainability problems that intersect education, policy and economics in multi disciplinary ways and can include of some or all of the following sustainability-friendly themes through problem and project based, experiential, real world explorations across disciplines, utilizing multiple points of view. Here are but a few:

Energy:

Redesign how schools use energy, moving quickly toward renewable non-carbon based energy, finding ways to conserve, gather and store energy cleanly, and embedding this in learning within classrooms. Create short term plans that place computer labs and lights on sensors and timers to log off overnight and that campaign for behaviours for efficiency and innovations to use renewable energy to power personal devices. Long term planning could envision designing innovative solar, wind and geothermal energy capturing devices generated from schools and powering not only schools, but also potentially building community programming and selling to neighbourhood grids. Embed these into the pedagogy and curriculum of multiple classes.

Food:

Connect food sovereignty to place and land with healthy sustainable practices for long term thriving, including understanding the connections between food and economic, social, physical and mental health. Embed this understanding in classroom learning, policy making and following, reskilling students to advocate for and gain access to affordable healthy food and nutrition, and planting, growing, harvesting, making and eating food and designing cradle to cradle waste disposal that crosses curricular boundaries, fosters mentorship, and makes excellent use of school grounds for all students.

Policy:

Integrate ministries of environment, food and agriculture, and education policies transparently into the curriculum in regards to sustainability to encourage active citizenship

and critical awareness of them as part of learning across disciplines. At this point, there is no liaison that works to interpret how policies in these ministries translate into school practices. Have students respond critically and actively engage in pushing for policy that reflects the kind of future structures they will be able to live with.

Economics:

Redefine profit as cradle to cradle rather than the zero sum mindset of growth as the framework for success. Look at long term gains rather than short, in order to allow for innovations to amortize their value over time. In education this looks like reducing costs at the cost of depleting resources; raising marks and attendance potentially at the cost of enriching engagement; While quantitative data is useful, make room for qualitative experience as a marker of success within reporting school and teacher appraisals. Have schools design a business or proposal for one that addresses these issues within the school or community.

Arts:

Arts based or creative based work is the reflection of the culture or society. With support for the arts, we are fostering a thriving creative and innovative community of advocates for social and environmental change that have a voice that will be listened to that is a reflection of the critiques of the system that can drive positive change. Creative communicators are necessary for systems to shift and for dissent and innovations to find a voice. Integrate academic and political sustainability issues with artists that can communicate the problem and potential solutions and create projects that advocate for sustainability issues publicly within the communities they are situated and beyond.

Innovation:

Build a system that fosters the skills for innovation – creativity, communication, systems thinking, community problem-solving, resilience, and inquiry. Make this the focus of success. Projects can include any of the disciplines or themes mentioned above: create a bicycle powered cell phone charger; design a vermiculture composter in a school to create soil for the school garden; design a template for communal petitions, campaigns or protests advocating for sustainable practice; design the technical elements of a performance art piece, theatre performance, film, sculpture, poetry slam, mural, eco-graffiti blitz articulating sustainability concerns.

Resistance Campaigns:

With our current premier nixing great programs already doing this kind of good work, there can be the potential to embed in teaching and learning a strong element of political resistance to mandates that do not work toward supporting the evidence for sustainability and justice work in schools. As most school boards cite the mandate of their schools to be to teach critical thinking toward active citizenship, resistance education fits well within the scope of the mandate to support students for the future.

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Kozak, S., Elliott, S., & Learning for a Sustainable Future. (2014). *Connecting the dots: key strategies that transform learning for environmental education, citizenship and sustainability Which learning strategies engage students as active citizens in supporting environmental, social, and economic sustainability? Connecting the Dots answers the question: what are the learning strategies for environmental education that we can employ to prepare our young people to take their place as informed, engaged citizens? Throughout the process, a secondary line of inquiry emerged: how are these strategies aligned with 21st century learning skills including collaboration, creativity, communication and critical thinking? We delved into the literature to find strategies that develop the concepts, real-world connections and learning skills that build engaged citizenship. The result is this guide, which shows ways of organizing learning experiences — in other words, the "how to" of learning. We believe these strategies represent the best that environmental education has to offer to formal learning. They are the "dots" that connect to form a system approach to learning. Each learning strategy "dot" can: Link environmental, economic and social issues within subjects and across subjects Link students to each other, their home life, their schools and their community Link knowledge, skills and perspectives through student engagement and action Provide a meaningful context to address numeracy, literacy, character and other educational expectations. The Seven Strategies Learning Locally Integrated Learning Acting on Learning Real-world Connections Considering Alternative Perspectives Inquiry Sharing Responsibility for Learning Download the electronic version: Connecting the Dots Purchase Connecting the Dots $24.95 @ UofT Book Store Written by Stan Kozak and Susan Elliot Edited by David Israelson Designed by Dino Roussetos Copyright © 2014 Learning for a Sustainable Future*.

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