

Climate Change Education:

A Portfolio

By

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Abstract

The focus of this portfolio is climate change education, with a particular emphasis on the challenges facing educators in Alberta where economic matters are often prioritized over environmental ones and the lessons we can learn from paying attention to the experiences of climate change educators elsewhere and to recent research in the field. In the past year, I volunteered with the Alberta Council for Environmental Education (ACEE) to collaboratively develop materials to support educational workshops for teachers, non-governmental organizations, and government of Alberta representatives. My MEd studies were particularly helpful in the development of a guidebook, *What Is Excellent Climate Change Education?* that is now published online by the ACEE. My MEd portfolio captures some aspects of my work with ACEE and includes three tasks: 1) a literature review; 2) an annotated bibliography; and 3) a short reflection paper.

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Chapter One: Introduction

I grew up believing that it is always best to do what feels right, that there is no excuse for not working towards goals, and I had better be able to answer for what I do, both good and bad. Growing up in a working class, Euro-Canadian household, however, I should add there was always a caveat: unless it is going to cost you money. I did not understand why then, but that caveat always bothered me even from the earliest times I could remember. Why did money have to always be the deciding factor for every decision? Why did that take precedence over what felt right or wrong? Why was the answer “because it was the cheapest” always the one that trumped all the others?

I grew up watching a cartoon called *Captain Planet*, a television show that made it quite clear: polluters are often pig-like or rat-like humans in both their appearance and manner and they never care about the feelings or well-being of others. Unfair characterizations of other animals aside, the polluters (i.e., the villains of the stories) were almost always out to pollute for personal gain of one kind or another, ignored the suffering of other animals or the impacts on the environment, and often promoted hate amongst people. Thankfully, the heroes of the show, the Planeteers, were always there to stop them. In my childhood, it all seemed so straightforward: polluters are evil villains that should be stopped, and they were not like me.

As I got older, I did not meet many pig-like or rat-like humans nor did I meet people who were totally ignorant of or indifferent to the suffering of the environment, animals, or other human beings. I did, however, meet a lot of people who were impacting the Earth through the way they chose to live their lives. And I realized I had to include myself in that category too. I never felt it to be my right as a Canadian to have such a heavy environmental footprint yet bear few of the costs (at least thus far), but rather experienced that realization as a burden. I am

uncomfortable that I, and now my children, have benefitted from the good fortune of happening to be born in this time and in this place. Whether it is through the food we eat, the clothes we wear, or how we spend our leisure time, we are benefiting from global inequity in countless ways. And I feel compelled to spend the privilege I do have and work towards environmental and social change.

I now live in the province of Alberta, a province in Canada that has probably benefited the most from a society that values economic growth over environmental health, increased consumption over sustainable lifestyles, and low taxes over carbon taxes. In social settings, I often find myself treading carefully about my environmental views lest I be labelled “a dirty tree-hugger,” an identity that used to be taken lightly in my childhood social circles in Northwestern Ontario, but in Alberta is often much more controversial. Indeed, it is not uncommon for me to be sitting in the waiting room for one of my children’s appointments and be approached by a fellow parent looking for agreement that global warming is some kind of liberal nonsense, especially if it happens to be a colder day and they do not understand the difference between climate and weather. Anti-environmental sentiments run deep here, which presents particularly difficult challenges for those of us who want to advance discussions and action on environmental issues. Despite these challenges, accepting the status quo because it is the path of least resistance does not feel like the right thing to do, but that does not mean I do not personally struggle with how to have productive conversations about climate change or other environmental and social justice issues in my daily life.

The oil and gas industries are prevalent here in Alberta, and they employ many tens of thousands of Albertans and pump billions of dollars into the provincial economy annually. Ironically, the folks working on oil rigs are often referred to as “rig pigs.” Aha! Surely these are

the pig-like humans that *Captain Planet* warned me about, the ones who are so myopically focused on financial gain and so hateful of the environment that they will bring us all to our doom. Obviously, this is a drastic mischaracterization of folks who are just doing their jobs in a harsh neoliberal, capitalist economy. And they are people who have a similar perspective as that of my own childhood family where dollars trumped ethics. Besides, if I am being honest, am I any less responsible for that oil being drilled from the ground so it can be burned in my car and used to heat my home and ultimately be sent up to the atmosphere? Of course not. I may not operate the drills, but I turn my car's ignition on a daily basis. I am a part of this energy-hungry society that has sustained the demand for such practices, which in turn helps maintain the status quo of society.

When I take the time to reflect on the impact my daily choices have on the state of the world I experience a deep sense of sadness. I think this is the kind of feeling Martusewicz (2014) refers to when she talks about the "hidden wound" of human supremacy, the acknowledgement of which can be seen as an opportunity to take responsibility for, and start to learn more about, what is needed to heal the rifts between humans and the more-than-human world, as well as among human beings. I am part of the problem, but I also hope to be part of the solution. And I believe education can and should play a role in helping to ensure that all of us on Earth and the Earth's systems can flourish.

Fortunately, I have connected with the Alberta Council for Environmental Education (ACEE), a small non-profit group that aims to work collaboratively with teachers, governmental and nongovernmental groups, parents, and students to advance environmental education so that ultimately Alberta can become an environmental leader whose citizens are well informed and motivated to work towards sustainability. All of ACEE's aims relate directly to improving

environmental education and increasing environmental stewardship in the province. The staff and volunteers understand the challenges associated with climate change education, especially in the Alberta context. (These difficulties will be further explored in the first task of my portfolio, a literature review.) They asked for my support in developing materials that could provide some guidance to educators, government, and other non-governmental organizations on what research is suggesting might be effective climate change education. Like ACEE, I believe helping others interpret some of the latest research findings could be an invaluable tool since few have the time or easy access to scholarly journals to be able to dig through and analyze the literature themselves.

I was involved with the development of ACEE's recently published guidebook, *What is Excellent Climate Change Education?* (2018)¹ that is meant to form part of a larger educational strategy that includes workshops for teachers, nongovernmental organizations, and government of Alberta representatives. It also is available online. I have been told that the intent of this guidebook is to start a dialogue among environmental educators instead of being the place to find *all* the answers or easy recipes. While I am not naïve enough to think that a simple guidebook will make Planetears out of climate change deniers, I do believe these kinds of tools can help facilitate more constructive conversations about how humans relate with and impact the Earth, its systems, and all life on it, and I am happy to have been able to be able to contribute to its development. The second task in my portfolio, the annotated bibliography, was particularly helpful in the early days of developing the guidebook. I now turn to a more detailed description of each portfolio task.

¹ The Guidebook can be found here: [http://www.abcee.org/sites/abcee.org/files/3-What%20is%20Excellent%20Climate%20Change%20Education%20\(7%20Dec%202017\).pdf](http://www.abcee.org/sites/abcee.org/files/3-What%20is%20Excellent%20Climate%20Change%20Education%20(7%20Dec%202017).pdf)

Description of Tasks

This portfolio is made up of three primary components: 1) a literature review; 2) an annotated bibliography; and 3) a short reflection paper.

The first, the literature review, is focused on providing a brief overview of climate change and various responses to it, and then zeroes in on research focused on climate change communication and environmental education, particularly in Canadian and Albertan contexts.

The second, an annotated bibliography, provides summaries of research that served to feed the guidebook. In order to ensure the guidebook created for ACEE is relevant in the contemporary Alberta context, I focused primarily on recent research (i.e., after 2000) and sought Canadian research where possible. I also leaned particularly heavily on literature reviews as those who performed the reviews had read numerous other refereed journal articles and other relevant work and offered useful syntheses and analyses.

My third task is a brief self-reflective essay on what I have learned through this portfolio process and my ideas for future work. The short version is that I can say that helping the small not-for-profit organization, ACEE *felt* like the right thing to do, supported my personal goals of helping humankind live more in line with the limits of Earth's systems and in harmony with each other and other life, and was the kind of collaborative project I will be able to answer for. ACEE has made this resource available to everyone online for free so at least finances will not be the deciding factor in whether or not it can be accessed and used across Alberta, and beyond.

Chapter Two: Literature Review

Climate change refers to the alteration of long-term weather patterns through outside forces, most recently and prominently due to human activity. Many have called it the most challenging issue facing humanity to date (FitzGibbon & Mensah, 2012; Incropera, 2015; Jickling, 2013; Wibeck, 2014), with the phenomenon of global warming gaining awareness in the public sphere (Bowers, Monroe, & Adams, 2016; Intergovernmental Panel on Climate Change [IPCC], 2014; Kolbert, 2007; Markovic, Branovic, & Popovic, 2015). It has proven itself to be an “ugly” issue, or what some have called a “wicked” problem (FitzGibbon & Mensah, 2012; Incropera, 2015) in that it is complex, often perplexing, and lacks a singular or simple solution.

Education has been looked to as a critical tool in the fight against climate change and its impacts (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2015). For the most part, climate change has been by discussed primarily by those working in environmental education and science education, although Henderson, Long, Berger, Russell, and Drewes (2017) argue that it should be the concern of *all* educators given the enormity and complexity of the problem and the need for a multifaceted response. As noted in recent reviews, there is growing research literature devoted to climate change education specifically (Henderson et al., 2017; Monroe, Plate, Oxarart, Bowers, & Chaves, 2017; Wibeck, 2014). There is also a growing interest in climate change communication that, while relying on one-way messaging so not education per se, nonetheless has relevance to climate change education when thinking about reaching the broader public (Bowers et al., 2016; Wibeck, 2014). As well, in both climate change education and communication, there is an increasing awareness of the role emotions and personal values play in responses to climate change (Kelsey, 2016; Ojala, 2012).

Given the increasing interest in climate change education, there are a wider range of voices at the table now, reflecting different starting points and educational paradigms, which can lead to confusion, disagreement, and worse, inaction (Blum, Nazir, Breiting, Goh, & Pedretti, 2013; Selby & Kagawa, 2010; Stevenson, 2008). The aim in this literature review is not to engage in a debate about which approaches are better than others since goals and context matter in determining the best choice for an individual educator or organization, but instead to provide a summary of recent writing in the field. To begin, however, let me first provide some introductory information on climate change and various responses to help set the stage for why climate change matters.

Climate Change and Responses

Calling the challenge of climate change a big deal is a significant understatement. There is much agreement that climate change is one of the greatest issues facing our world today (Chambers, 2011; FitzGibbon & Mensah, 2012; Incropera, 2015; Jickling, 2013; Wibeck, 2014). While the scientific community has long been certain that global warming would result from the widespread release of vast amounts of carbon into the atmosphere (Matthews & Weaver, 2010) and the climate of the earth is warming at a rate that was previously unprecedented, there has been limited attention given to climate change in educational research (Henderson et al., 2017). For climatologists, climate change has gone from theoretical to measurable, with documented changes in precipitation patterns and severe weather events (Bowers et al., 2016; IPCC 2013; Markovic et al., 2015; Trenberth, Fasullo, & Shepherd, 2015), and scientists in fields beyond climatology, including butterfly researchers, mosquito researchers, and permafrost researchers, have all observed changes in their respective fields as a result of a warming climate (Kolbert, 2007).

There is an ever-expanding body of work in scientific literature that gives evidence that humanity is beginning to overstep the very conditions that sustain our existence as a species (Rockstrom et al., 2009). In fact, the impact of human activities on the planet has now sparked debate amongst geoscientists and others as to whether we are now in a new geological epoch called the Anthropocene in recognition of how human activities are leaving a significant mark on the geological record (Crist, 2013). Humanity's overstepping is related primarily to energy consumption, which is seen as a fundamental driving factor for economic development and upon which everything from education and food systems to political and economic systems is dependent (Zencey, 2013). Alas, currently the production and consumption of energy is carbon-intensive (Jorgenson, 2014).

In its Fifth Assessment Report, the IPCC (2014) outlined the consensus on climate change research: it is a stark reality and global in scale. Further, the influence of human activity on the climate system cannot be dismissed but is indisputable. Recent greenhouse gas emissions are the highest in recorded history and the resultant changes in climate, which are more from the cumulative emissions than the recent ones, have had a profound impact on both human and natural systems. The warming of the climate system and changes such as diminished ice and snow and rises in sea level are unprecedented in modern history (IPCC, 2014).

While there is scientific consensus that climate change is a clear and present issue, there is still disagreement about the efficacy of different strategies that could be implemented for tackling the problem. Everything from technical "fixes" to carbon taxes to educational interventions have been proposed (Bangay & Blum, 2010; IPCC, 2014; Laird, 2005). Certainly, education is touted as a critical component of how societies should respond to the challenge, including playing a role in helping to support citizens in understanding and addressing climate

change impacts as well as encouraging necessary changes in attitude and behaviour to address climate change causes (Bangay & Blum, 2010; Monroe et al., 2017; Wibeck, 2014). Education can also show individuals how to adopt a more earth-friendly lifestyle, support them in developing skills needed to adapt to the impacts of climate change, become more politicized and active, and enhance the resilience of those groups and communities (Berger, Gerum, & Moon, 2015; Monroe et al., 2017; UNESCO, 2015).

Another area of concern is that the public's understanding of climate change tends to be partial or incomplete, with an often poorly formed understanding of the complexity and scale of climate change itself (Chen, 2011; Choi, Niyogi, Shepardson, & Charusombat, 2010; Gonzalez-Gaudiano, & Meira-Carrea, 2010; Lazo, Kinnell, & Fischer, 2000; Sterman, 2011). It can be difficult to comprehend the severity of climate change and its impacts or recognize any single person's role in contributing to it, much less their role in alleviating it. The total harm of climate change globally is not solely a result of present-day human activities but the culmination of activities stemming back to the beginning of the Industrial Revolution (Mochizuki & Bryan, 2015). While climate change is increasingly being taken seriously, it is still also perceived as being distant both in time and space (Lorenzoni & Pidgeon, 2006; Wolf & Moser, 2011).

Exacerbating inertia in responding, studies aimed at understanding public barriers to engagement have pointed to the fact that in many "developed" areas of the world, social norms equate higher consumption with higher status (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007; Whitmarsh, Seyfang, & O'Neill, 2011). A secondary feature of these studies is that those who currently face the impacts of environmental racism and classism and other forms of marginalization will also inevitably bear the biggest brunt of impacts associated with an ever-changing climate (Henderson, Beiler, & McKenzie, 2017; Gardiner, 2011; Global Humanitarian

Forum, 2009; Tutu, 2010). On an individual level, then, whether consciously or subconsciously, it seems easier for many people to bury their “heads in increasingly dry sand” (Henderson et al., 2017, p. 413) and live in a form of denial by distancing themselves from the issue or deferring it to future generations (Henderson et al., 2017; Etkin & Ho, 2007; Moser & Dilling, 2004; Tonn, Hemrick, & Conrad, 2006).

Denial, then, whether in the outright refusal to accept the reality of climate change or “the subtler and pervasive general denial that manifests as the socio-psychological avoidance of the idea that certain contemporary lifestyles cannot continue in perpetuity” (Henderson et al., 2017, p. 413) appears to have become a rather common response to climate change (Adam, 2009; Norgaard, 2011; Ojala, 2012; Selby & Kagawa, 2010), both for individuals and governing bodies. That denial manifests itself in a wide variety of ways. Looking at proceedings such as the G20 summit of April 2009 where the world political leaders focused more on the reconfiguration of global economic growth than the exploration of a lower carbon global economy, it is not difficult to understand where these criticisms to the collective response to climate change originate (Adam, 2009; Selby & Kagawa, 2010). Things like global economic growth have been argued as being a part of the bigger root cause of the climate crisis, and yet politicians are not prepared to stray from the status quo even in the face of consensus that climate change will impact where people can settle, grow food, develop and maintain infrastructure, and even their ability to rely on the functions of existing ecosystems (IPCC, 2014; United States Global Change Research Program [USGCRP], 2016). While climate change reaches into multiple spheres of human activity such as the environmental, political, and social spheres, the conversation tends to be framed in a manner that seems to lead to polarization and climate denial (Kahan et al., 2012).

Clearly, then, there is a great need for an educational response that can navigate the current tendency towards denial and inaction (Henderson et al., 2017).

In 1992 the *United Nations Framework Convention on Climate Change* (UNFCCC) recognized that education was essential in formulating a global response to climate change. This sentiment was echoed in subsequent international meetings in the years that followed. In 2005, the *Education for All Global Monitoring Report* organized by UNESCO identified two critical dimensions of educational quality, the first being the promotion of the cognitive development of learners and the second the cultivation of productive citizenship including those skills, knowledge, attitudes, and values that would be necessary for critically thinking, responsible, and active citizens (UNESCO, 2005). UNESCO's approach at that time still prioritized cognitive development with the expectation that it would lead to more ethical decisions and actions.

But climate change is a complicated, messy, and very human issue and thus it has been categorized as a "wicked" problem (FitzGibbon & Mensah, 2012; Incropera, 2015). Efforts to mitigate, live through, and adapt to these current and impending realities, both social and environmental, thus requires more complex understandings of how we engage with the natural world and each other (Dunlap & McCright, 2015; Selby & Kagawa, 2010). Many have therefore been critical of approaches that rely too heavily on cognitive development to effect change, arguing in favour of more complex, globalized, and even politicized approaches (Selby & Kagawa, 2010). Indeed, the "information deficit model" and the assumption that enhanced scientific knowledge could act as a solitary solution has been roundly critiqued (Brossard & Lewenstein, 2010; Lewenstein & Brossard 2006; Nisbet & Scheufele, 2009). There thus has been a shift from a deficit focus (i.e., laypeople lacking scientific literacy) to approaches that are more contextual and work with, rather than against, existing public understandings of climate change

science and policy (Schafer, 2009; Wibeck, 2014; Wynne & Felt, 2007). That environmentally responsible behaviour change does not automatically follow from increased knowledge of climate science is proof that it is not enough for the public to simply be given information, echoing calls for environmental educators to “mind the gap” between knowledge and behaviour (Kollmuss & Agyeman, 2002). I thus now turn to a discussion of climate change communication that tends to rely on the sort of one-way messaging of concern to those worried about “the gap” because, while there are concerns, it nonetheless remains of some relevance. After doing so, I will then delve more deeply into the growing field of climate change education.

Climate Change Communication

Climate change as an issue can be framed in a myriad of ways. While there does seem to be genuine confusion in the public about climate change, research indicates that relaying climate science information does not appear to be the most strategic way of attracting people’s attention or encouraging them to adopt more earth-friendly behaviours (Bowers et al., 2016; Howell, 2013; Kahan et al., 2012; Wolf & Moser, 2011). Hence in the field of climate change communication, there has been a fair body of research dedicated to the effects of messaging and framing (e.g., Maibach, Nisbet, Baldwin, Akerlof, & Diao, 2010; Wolf & Moser, 2011; Weber, 2006). Indeed, framing is seen by some as critical in leading to a feeling of responsibility to take action (Maibach et al., 2010; Wolf & Moser, 2011; Weber, 2006). For example, when climate change is framed as specifically a scientific matter, there have been indications that laypeople do not feel a sense of inclusion and therefore are less likely to act since this type of framing gives them the sense that the topic falls under the purview of experts and experts alone (Bowers et al., 2016; Wolf & Moser, 2011).

Similarly, the messages, stories, and imagery used by various climate change activists can either serve to underscore or inhibit an individual sense of responsibility (Nicholson-Cole, 2005; Wibeck, 2014). One key inhibitor is pessimistic messaging (Gardiner, 2011; Hicks & Bord, 2001; Hicks & Holden, 2007; Norgaard, 2011; Ojala, 2012). A sense of helplessness is hardly conducive to engagement; hence, there is growing interest in the importance of instilling hope in the future (Kelsey, 2016; Li & Monroe, 2017; Lueck, 2007; Ojala, 2012, 2015).

One significant shift in climate change communication is the recognition of the importance of finding ways to reach diverse audiences (Akerlof, Bruff, & Witte, 2011; Featherstone, Weitkamp, Ling, & Burnet 2009; Maibach, Roser-Renouf, & Leisorowitz, 2008) and fostering public engagement, which is typically regarded as feeling a personal connection with the issues and participation in climate actions such as policy deliberations (Herriman, Atherton, & Vecellio, 2011; Lorenzoni et al., 2007; Whitmarsh et al., 2011; Wolf & Moser, 2011). This trend towards engagement rather than a focus on imparting scientific facts is mirrored in broader science communication (Nerlich, Koteyko, & Brown, 2010).

One of the ways recommended to help make climate change more relevant is to attend to the social and economic contexts of the audience because studies have indicated there has been a shift in public interest from environmental problems as standalone issues to how these connect to fairness, equity, livelihood, and health concerns (Bowers et al., 2016; Wolf & Moser, 2011). In Alberta, where the workforce is heavily situated in carbon-intensive activities such as oil and gas extraction, that might mean talking about opportunities to build skills that allow people to shift into a lower carbon job force.

Climate Change Education

As noted, education is viewed by many as an important tool in the journey to finding solutions to climate change. Whether discussing mitigation or adaptive strategies, many researchers argue that an emphasis must be put on education (Anderson, 2012; Bangay & Blum, 2010; Hermans & Korhonen, 2017; Lehtonen & Cantell, 2015) so that it is not just a small group who possess the knowledge, values, and skills to make decisions but rather a large group of individuals and communities working together and making informed decisions (Shepardson, Niyogi, Roychoudhury, & Hirsh, 2012). Given climate change is a complex problem, it follows that it poses unique challenges for educators (Henderson, Beiler, & McKenzie, 2017; Nicholls, 2017). While research in climate-focused education is still sparse, which makes sense given the current focus on mitigating climate change is still a recent phenomenon (Vaughter, Wright, McKenzie, & Lidstone, 2016), it clearly is growing (Henderson et al., 2017; Monroe et al., 2017).

Certainly, climate change education has been of growing interest to environmental educators (Henderson et al., 2017; Monroe et al., 2017). In general, environmental education is an approach to teaching and learning that seeks to cultivate sustainability and that occurs in both formal and informal settings for all ages (Stevenson, Brody, Dillon, & Wals, 2013). There are many different approaches to environmental education including environmental science education, sustainability education, education for sustainable development, outdoor education, critical environmental education, Indigenous environmental education, place-based education, environmental justice education, and ecopedagogy, to name just a few. Each approach has the potential to promote climate literacy and social learning that emphasizes citizen empowerment and engagement with key issues such as sustainable lifestyles, human rights, and poverty

reduction in a way that will hopefully encourage changes in behaviour and lead to a more sustainable future. Some argue that many of these approaches have become inextricably linked and have significant overlap (Blum et al., 2013). For example, both environmental education and education for sustainable development have been used to refer to particular sets of pedagogies, processes, and practices that are meant to ensure that education systems and people are prepared for current and future sustainability challenges (Aguilar, 2018; Eames, Cowie, & Bolstad, 2008; Kemmis & Mutton, 2012), but there nonetheless are differences between these fields and other sub-fields that ultimately shape visions for climate change education.

The differences that exist between the different sub-fields are often related to underlying assumptions; for example, how is a word like “development” understood? Should development refer to economic growth or, more holistically, the flourishing of all humans, other life, and the planet? There are inherent problems when development focuses solely on economics as opposed to social justice and environmental health, a matter that has been discussed in the field for years, including how these assumptions influence approaches to climate change education (Blum et al., 2013; Jickling, 2013; Selby & Kagawa, 2010). Another example is assumptions about human/nature relationships, with some arguing that insufficient attention has been paid in climate change education to a growing disconnect between humans and the natural world (Selby & Kagawa, 2010). Instead of viewing nature as a resource that matters only because of its economic worth, some argue that nature’s intrinsic value needs to be honoured; thus, opportunities for firsthand nature experience is recommended so that humans can see themselves as in relationship with, and dependant upon, nature (Levinson, 2012; Selby & Kagawa, 2010).

Another topic of discussion that reveals differing underlying assumptions centres on the role of climate science, which is heightened by the fact that scientific understandings of climate

change are continuously being refined. Several studies have found that fostering an understanding of climate science can lead to better awareness of the issues and an overall sense of responsibility (Anderson, 2012; Bybee, 2008; Hartley, Wilke, Schramm, D'Avanzo, & Anderson, 2011). Still, there has been a shift in recent years from defining scientific literacy as simply knowledge of abstract facts to the importance of contextualizing scientific knowledge in everyday life (Whitmarsh et al., 2011), which requires a more constructivist approach to learning that takes into account not only learners' pre-existing knowledge and perceptions of climate change but also the communicative context of climate change education (Wibeck, 2014). This shift has led to calls for a multidisciplinary, comprehensive approach that includes climate science literacy and awareness of the impacts of climate change as well as knowledge of relevant social and environmental issues (Anderson, 2012; Cagle & Tillery, 2015; Filho, Pace, & Manolas, 2010; Gonzalez-Gaudiano & Meira-Carrea, 2010; Monroe et al., 2017; Selby & Kagawa, 2010). In formal education settings, that necessitates moving from climate change education being solely the purview of science teachers to a more holistic approach that involves all subjects (Anderson, 2012; Monroe et al., 2017; Selby & Kagawa, 2010; Wibeck, 2014).

In addition to discussions of the content, certain skills have been identified as being particularly important in climate change education such as critical thinking and problem-solving (Anderson, 2012; Filho et al., 2010; Monroe et al., 2017), perspective-taking, issue analysis, decision-making, and action planning. Further, it has been found important to frame messages in a positive way that enables individuals to see their capacity to achieve positive outcomes rather than emphasizing the negative impacts of climate change (Kelsey & Armstrong, 2012; Monroe et al., 2017). This attention to the emotional dimensions of climate change education, including minimizing crisis discourse (Henderson et al., 2017), has partially come about because of

increasing awareness that factual knowledge has not led to a significant change in lifestyle and behaviour (Whitmarsh et al., 2011). This phenomenon is referred to as the “knowledge-action gap” or the “value-action gap” (Kollmuss & Agyeman, 2002).

Studies have shown that climate change education may be more effective when the focus is on individual engagement and empowerment rather than on climate change causes and impacts (Monroe et al., 2017; Nicholson-Cole, 2005; Ojala, 2012). Studies have also shown that regardless of people’s feelings about climate change, there is often more general support for environmentally responsible behaviour, so climate change education that includes stewardship activities may be advisable (Anderson, 2012; Bowers et al., 2016). Further, much of the research to date shows that negative or fear-based messaging has been common in climate change education (Reid, Payne, & Cutter-Mackenzie, 2010; Wibeck, 2014) but can work in a way that is counterproductive, producing feelings of helplessness and guilt leading to apathy or issue fatigue (Filho et al., 2010; Monroe et al., 2017; Wibeck, 2014). This is inappropriate in education for adults, and seems particularly unfair, and unsettling, for school-aged children (Kelsey & Armstrong, 2012).

In contrast, there has been some work on the role of hope in environmental engagement (Hicks, 1998, 2014; Lueck, 2007; Norgaard, 2011; Ojala, 2012, 2015). There has been some concern that hope can be simply a psychological coping mechanism to deal with the existence of climate change (Homburg, Stolberg, & Wagner, 2007; Lorenzoni, Jones, & Turnpenny, 2007) and that it leads not to agency but wishful thinking or an externalization of responsibility (McGeer, 2004). Thus, some researchers now talk about “constructive hope” that is based on the belief that people can make a difference together, which has been linked to pro-environmental behaviours (Lueck, 2007; Ojala, 2012, 2015). Constructive hope, then, is more than just a simple

“feel good” emotion but involves a positive re-appraisal by focusing on specific sources of hope such as examples of increased public awareness and action (Kelsey, 2016; Ojala, 2012).

Action could take many forms so there is great potential to counterbalance the effects of the “doom and gloom” narrative that has been presented to school-aged children (Anderson, 2012; Kelsey, 2016). One suggestion is to nurture a sense of community by having children first share their own experiences of, and emotions around, climate change and then getting them involved in outdoor activities and community revitalization projects (Hicks & Holden, 2007; Kelsey, 2016), providing them ample opportunity to build and practice new skills and to feel empowered through reaching goals (Anderson, 2012; Chawla & Cushing Flanders, 2007; Kelsey, 2016). For children particularly, involvement in initiatives within their community can be crucial to counterbalancing the negative aspects of climate change and fostering more positive feelings like confidence and hope for the future (Kelsey, 2016).

Although there is no one-size-fits-all way to increase engagement (Wibeck, 2014), in general, a more action-based learning approach to climate change education is recommended by a number of scholars (Anderson, 2012; Selby & Kagawa, 2010; Whitmarsh, 2011). It is argued that such an approach has the potential to foster a more deliberative form of democracy with citizens developing everyday expertise and becoming “lay-experts” with time and effort, which could improve dialogues and inform policies (Lövbrand, Pielke, & Beck, 2011; Selby & Kagawa, 2010). Studies have shown that when students consider themselves environmentally conscious because they have been involved in action, they are more hopeful and confident that they can make a difference (Anderson, 2012).

Achieving positive results through action may also serve to create a positive feedback loop for learners in that they may become more motivated to engage again after experiencing

positive outcomes. At a perhaps less ambitious level, it also helps to keep climate change education interesting (Hermans & Korhonen, 2017; Moser & Dilling, 2004). A shift away from approaches that have perpetuated the information deficit model to one that is more interactive, experiential, and by its very nature more participatory has been long seen as valuable in environmental education (Jensen, 2002), and this clearly has relevance for climate change education specifically.

Climate Change Education in Canada

Climate change education varies by place, reflecting contextual differences. As one example, in the years prior to Denmark hosting COP15 in 2009, climate change education was given special attention as a strategy that could contribute to national efforts to address climate change. The Danish Ministry of Education worked closely with the Ministry of the Environment on various climate change education projects, mostly concentrated in science education (Breiting, Hedegaard, Mogensen, Nielsen, & Schnack, 2009). Examples of practical initiatives stemming from this mandate included the creation of climate teaching materials for primary and secondary schools, resource websites, and even a mobile unit that enabled a team of teachers to visit schools with specialized equipment (Blum et al., 2013). In contrast, in Canada and the UK climate change education appears to have been more driven by the efforts of NGOs who primarily engage in awareness-raising campaigns (Blum et al., 2013).

One of the challenges in Canada is that formal education is not a federal responsibility but is under provincial government control and there are also significant differences between the provinces in terms of geography, culture, history, and language. Even within provinces, there is great diversity (e.g., rural vs urban, number of Indigenous people, a growing immigrant population) so a homogenous approach is not possible even if it might be desired (Council of

Ministers of Education, 2008). This situation, then, presents challenges to any climate change educator looking for a quick fix (Blum et al., 2013).

Alberta, where I live, is a good example of how context can influence climate change education. While Alberta certainly possesses an abundance of natural beauty and its landscapes are rich and diverse, one cannot escape from the fact that it has enjoyed tremendous economic growth built primarily on the oil and gas sectors (Bissell, 2014; Chambers, 2011; Laird, 2005). Nor can it be ignored that Alberta has also been governed for over four decades by political powers that value economic growth well above any concerns that Alberta also produces the largest amount of greenhouse emissions in the country (Harrison, 2005). The influence of culture, ecology, economics, and politics is present in the curriculum and the educational policies and practices of Alberta (Bissell, 2014; Chambers, 2011), which can also be said for the rest of Canada.

Educational institutions are only just beginning to modify their own practices and policies in light of climate change (Colston & Ivey, 2015; Henderson, Beiler, & McKenzie, 2017; Plutzer et al., 2016). Arguably there is a need for more analyses both systematic and comparative on education policy and practice, including in relation to the Canadian system (Henderson, Beiler, & McKenzie, 2017; Vaughter et al., 2016). In the past few years, research has been conducted by The Sustainability and Education Policy Network based at the University of Saskatchewan on climate change education at the K-12 and post-secondary levels in Canada (Beiler, Haluza-Delay, Dale, & McKenzie, 2018; Hargis, Chopin, & McKenzie, 2018; Henderson, Beiler, & McKenzie, 2017). In their analysis of educational policies in Canada, they found that climate change is generally not often given significant attention (Beiler et al., 2018; Hargis, Chopin, & McKenzie, 2018; Henderson, Beiler, & McKenzie, 2017). At the post-secondary level, they

noted how climate change education is often approached in behaviour modification terms (Henderson, Beiler, & McKenzie, 2017), with a focus on changing patterns of consumption of staff and students. There is more critical work being done as well, however, like the climate change education course being taught in both the BEd and MEd programs at Lakehead (Berger, Gerum, & Moon, 2015).

It is clear just from this brief overview that there is much variation in climate change education in Canada. Promisingly, interest in climate change education has increased not only across the globe (Henderson, Beiler, & McKenzie, 2017; Monroe et al., 2017), but also in Canada (Beiler et al., 2018; Hargis, Chopin, & McKenzie, 2018; Henderson, Beiler, & McKenzie, 2017). Besides the scholarly articles mentioned above, it is important to note that there are also now a growing number of practical climate change education resources produced in Canada that are available for educators (e.g., Cho, 2014; Frank, 2017; Grant, 2017, 2018). The second task of my portfolio, an annotated bibliography, seeks to provide an additional resource for teachers and was developed at the request of the Alberta Council of Environmental Educators.

Chapter Three: Annotated Bibliography

The journey involved in creating this annotated bibliography for the ACEE earlier this year helped me familiarize myself with the breadth and depth of climate change education and communication. Through reading these articles I became acutely aware of many different perspectives that exist in the broader fields of environmental education and sustainability education as well as the specific field of climate change education. I learned that the way authors define purpose, measure progress, and envision success impacts how positively or critically they view current climate change education efforts. While this may seem like an obvious observation, realizing that the author's perspective has an impact on their research and writing allowed me as a reader to interpret and appreciate their work on a different level.

As noted in the introduction, I chose to focus on writing published from 2000 onwards and I was particularly interested in review articles that synthesized existing literature of the time. I also included a couple of key articles beyond the field of climate change education that I found particularly helpful, such as Kollmuss and Agyeman's (2002) much cited article about "minding the gap" between environmental knowledge, behaviour, and action. I organized the annotations alphabetically, summarizing each article and including keywords for each. My hope is that this format makes the bibliography easy for others to use if desired.

I intend to continue building this annotated bibliography as publications come out and the field of climate change education continues to evolve. As a means of contributing to the environmental education and climate change education communities, I intend to seek out opportunities to share this ongoing project with fellow academics and environmental educators. This will be done through networking opportunities at environmental education conferences and through connections made throughout Alberta and beyond.

Albe, V., & Gombert, M. (2012). Students' communication, argumentation and knowledge in a citizens' conference on global warming. *Cultural Studies of Science Education*, 7(3), 659-681.

In this study of 12th graders participating in an interdisciplinary activity on global warming, it was recommended that specific interventions focused on argumentation were helpful when educating about socio-scientific issues such as climate change. Doing so enabled students to participate as citizens and not just learners. There needs to be more research with a focus on socio-scientific issues and how best to integrate them into curriculum design to encourage students not only to learn about these issues but to encourage new learning and an ability to adapt the knowledge they gain into meaningful participation outside the classroom.

Keywords: argumentation; citizenship; engagement; participation; socio-scientific issues, secondary school

Anderson, A. (2012). Climate change education for mitigation and adaptation. *Journal of Education for Sustainable Development*, 6(2), 191-206.

Anderson makes recommendations for climate change education after conducting a review of research. Improvements in climate change literacy can be made through a shift to a curriculum that is cross-disciplinary and that centres on the practical application of both environmental and climate science. To this end, Anderson argues that climate change education should not be introduced as a subject on its own but rather be integrated across many existing subject areas (e.g., science, social studies, history, the arts, and into areas like citizenship education). Further, allowing for active hands-on learning and local problem-solving can increase learners' understanding of climate change and their own role in it. This could be noted especially in instances where there are links included to sustainable development. Anderson also

argues that it is important to focus on the development of critical thinking skills and problem-solving skills whether through messaging (e.g., focusing on the ability of the individual to achieve positive results) or motivational framing (e.g., emphasizing solutions and values) as these improve engagement. Emphasizing the empowerment of individuals is just as important as increasing knowledge of climate change as empowerment is linked to a decrease in fear and uncertainty and feeling capable of making change, which is important since many studies have noted the correlation between an increased sense of helplessness and overexposure to climate change issues. A problem-solving approach where options for behaviour change are presented alongside the introduction of measurement tools (e.g., carbon calculators) allows learners to see the direct results of their actions.

Keywords: active learning; behaviour change; climate science; critical thinking; cross-disciplinary; engagement; interdisciplinary; problem-solving

Benjamin, D., Por, H., & Budescu, D. (2016). Climate change versus global warming: Who is susceptible to the framing of climate change? *Environment and Behaviour*, 49(7), 745-770.

Framing is seen to influence attitudes and often behaviours, although this paper shows that the result is often quite minimal in sub-populations where beliefs are identified closely with particular political identities. Those with beliefs that do not necessary mirror their political affiliation are the ones who are more easily swayed by simple rhetorical tactics. The authors recommend that those in charge of creating climate change communication understand the value of the heterogeneity that exists when they are creating messaging, especially when addressing those who are not so easily classified. Further, they suggest avoiding relying on self-reports of political affiliation alone and to seek a better understanding of the range of beliefs, attitudes, and

opinions of target audiences. While some suggest tailored messages to audiences, the authors caution that when the communicators' views and beliefs differ from those of the audience, especially on polarized issues such as climate change, there can be a "boomerang effect" with audiences rejecting the messaging altogether. Finally, the authors recommend targeting moderates to reach the largest segment of the population.

Keywords: audience; framing; messaging; political affiliation

Bowers, A., Monroe, M., & Adams, D. (2016). Climate change communication insights from cooperative extension professionals in the US southern states: Finding common ground. *Environmental Communication, 10*(5), 656–670.

It is not accurate nor practical to treat audiences as being homogenous, and this applies to climate beliefs. Developing programming that will reach everyone is a huge challenge in climate change education because the audience is diverse. Where some might become engaged through learning about recent scientific information about climate change, hearing those same facts may stop others from listening. Some have found that focusing on stewardship activities or on making changes that feel economically feasible may lead to more engagement and interest by the public in general. The key message of the article is that audiences are not all alike, which illuminates a significant challenge faced by those developing climate change education resources. This holds true whether thinking about adult education or reaching elementary students, and in both formal and informal learning sites.

Keywords: audience; extension education; program development

Boyd, E., & Osbahr, H. (2010). Responses to climate change: Exploring organizational learning across internationally networked organizations for development. *Environmental Education Research, 16*(5-6), 629-643.

The study examined questions being posed by four organizations involved in the development of curriculum. Challenges identified included how to keep up with and capture research advances being made and finding informal learning opportunities to foster innovation. The authors favour a resilience-based approach that they recommend could guide organizations in honing their reflexivity and generating responsible learning practices.

Keywords: curriculum development; organizational learning; resilience

Boykoff, M., & Boykoff, J. (2004). Bias as balance: Global warming and the US prestige press. *Global Environmental Change, 14*(2), 125–136.

In the United States, calling for mandatory action in sectors such as energy or transportation policy to address global warming is often seen as a threat to carbon-based interests, which influences governments' perceptions and actions. Many lobbyists rely on alleged scientific uncertainty to promote feelings of helplessness or inaction and demand "balanced" reporting, that "both sides of the story" are told. This approach resonates with the norms and values of journalism. Their conclusion was that in trying to adhere to the ideal of balanced reporting, the media ultimately often ends up contributing to biased coverage of climate change, which creates a space for the government to neglect its responsibility and continue a course of inaction. This has implications for climate change education given teachers often also feel the need to be "balanced" in their approach as they walk what teachers see as a fine line between education and advocacy.

Keywords: balance; denial; government; journalism; media; messaging

Brownlee, M., Powell, R., & Hallo, J. (2013). A review of the foundational processes that influence beliefs in climate change: Opportunities for environmental education research. *Environmental Education Research, 19*(1), 1-20.

There is a need for the verification of the existence as well as the actual level of influence of environmental, psychological, and human evolutionary processes on climate change education outcomes, paying attention to differences between settings, populations, and over time.

Understanding the beliefs of the audience is particularly important in the context of climate change education, especially considering confirmation bias and potential influences such as religion or political leanings. The authors note that efficacy of framing, specifically intentional framing as well as the use of visual aids (e.g., time-lapse photos, historical photos, simulations), are largely untested practices so while likely beneficial, caution should be used in their use.

Keywords: beliefs; communication; confirmation bias; framing; human evolution; psychology; visual aids

Cagle, L., & Tillery, D. (2015). Climate change research across disciplines: The value and uses of multidisciplinary research reviews for technical communication. *Technical Communication Quarterly, 24*(2), 147-163.

In this review paper, the authors found that both local contexts and global dimensions were important. They found that not enough attention is being paid to visual aspects of climate change communication or newer digital media and tools, something they recommend be addressed. They also recommended the creation of interdisciplinary communication teams since

research has pointed to the usefulness of interdisciplinary efforts in other fields and they argue it could transform the climate change conversation as a whole.

Keywords: digital media; interdisciplinary; messaging; visual representation

Chambers, J. (2011). Right time, wrong place? Teaching about climate change in Alberta schools. *Alberta Science Education Journal*, 42(1), 4-12.

Chambers shines a light on some of the challenges faced by Alberta teachers when it comes to climate change education. In Alberta, teachers are asked to teach environmental education as a part of science instruction but given little if any preparation or support in teaching climate change and climate science. She discusses the importance of context in education and in this case, the province's reliance on carbon-based sectors such as oil and gas creates a major barrier for teachers being asked to implement climate change education. Other issues teachers shared included a perceived lack of time and the complexity of climate change not fitting neatly into an already packed science curriculum. Others admitted they give priority to discipline sciences in order to better prepare students for higher grade levels. While teachers did see the importance of climate change education, many did not feel comfortable with the subject as some felt they lacked sufficient knowledge to teach it appropriately and others expressed anxiety about how class discussions could cross over into social and political dimensions they would rather avoid. Chambers argues one of the best hopes to seeing climate change realized in a meaningful way is to stop marginalizing the subject and allow for a more natural crossover between disciplines that would see students presented with opportunities to gain knowledge as well as critical thinking and citizenship skills.

Keywords: Alberta; barriers; political context; science education; teacher perspectives; teacher

preparation

Cotton, D. (2006). Implementing curriculum guidance on environmental education: The importance of teachers' beliefs. *Journal of Curriculum Studies*, 38(1), 67-83.

Cotton found that teachers' beliefs are not necessarily aligned well with environmental education. Some teachers desire to be "neutral" and to offer a "balanced" perspective, which can be problematic. For example, many were anxious about challenging students' beliefs or views on climate change, feeling that was being too much like an advocate or what they called a "committed" teacher. Yet Cotton argues that a socially critical approach to environmental education is needed and that a neutral position is an illusion and therefore is destined for failure. Other reasons for why the teachers in this study were unable to implement the curriculum in a way more closely reflective of the developers' vision included external examinations, parental pressure, and the school structure. Cotton argues that a more radical environmental education agenda cannot be accomplished without teachers being on board; it cannot be pushed through curriculum alone. If curriculum developers do not consider the beliefs teachers have about education and the environment when developing new materials, they are less likely to be implemented as intended.

Keywords: advocacy; curriculum development; curriculum implementation; program development; teacher beliefs; teacher perspectives

Eames, C. (2017). Climate change education in New Zealand. *Curriculum Perspectives*, 37(1), 99-102.

Writing from a New Zealand context, Eames notes that while some might think that,

given the isolated nature of the country, climate change education is less important, no place is removed entirely from the impacts or the need for action. Eames argues for approaching climate change from a socio-economic as well as an environmental standpoint. He advocates for a focus on preparing citizens of all ages, not just students in schools, to make decisions to enable necessary lifestyle shifts.

Keywords might include: adult education; citizenship education; engagement; informal learning; lifestyle changes; New Zealand

Filho, W., Pace, P., & Manolas, E. (2010). The contribution of education towards meeting the challenges of climate change. *Journal of Baltic Sea Education*, 9(2), 142-155.

The paper focused on examples of practices that promoted students feeling ownership of their learning in climate change education, including active learning and personalizing knowledge in a learner-centred pedagogy. Further, there was a call to acknowledge the global dimensions of climate change but that there also should be a focus on local impacts as well. Encouraging action in non-formal contexts is seen as a means of complementing the awareness and knowledge gained through formal education.

Keywords: active learning; adaptive behaviours; global and local; learner-centred education; ownership

Henderson, J., Long, D., Berger, P., Russell, C., & Drewes, A. (2017). Expanding the foundation: Climate change and opportunities for educational research. *Educational Studies*, 53(4), 412-425.

The authors draw attention to the fact that there is a continued ambivalence throughout

the educational research community towards climate change that will ultimately contribute to what the authors call a self-imposed irrelevance. They offer some introductory information on climate change, then briefly review some key literature in the field, and then identify potential directions and topics for future educational research beyond the confines of environmental education and science education.

Keywords: denial; educational research; review

Hermans, M., & Korhonen, J. (2017). Ninth graders and climate change: Attitudes towards consequences, views on mitigation, and predictors of willingness to act. *International Research in Geographical and Environmental Education*, 26(3), 223-239.

The findings of this study suggest, for example, that ninth graders perceive climate change as a risk and that they do not perceive mitigation strategies as currently presented as being effective to stop climate change. The authors recommend a shift in pedagogy towards a more action-oriented, interactive, experiential approach to aid development of students' understanding of mitigation and adaptive strategies and willingness to act.

Keywords: active; adaptation strategies; experiential; mitigation strategies; secondary school

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239-260.

This is one of the most highly cited articles from the journal, *Environmental Education Research* and it remains relevant today. Environmental knowledge does not automatically lead to behaviour change that benefits the environment, and the authors wanted to understand why.

Many factors compete to shape our daily decisions, including that pro-environmental actions often are perceived to be in conflict with comfort and convenience. Thus while a person may express a willingness to change a behaviour, it is hard to turn that new behaviour into a habit. Also, often overlooked is the influence of personality traits and the degree of emotional investment in an issue. However, developing models that incorporate a wide array of factors underlying pro-environmental behaviours has been challenging, but the authors attempt to do so, using an illustration of a model.

Keywords: behaviour change; knowledge-behaviour gap; pro-environmental behaviour; value-action gap

Li, C., & Monroe, M. (2017). Exploring the essential psychological factors in fostering hope concerning climate change. *Environmental Education Research*. Advance of print.

doi.org/10.1080/13504622.2017.1367916

Li and Monroe examined the links between concern, hope, and effective climate change education. The results seem to suggest that there is a positive association between concern and hope and that if young people are concerned about climate change and experience a high degree of hope, this may mean they have more capacity to gain knowledge. They noted that model-building, while correlated with hope, did not act as a path to hope. Simply knowing that climate change exists and the impacts of human activities will not lead to a higher degree of hope, but having access to ideas or activities related to mitigation strategies or more sustainable lifestyles can be helpful. Program designers need to know that it is important to foster hope; even if it is often written off as an intangible element, it is essential, albeit complicated. If we not do so, we risk fostering fatigue, helplessness, or despair.

Keywords: emotions; hope; messaging; model-building; positive psychology

Lorenzoni, I., Nicholson-Cole, S., & Whitmarsh, L. (2007). Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change, 17*, 445-459.

Writing in the UK, the authors argue that if the government is to achieve its reduction target for carbon dioxide emissions there must be public engagement with climate change to help citizens shift to a lower consumption lifestyle. The authors reported on studies that identified an array of barriers to engagement, both at the individual and social scale, such as a lack of knowledge, an externalization of responsibility and blame as well as the perception of climate change as a distant threat. These types of barriers must be tackled given the importance of the issue not only in terms of climate change mitigation but in fostering social justice and well being.

Keywords: barriers; engagement; policy; UK

Lowe, T., Brown, K., Dessai, S., de Franca Doria, M., Haynes, K., & Vincent, K. (2006). Does tomorrow ever come? Disaster narrative and public perceptions of climate change. *Public Understanding of Science, 15*, 435-457.

Using the film *The Day After Tomorrow* as an example, the authors argued that while the film did raise awareness of climate change, it also triggered feelings of anxiety among some viewers. The merit of such messaging from an educational point of view is thus debatable. Still, many viewers in their study categorized the film as fiction rather than science and some expressed high motivation to do something after watching the film, but without guidance were not sure what could be done to mitigate or adapt to climate change. The authors recognize that

the use of dramatic imagery and words can be tempting as it seems to have an initial impact, but they argue that the impact is brief and often overshadowed by everyday experiences. Further, fear messaging may initially raise awareness and concern but people can then be left feeling overwhelmed and unable to act.

Keywords: action; fear; film; hope; media; messaging

Monroe, M., Plate, R., Oxarart, A., Bowers, A., & Chaves, W. (2017). Identifying effective climate change education strategies: A systematic review of the research. *Environmental Education Research*. Advance of print. doi:10.1080/13504622.2017.1360842

The authors examined several studies that reported a variety of educational outcomes, ranging from increasing awareness of climate change and its impacts to building skills in assessing scientific conclusions and helping mitigate climate change. The authors noted that few of the studies reflected an inclusive, interdisciplinary, and intentional approach to climate change education. Methods mentioned in studies included interactions with scientists, deliberative discussions, role-playing and community action projects. Those strategies deemed most effective were generally learner-centred, experiential in nature, and looked to ensure personal relevance. Further, they found that because climate change is not only a complex scientific issue but also a social one, educational initiatives need to take into consideration diverse perspectives in order to make a stronger connection with learners. They recommend that future research focus on personal relevance and how to engage learners in discussions that question assumptions and encourage exploration of perceptions.

Keywords: experiential; learner-centred; outcomes; personal relevance; review; strategies

Moser, S., & Dilling, L. (2004). Making climate hot: Communicating the urgency and challenge of global climate change. *Environment*, 46, 32-46.

Working in the United States, the authors recognize how polarizing climate change has been. How might climate change communicators reach audiences who have been previously disengaged or put off by past attempts? They recommend a re-framing and hope that climate scientists, other physical scientists, social scientists, and communication experts could collaborate to have interdisciplinary conversations that could lead to renewed discussion. They also recognize the challenges of holding people's attention for any length of time and fostering long-term and substantive behaviour change.

Keywords: engagement; framing; interdisciplinary collaboration; lifestyle; policy; US

Nicholls, J. (2017). Queensland teachers and climate change education. *Curriculum Perspectives*, 37(1), 79-82.

Examining climate change in schools in Queensland, Australia, the author found that there was also not much evidence to show that students were being engaged in education on climate change mitigation or adaptation which is problematic given the constantly changing environmental conditions that they are experiencing. Many teachers in the study agreed that climate change was an important issue but did not see a way to include it in the current curriculum and felt a lack of support in trying to include the subject in a way that was meaningful and useful to their students. Nonetheless, teachers still attempted to engage students in many informal ways, but the author found not in ways that were adequate to prepare them for the future. The author suggests that this reflects the Australian context generally where environmental education has not been given adequate attention or credence historically.

Keywords: Australia; curriculum; engagement; teacher perspectives; teacher preparedness

Ojala, M. (2012). Hope and climate change: The importance of hope for environmental engagement among young people. *Environmental Education Research, 18*(5), 625-642.

Hope has a unique influence on pro-environmental behaviours. There are different types of hope, however, such as hope tied to denial of climate change and hope that is generated through being actively engaged in climate change mitigation and adaptation. Further, trust in others is important since climate change is not an issue that can be faced by one person alone and working with others can be motivating. Ojala found that hope is much more crucial than has been previously thought when engaging young people with climate change. More research should be done to see whether hope precedes pro-environmental behaviours or the other way around.

Keywords: behaviour; engagement; hope; messaging; trust

O'Neill, S., & Nicholson-Cole, S. (2009). Fear won't do it. *Science Communication, 30*(3), 355-379.

Research shows that using fear, sensationalism, and shocking representations of climate change can be effective at creating awareness and highlighting the issue's importance, but it has also been shown to lead to feelings of issue fatigue, helplessness, or being overwhelmed. Unfortunately, these types of representations have a strong presence in the media, which may have a negative impact on encouraging active engagement with climate change. We need to shift to an exploration of deeper personal feelings that might better lead to lifestyle changes.

Keywords: barriers; engagement; fear; messaging

Poortinga, W., Spence, A., Whitmarsh, L., Capstick, S., & Pidgeon, N. (2011). Uncertain climate: An investigation into public scepticism about anthropogenic climate change. *Global Environmental Change, 21*, 1015-1024.

Based in Britain, this paper discusses public scepticism about climate change and the socio-demographic and ideological profiles of those holding sceptical views. While the authors found that scepticism did not appear widespread in Britain, many doubted the seriousness of the problem. Part of this could be attributed to the abstract nature of climate change. The authors argue that challenges exist in reaching both sceptical and non-sceptical groups.

Keywords: beliefs; ideology; messaging; scepticism

Tonn, B., Hemrick, A., & Conrad, F. (2006). Cognitive representations of the future: Survey results. *Futures, 38*(7), 810-829.

Survey results indicate that individuals hold very diverse and complex conceptions of the future, what it holds, and their own approaches to it. Individuals were also found to interpret the future within the context of their own lives and not on a longer scale. When looking forward roughly 10 years, most respondents could describe what the future would hold but when discussing 15-20 years ahead, many could not envision it as clearly. This corresponds with other findings in the field that state that many individuals have difficulty looking further ahead or at the bigger picture and therefore experience a sense of removal from issues like climate change. The authors suggest using approaches that encourage more future thinking, including writing and visioning exercises, which could be useful in terms of climate change education and mitigation efforts.

Keywords: framing; future; visioning

Whitmarsh, L. (2011). Scepticism and uncertainty about climate change: Dimensions, determinants and change over time. *Global Environmental Change*, 21, 690–700.

Climate change attitudes are often entrenched and determined by an individual's values and worldviews. Information campaigns can be effective when focused on groups described as ambivalent but will not engage most sceptical groups who are seen to have very entrenched views. There thus is a need for a change in the current tone of climate change communication, which the authors currently characterize as full of hype and alarmist messaging. Further, there needs to be a shift towards constructive messaging, and emphasizing hope over fear if the communication is to be motivating. Highlighting solutions such as the benefits of low carbon lifestyles rather than pushing the catastrophic consequences of climate change should be used. Further, this information needs to be tailored to particular audiences rather than trying to cast a wide net. There also still needs to be a major focus on making institutional and social changes, which will help individuals make changes too.

Keywords: attitudes; emotions; ideology; motivation; messaging; scepticism

Wibeck, V. (2014). Enhancing learning, communication and public engagement about climate change: Some lessons from recent literature. *Environmental Education Research*, 20(3), 387-411.

Wibeck reviews literature that was published between 2000-2011. She found that while climate change is on the public agenda, media coverage around the world has been steadily decreasing, which points to signs of climate fatigue in some places. If such issue fatigue exists, it could mean that there will be less inclination to learn about climate change or engage in strategies for mitigation. One way in which this could be addressed is to find new modes of

communication and providing learners with different opportunities to engage with the issue on a local and individual level. Much of the literature focused on the developed world but there are arguments that the developing world could offer valuable perspectives and contribute useful knowledge on how sociocultural factors play into public engagement and different barriers to engagement. The literature also points to the benefits that could be gained by sharing positive stories about actions rather than relying on fear messaging. There are indeed very different audiences out there and climate change education and communication is not one size fits all.

Keywords: fatigue; developed and developing countries; review; messaging; positive stories

Chapter Four: Reflection

My MEd journey at Lakehead University has not been straightforward. I completed most of my courses ten years ago and then had to put my studies on hold due to family commitments. As the years passed and my life became even more full with parenting and professional responsibilities, the thought of finishing my MEd nonetheless occasionally surfaced. Last year, I finally decided it was time to return. My passion for environmental issues remained during this entire period so my initial goal in re-engaging with the MEd program was to create something that contributed meaningfully to the field of environmental education. At the time I did not know what that would be, but I knew I would find something that would *feel right* for me. In hindsight, I am grateful that my supervisor encouraged me to reach out to local environmental organizations to offer my assistance. I did not fully realize it at the time, but she was essentially guiding me to engage with environmental educators who were on the frontlines of public engagement and ask them to share their needs with me. Not only was this an efficient approach to determining a possible portfolio focus given my wide range of interests, it helped ensure that my contributions met a real need and that my work might be utilized and leveraged throughout the province of Alberta. I quickly learned that in the field of environmental education, there are numerous groups that are happy to receive help from anyone willing to volunteer their time and effort and I will continue to engage with them well beyond the completion of this portfolio and my MEd.

The experience of working with the Alberta Council for Environmental Education was a good one, but I was surprised to find it was also a hurried one. Like so many non-governmental organizations trying to do much with very little, they often find themselves applying for grants with tight deadlines for “deliverables” that often overlap, which means that juggling projects and

effective time management is a must for these groups. Thus, while the creation of resource and reference materials to help develop the guidebook was *my* primary focus as a volunteer, the staff and other volunteers had numerous other projects also on the go at the same time. This meant that a good portion of my time was spent researching and writing independent of guidance from them, which I found difficult. I wanted to ensure that the guidebook served as a useful tool for their target audiences (Bowers, Monroe, & Adams, 2016) while also striking the right balance between having a critical academic perspective and being accessible to educators and others interested in climate change education, some of whom would likely not have any background in the field; thus, being able to bounce ideas around with them more would have been beneficial. It is not that ACEE staff did not want to discuss matters, but that they simply did not have much time given all the other projects they were juggling. I certainly gained real insight into how challenging frontline public environmental education work can be, which may illustrate one reason there can sometimes be a “gap” between research, theory, and practice (Breunig, 2011; Kollmuss & Agyeman, 2002).

I also struggled as I have a tendency to want to scaffold my own approach to learning and I wanted to take that approach to this guidebook that was envisioned to answer the question, “What is excellent environmental education?” For me, I would have liked to have started my own explorations by beginning with simple concepts related to climate change education, *then* learn how excellence in climate change education might be understood, and *then* explore how that excellence could be achieved. But I have come to realize learning is rarely that linear or straightforward (Kollmuss & Agyeman, 2002; Russell, 1999), particularly when dealing with wicked problems like climate change (FitzGibbon & Mensah, 2012; Incropera, 2015). For example, is the efficacy of climate change education best measured by simple changes in

behaviour? If so, which behaviours matter most? Who decides? On what grounds? And how might someone take into account the complexity of learners' starting positions, beliefs, motivations, and emotional responses in such an approach? The more I read, the more I realized climate change education was complicated and why there is such a need for more work in the area by diverse educational researchers (Henderson et al., 2017). Further, I admit that the more I read, the harder I found it to synthesize the research in a way that both respected this complexity and was accessible.

The eventual title of the guidebook did indeed become *What is Excellent Climate Change Education?* (ACEE, 2018) but I do not feel like we really answered that question. Rather, I think that the guidebook does an excellent job of answering the question, "What advice can we give to educators relating to climate change education?" We have summarized a few key messages that might help educators wanting to improve the effectiveness of their climate change pedagogy, and we also have compiled many different resources in a single place, which should be helpful since gathering all that information on one's own as a solitary educator would be a challenging task. And the guidebook is not necessarily in its final form. The staff at ACEE made it clear that the intent of the guidebook is to generate conversations around climate change education and that further changes to the guidebook down the road would be considered. For now, I am pleased to hear that the guidebook in its current form was used to support workshops they recently presented across the province and that it was very well received. It was also made available online (see ACEE, 2018) and can be downloaded at no cost, widening its potential impact.

Even if the final guidebook was not quite what I had imagined, the process of creating the annotated bibliography that fed its development greatly enriched my own understanding of what has been done in the past in climate change education, what current research is telling us, and

promising directions for the field. With an issue as large and looming as climate change, time is of the essence and we need to get it right. Building on an accumulating body of knowledge and learning from past mistakes will be invaluable in that regard. Thus, I want the annotated bibliography to be a living document that I can continue to build and share with others interested in exploring what we have learned so far about climate change education.

I also found that delving into the literature allowed me to feel part of a wider community of climate change educators. The more published articles I read, the more it started to feel like I was getting to know the authors themselves. I often found myself talking to the authors aloud saying things like, “Oh, X, it’s not *that* bad” or “Why do you folks have to be so critical of Y’s work? They’re just trying to help!” While I realize I do not really know the authors, I nonetheless have learned that certain authors tend to take certain perspectives or approach issues in particular ways, which I found valuable as I reflected on my own perspectives and realized that I resonated with some approaches more so than others.

Given that climate change is not the kind of problem that will go away by itself, I can only imagine that further work is, and will continue to be, needed. More research is required, new avenues will need to be explored, tested, refined, and shared, and people like me will need to continue bridging the gap between the academic world and frontline educators to help ensure that we learn from the past, adapt our current practices, and continue to improve. In general, our relationship to other life on Earth has grown more distant with time, not closer. I believe that must change. I still believe that education can and should play a role in bringing our lifestyles in line with what the planet can sustainably support. I am not entirely sure what that looks like, but I have *hope* that we can get there, and that education can provide a forum for that discussion and a springboard to action.

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