Promoting Pro-environmental Behavior: Community Environmental Engagement at Home

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ABSTRACT

The primary goal of environmental education is to promote pro-environmental behavior. Unfortunately, this goal is essentially absent from environmental education curriculums as the majority of their topics focus on global environmental issues. Environmental education is usually learned from a textbook and inside a classroom. Unintentionally, this promotes a desensitization and disengagement from the environment for students. The literature shows there are many variables and a variety of contexts that contribute to promote pro-environmental behavior. The two main variables of focus chosen for this research were internal locus of control (ILOC) and environmental agency (EA). A case study was conducted in a rural New Brunswick public high school. A two-week unit that centered around an important community watershed was carefully created in order to promote ILOC and EA. Community-based learning was the vehicle in which the curriculum and opportunities for students to develop ILOC and EA were delivered in hopes of promoting pro-environmental behavior. The study concluded that ILOC and EA increased within students in this particular context, as elements of these dispositions were visible within the data; however, evidence of the students engaging in new pro-environmental behaviors (PEB) was not evident.

DEDICATION

I would like to dedicate this thesis to the educators who take risks, who tirelessly work to find new and engaging ways to teach their students about environmental issues and who lead by example.

PREFACE

Large-scale meaningful change in an individual's behavior towards the environment has yet to be realized by the majority of people. Promoting individual behavioral change, in the form of pro-environmental behavior can be daunting; however, historically individual behavioral change is the only thing that has ever promoted societal progression in democratic societies (Pongiglione, 2014). Attempting to advocate for and promote pro-environmental behavior within youth through various methods of environmental education, could lead to long-term attitudinal and behavior changes that permeate their social context (Pongiglione, 2014). The goal for this research was to create experiences for students through community and experiential-based learning that allowed knowledge, self-efficacy, locus of control, confidence, and agency to flourish. Thus, my research questions are:

Research Questions:

- **What is the impact of environmental community-based learning on students' internal locus of control?**
- **What is the impact of environmental community-based learning on students' environmental agency?**

In addition to these two research questions, I am also interested in determining if internal locus of control (ILOC) and environmental agency (EA) would positively correlate with an increase in pro-environmental behavior (PEB). However, this is contingent on a change in internal locus of control and environmental agency that would have needed to develop during my research. According to Kollmus & Agyeman (2010), there is a correlation that exists between locus of control, environmental agency and pro-

environmental behavior, yet the specifics of the relationship are not known because there are a multitude of other variables involved. My goal for this research is to shed more light on these variables and how they can influence one another.

To tackle these two main research questions and the contingent one, a two-week unit based on the watershed was developed and co-taught in two separate Grade 10 Science classes in a rural high school in New Brunswick. Guest speakers, interactive lessons and community outdoor experiences are just a few of the things that made up this unit. The unit was created in alignment with the Grade 10 Science Ecology curriculum and met many of the outcomes in that section. A detailed list of outcomes used can be seen in Appendix A. The following three chapters will explain in detail how and why I came to build this two-week unit. Chapters four to six will then explore how I went about analyzing and answering these research questions and what my recommendations are for future research in this area.

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This thesis would have not been possible without the help from the cooperating high school. Thank you for allowing me to conduct this research within your school, with your staff and students.

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Chapter 1: Introduction

The three R's, Reduce, Reuse and Recycle. I can clearly remember memorizing these words in my grade four elementary class. Unfortunately, other than enrolling in an Environmental Science class for my high school elective, which dealt with global issues, this is all the environmental education (EE) I can remember experiencing throughout my public school education in rural New Brunswick. Nonetheless, I went on to minor in Environmental Studies for my Undergraduate degree. I began thinking about the significant lack of specific, cross-curricular and integrated environmental education from kindergarten through to graduation during my Bachelor of Education Studies. In correlation with the lack of significance placed on EE, as a student I was rarely taken outside to learn in nature or in a natural setting. My rural community is home to many individuals who are invested in its student population, yet there was little to no community involvement throughout my educational experience.

The current lack of EE within most schools does not correlate with what I believe to be the existing ecological crisis. Environmental issues are reported frequently in the media for example, the continual loss of artic sea ice and its detrimental effects on a diversity of factors such as rising sea levels (Ramsayer, 2014). Environmental issues are predominantly understood as a phenomenon created by anthropogenic factors that have negative consequences for global ecosystems. Environmental issues are complex. It is difficult for scholars, researchers and governments to distinguish causality, severity, global and regional effects, let alone ways to mitigate these global changes in time frames that are comprehensible to the average person. If this is the case, how can we expect students to be aware of these complex and diverse issues, let alone be motivated to do

anything about them? How can students engage in pro-environmental behaviors if education does not provide the foundations for engagement with large environmental issues through community projects that the students can see and have an impact on or as an integral part of education?

The environmental movement that began in the 1970s had some impact on education. Some examples include the celebration of Earth Day and the implementation of environmental education in most schools (Kahn, 2010; Moroye, 2013). However, the general ignorance of the environment displayed by the average person remains a significant problem. For example, 45 million adult Americans still believe the ocean is a source of fresh water, while 125 million believe aerosol cans contain CFCs (chlorofluorocarbons), even though their use was banned in 1978 (Kahn, 2010). Environmental education is working to combat this ignorance, with most American adults overwhelmingly supporting EE programs (Kahn, 2010), but it is not enough.

Like adults, students' overall perception of the environment in North America is not reflecting the current global ecological crisis. Canadian students in Ontario reported most of their information regarding the environment comes from the media (Douglas, 2011). Unfortunately, students are being largely misinformed about the environment. Douglas' assertions correspond with Duvall & Zint (2007), as they note most students possess limited understanding of the environment, with Goldman, Assaraf & Shaharabani (2013) adding that students romanticize the environment and see themselves and their actions as separate from it. Students' view of their environment is one important reason why environmental education, whether formal or informal needs to be more prevalent in schools.

I believe the gap between education and knowledge of the environment derives from the disconnect between curricula, pedagogy, text, and real life examples and context, but also because, environmental education has been unsuccessful at presenting itself as being tangible or relatable to students on a local, regional or even national level. Kahn (2010) notes, "just as there is now an ecological crisis, there is also the crisis of environmental education" (p 59).

This research immersed students within their local environment and to exposed them to informal environmental education and community learning to measure whether this had an impact on their sense of environmental agency (EA), internal locus of control (ILOC) and perhaps further, their pro-environmental behavior (PEB). The purpose of this study was to foster a sense of interconnectedness and respect between students and their community environment through course work that specifically addressed a community environmental issue (the watershed). Through working in the community and learning about the local environment, students should be able to apply and relate their knowledge to a global context and to other environmental issues (Cross & Willis, 1994; Blanchet-Cohen, 2008; Price & McNeill, 2013; Lane, Lucas, Vanclay, Henry, & Coates, 2005). Blanchet-Cohen (2008), and Chawla & Cushing (2007) note that a linear relationship between knowledge and motivation to change an individual's actions or behavior does not exist. While knowledge can promote awareness or an understanding of an environmental phenomenon, knowledge alone does not directly foster motivation for a behavioral change (Blanchet-Cohen, 2008). This is precisely why community-based learning became the thread that wove this research together and the vehicle for delivering this unit.

The following chapter details the literature review for this research and encompasses major themes that are discussed throughout the thesis. Chapter 3 delves specifically into the case study methodology and the methods used to make this research happen. Chapter 4 details the analysis process for the types of data collected, while Chapter 5 explains and discusses relevant categories, themes and findings from the data. Chapter 6 then concludes the thesis by detailing significances from the research questions, from the data and notes some recommendations for future research and future researchers.

Chapter 2: A Review of the Literature

There has recently been a lot written about the impending outcomes of large environmental issues for the globe such as the decrease in biodiversity, rapidly melting glaciers (and the changes to sea level as a result), air pollution and increasing severity and frequency of storms. There has also been a lot written about how to mitigate these large environmental issues through individual or communal pro-environmental behaviors (PEB). The most commonly discussed issue within that body of literature is that there is an inconsistency in how to promote PEB in individuals because a change in knowledge that leads to a change in behavior is no longer thought of as a linear progression (Blanchet-Cohen, 2008). Throughout this chapter I will delve specifically into the way in which I have approached the promotion of PEB in youth based on the successes described within the literature. This will include specific discussions of environmental education (EE), internal locus of control (ILOC), environmental agency (EA), pro-environmental behavior (PEB), and community-based learning. Following each explanation, I will conclude each section by identifying gaps that exist within the literature that this study has sought to address and how these gaps informed the data collection process.

Environmental Education (EE)

The current status of environmental education. Environmental education is intended to positively change and impact human behavior by sharing knowledge of the natural environment, allowing for interdisciplinary exploration, providing opportunities for inquiry-based learning, having a student-centered curricular framework, while also giving students choices and opportunities to act in environmentally responsible ways

(Heimlich, 2002; Kahn, 2011; Stevenson, 2007). These are promising and attractive goals for any course. Unfortunately, in many cases EE is not living up to its potential and has largely been decontextualized from its goals (Kahn, 2010; Stevenson, 2007).

Even though EE as a discipline did gain headway through the 1970s with the environmental movement, (for example the United Nations' General Assembly in December 2002 launched the Decade of Education for Sustainable Development,) Kahn (2010) notes that EE has "failed to become more than a marginal academic discipline relative to the curriculum as a whole" (Bonnett, 2013; p. 6). In my opinion, New Brunswick, Canada is complicit in this failure of decontextualization. Currently in New Brunswick, the *Introduction to Environmental Science 120* course is offered as an elective at the high school level. Originally it was implemented in 1997 as a 122 or a 123 course. The 122 stream highlighted its academic integrity, but has since been changed to a 120 survey course in 2012 as part of a natural progression of curricular update (M. Emberger, personal communication, April 9, 2015). This suggests that there was not enough interest in the course as a more mainstream academic subject. Kahn (2010) asserts that not only has environmental education failed to hold a strong position as an academic discipline amongst other curriculums, but also the EE curriculums that are implemented do not convey the original goals of environmental education mentioned above. Although definitions and global scientific processes are important, it is not enough to solely rely on abstract cognitive processes for EE, such as the analysis of text. Kahn (2010) argues that this approach isolates students from the natural world and therefore EE continues to promote an anthropocentric view of the world to students.

Although the implementation of environmental education has not been overtly successful, teachers can implement EE informally during other classes such as History, Science or English, which are compulsory for all students until Grade 10. There are instances where ecologically-minded teachers of any subject or background integrate environmental education into their daily lessons. For example, during a social studies lesson on the history of food, a teacher could make a point to tell students about eating local, and how they have grown up being exposed to many types of foods in the grocery store and many types of drinks. The teacher attempts to sway their lesson in order to get students to develop a sense of self, while also realizing why they are choosing specific behaviors (Moyoroe, 2013). Although this teacher is instilling knowledge of great value into students and some environmental knowledge, the EE seems mostly masked in this case; however, it is still providing students with knowledge that they may use when making positive environmental consumer choices in the future.

Despite some growth of EE over the last couple of decades, it is a field that needs to be reconstructed. It is not enough to just articulate global processes and dangers that a capitalist consumer life affords Kahn (2010) argues that collectively, EE is not pushing the demand for action and behavioral change, its ultimate goal (Heimlich, 2002; Chawla & Cushing, 2007). Educating students about disasters that they are disconnected from rarely warrants pro-environmental behaviors (PEB). Gifford and Nilsson (2014) report that the best discriminator between environmentally concerned teens and teens who are not is the amount of environmental knowledge about specific environmental issues they possess. Even so, environmental knowledge is rarely enough to stimulate students to act. Most environmental volunteers acknowledge that they had a background in

environmental education, which helped to spark their interest but acknowledge that the knowledge was not what influenced their decision to take up action (Liarakou, Kostenlou & Gavrilakis, 2011). Yet, in some cases, knowledge has been shown to stimulate more positive attitudes towards the environment (Diikstra & Goedhart, 2012). According to Price & McNeil (2013), the problem is the environmental education and science curriculums remain out of touch with students' personal lives. Current EE programs do not inspire students to alter the 'status quo' and this has resulted in the environmental education crisis (Kahn, 2010).

Case examples of environmental education. To investigate why a crisis in environmental education has occurred, researchers are beginning to look at what works and what does not when EE is delivered formally (classes labeled as EE or taught as such) or informally (EE embedded within other classes such as science or social studies or perhaps a summer program). There have been many instances where EE has been partly successful or fully successful in reaching its goals (Barton & Tan, 2010; Bonnett, 2013; Cross & Willis, 1994; Duvall & Zint, 2007; Goldman, Assaraf & Shaharabani, 2013; Moroye, 2013; Smith-Sebasto, 1995). Efforts are being made to make EE classes and science classes more hands on. The focus is on a 'lived' curriculum that connects students to real life situations such as recognizing themselves in relation to their environments and reaching out to their communities (Price & McNeil, 2013). Many different studies have recognized the need for this. For example, a review of the literature was done on the effectiveness of an environmental education class on promoting intergenerational learning. Researchers concluded programs that sent homework home with EE knowledge to be discussed with parents achieved more intergenerational

learning. It was also noted environmental education needs to encompass community level learning in order to facilitate social change (Duvall & Zint, 2007). Duvall & Zint (2007) state that future environmental education classes need to focus on students interacting with the local community environments and solving problems for them to be more effective. Cros and Wilis (1994) also note that many natural and local environments are often overlooked as learning sites and learning opportunities. Learning opportunities can stretch as large as a community or as small as a ditch near the school.

Price & McNeil (2013) offer an example of how teachers have made an EE topic become real for students. Teachers took the ecology unit of a science curriculum and made it relevant to students' lives. Students in this class were supposed to learn about global ecosystems such as the tundra and the rainforest. Instead, teachers focused on the ecosystems in their back yard and in their communities. This required students to be able to connect their knowledge of larger ecological concepts to their local ecosystems and compare and contrast.

As a teacher, it is reassuring to have steps to follow for implementing curriculum that requires embedded experiences for students. Boston (1999) has a process model for teachers to follow. First, students take a community inventory and study their local environments. Second, students pick a problem. Third, students research the problem, and fourth, students design their plan of action. Students then carry out the action and finally talk about ways to sustain the project long term. Much of the focus here is on the students having autonomy over their projects so they will develop ownership and engage with them. Teachers can easily personalize EE projects and individualize them to show how each student can make a difference (Gambro, Switsky & Harvey, 1992).

Other recommendations for community-based learning for environmental education come from Barton & Tan (2010). Their successful EE informal summer program engaged low socio-economic students in learning about urban heat islands (UHI). UHIs are urban areas such as large cities that are significantly warmer than rural areas due to human activity. Once students could grasp this phenomenon, the teachers allowed them to use Google Earth to look at their state and decide which areas could be affected by UHI. Students then interviewed community members to see if they had knowledge of UHI. When they community members did not, it empowered students to own their knowledge, to give back and teach the community members about UHI. Students did this by taking temperatures in different areas of the state, conducting interviews, taking photos and videos. Finally, students showed their videos at the school for community members to watch and learn from. Most students are receptive to this type of learning. Giving them this learning opportunity allowed students to feel like 'the scientist'; rather than passively receiving knowledge from experts, they were the experts. Students actually prefer to work on local issues rather than global issues because they are tangible (Lane et al., 2005).

Going forward. Lane et al. (2005) recommend that teachers of environmental education should allow for experiential opportunities. EE needs to stay local for interest purposes and teachers should provide opportunities for communication and argument between students. Smith-Sebasto (1995) also concurs that EE needs to focus on root causes and root-level solutions. He also notes that EE should include ways for human behavior to have an impact within the community to foster empowerment, much like the case of students and UHI. In conjunction with implementing community-based learning

and 'lived curriculums', it is also important to understand student perspectives before implementing certain projects. Before participating in an EE program, Smith-Sebasto (1995) realized that students saw the environment as an object. Students did not see the environment as a system of interacting components. Having a basic understanding of environmental systems is vital to developing a concern for the environment. Unfortunately, in addition to being disconnected from their own environment, students also seem to lack correct knowledge about the environment in general. For example, climate change is often confused with global warming (Diikstra & Goedhart, 2012). Community level EE is important for not only developing student's connection to their local environments, but also a local context by which to make sense of the EE knowledge necessary to understand its complexity. Unfortunately, too often EE is taught within classrooms and focuses on global issues that create a sense of hopelessness and helplessness amongst students (Smith-Sebasto, 1995).

Implications for this study. Environmental education seeks to change peoples' behavior; it is known that knowledge of global or even local issues is not enough. While there is no longer a linear model existing between knowledge and behavior, it is still an integral component necessary for PEB to flourish in individuals (Heimlich, 2002; Gifford & Nilson, 2014). Community-based learning, coupled with knowledge could begin to evoke feelings towards local environments in students. Research in EE is increasingly paying attention to the importance of developing a sense of self-efficacy and how children express environmental agency (EA) (Blanchet & Cohen, 2008). Although research in the area currently remains slim, Price & McNeil (2013) note that agency is tangled up in how students perceive themselves in different situations, yet as a teacher it

is important to recognize that they are being informed by their home, culture and experiences.

Internal Locus of Control (ILOC)

Internal locus of control defined. For this research, I am using Trigg's (1976) environmentally-orientated definition of locus of control; that is the degree to which individuals believe that general occurrences are contingent upon their behavior. Locus of control derives from Social Learning Theory. Social Learning Theory is a field of study in which behavior and instruction are considered to act as learning opportunities for individuals in a social context (Larose & Ponton, 2000). Locus of control was originally used as a behavioral measure in psychology but it is now being widely applied to other disciplines. There exists a spectrum for locus of control with individuals falling anywhere between internal on one end of the spectrum, and external locus of control on the other. Individuals with a high internal locus of control (ILOC) use knowledge to control their environment and know their behavior can change or impact a situation; perceived control of a situation evokes empowerment and engagement with it. Individuals who possess a high external locus of control (ELOC) believe that life events and the behavior of powerful individuals and institutions such as the government are not within their control and are contingent upon things such as luck. Individuals who are predominantly external and who are exposed to environmental problems or stressors are associated with social disengagement and a feeling of helplessness towards the stressor (i.e. the environment) (Trigg, 1976; Larose & Ponton, 2000; Kollmuss & Agyeman 2002). An example of this is provided by Larose & Ponton (2000) when they describe research that was conducted on domestic garbage disposal in Third World countries. Individuals with a higher ILOC

responded much better to environmental stressors and saw their actions as a way to mediate them.

Another finding that articulates the difference between individuals who have a high ILOC versus ELOC was presented by Liarakou, Kostenlou & Gavrilakis (2011). These researchers wanted to know if environmental volunteers exhibited a high ILOC or ELOC. In line with Trigg (1976) and Larose & Ponton (2000), they discovered that all volunteers showed higher levels of high internal locus of control. They believed they could influence the process of the programs in which they volunteered. Locus of control is a considerable measurement for an individual's self-confidence concerning a social context, personal empowerment, and their willingness to get engaged.

Locus of control is contingent upon context. It varies based on situations, and can be susceptible to change. For example, individuals that exhibit a high level of external locus of control in an environmental situation can develop into an individual with a high level of ILOC in that same context or visa versa; no one person is strictly one or the other (Smith-Sebasto, 1995). Locus of control is not a stable personality trait. It is a feeling of 'self' that changes with circumstances and experiences (Huebner & Lipsey, 1981). For example a prominent activist with a high ILOC can begin to develop a higher ELOC for their situation if they have suffered a lot of defeats and setbacks (Trigg, 1976).

ILOC can also influence students' knowledge of the environment. A study conducted by Gambro, Switsky & Harvey (1992) looked at the constituents of a student's environmental knowledge. The researchers noted that environmental knowledge is complex and involves gender, locus of control and informal science learning, to name a few. The strongest variable that predicted if students had a lot of environmental

knowledge or were going to pursue more environmental knowledge was locus of control. Even when controlling for all other variable influences on environmental knowledge, locus of control maintained its influence.

How do we increase ILOC? As Gambro, Switsky & Harvey (1992) indicated, an increase of internal locus of control is linearly linked with an increase in environmental knowledge. There is also a correlation between personality variables such as locus of control and pro-active behavior when exposed to environmental stressors. The study by Gambro, Switsky & Harvey (1992) is an example of individuals in developing countries responding to environmental stressors who also showed that locus of control correlated with literacy rates. Literate individuals are more willing to cooperate and communicate with others about environmental stressors, presumably because they are more readily able to access knowledge than illiterate individuals. ILOC and increased literacy were indicative of pro-active behavior within the community area. If this is the case, then locus of control is a good statistical predictor of how people will shape their environment (Larose & Ponton, 2000).

Little of the current research on locus of control concerns itself with students. Most research focuses on adults and on informal environmental education settings. However, one study focuses on the relevance of locus of control in regards to ecologically responsible attitudes and behaviors in students. Students and their measurement of locus of control (internal or external) correlated positively with the amount of concern they had for the environment (Huebner & Lipsey, 1981). Even environmental activists exhibit a higher amount of internal locus of control than non-activists (Huebner & Lipsey, 1981).

These studies suggest that it is plausible to connect the concept of locus of control in part to explain the lack of pro-environmental behavior (PEB) in individuals. Environmental problems are usually spoken about as global problems and are predominantly social trap situations (Pongiglione, 2014). That is, things that are of personal benefit to us often have environmentally negative consequences. For example, driving a car is convenient but produces hazardous chemicals that contribute to poor air quality. Selling your car can be socially detrimental and most people will not willingly endure the sacrifices. This suggests that people can feel helpless by their participation in PEB. Much of the reluctance for engagement comes from the idea that miniscule life changes for the environment will be largely ineffective and socially detrimental (Huebner & Lipsey, 1981). This makes it hard to engage individuals and why internal locus of control is such an important factor to develop within students.

To help instill an elevated internal locus of control (ILOC) in students, teachers can personalize environmental problems to show how students can make differences in their community. An example of this is starting a recycling program (Gambro, Switsky & Harvey, 1992) which in and of itself has only marginal ecological benefit, but potentially has greater long-term benefit because it empowers the students to believe they can make a difference and shows them they can act, increases their ILOC. Gambro, Switsky & Harvey (1992) also note that teachers can attempt to increase the internal locus of control of their students by demonstrating grass roots nature of several powerful environmental organizations while also emphasizing the importance for personal involvement. An example of this is energy conservation.

Implications for this study. Huebner & Lipsey (1981) noted that the main variable that distinguished activists from non-activists was their environmental education background and knowledge. This is also noted by Smith-Sebasto (1995) who said that students who completed an environmental education (EE) course versus students who did not had a much higher internal locus of control. From the literature, largely increasing someone's environmental knowledge in a community setting usually correlates with an increase in ILOC. The community setting and knowledge allows the individual to feel empowered and more knowledgeable about the different options available for shaping their context. Students with high internal locus of control are more likely to be motivated to obtain more environmental knowledge than students with an external locus of control (Gambro, Switsky & Harvey, 1992). Knowledge is not enough, but ILOC measures are a good indication for future behaviors. However, I have been unable to find any research in which ILOC has been tested on high school students during a formal or informal environmental education experience. For this study, I looked at the change in internal locus of control for a student when they are exposed to environmental education and community-based and experiential learning to ultimately see if it influenced pro-environmental behavior. I also looked at student environmental agency to see how this contributed to promoting pro-environmental behavior.

Environmental Agency (EA)

What influences agency? Barton & Tan (2010) approach the definition of agency with an anthropogenic lens. Agency takes place in the moment and is facilitated or constrained by the power and position of a person. Like locus of control, agency is contextual and dispositional. It is because of this that educators need to create learning

experiences that can be transferable, such as community learning projects to regional or global projects. According to Blanchet-Cohen (2008), having students develop a relationship with nature that involves not only reason but also feelings is the precursor to feelings of responsibility towards the environment. Human agency is core to human development. Many environmental educators notice that direct contact with the environment coupled with adult mentoring is key to nurturing affection for the environment. The conscious choice for a student to be environmentally involved is usually labeled as child agency. Like Barton & Tan (2010), Blanchet-Cohen (2008) acknowledge child agency is about paying attention to their power or lack of power in different situations and the way that they use it to influence their lives.

Agency can be expressed in different ways such as environmental agency and communicative agency. Communicative agency is a large part of children's lives and contributes to environmental agency. Communicative agency is the primary place for children's environmental agency. Communicative agency is when students tell others such as their family or community members about a piece of information. Increasing environmental agency of young people is directly linked to communicative agency and is an example of how children use their knowledge as power and can be facilitated by sending EE knowledge home to be discussed with parents (Lane et al., 2005; Duvall & Zint, 2007).

Implications for this study. Over all, there seems to be little evidence of research that focuses specifically on building students a sense of environmental agency. It is my observation that traditional science discourse is predominantly about relaying expert messages about the environment to students, which is passive and impersonal. Rarely,

does one observe teachers providing students with the opportunity to plan projects, activities and environmental excursions, to document their own experiences and allow for an active voice in their reporting; these are all activities that promote the building of agency within students (Barton & Tan, 2010). Students' work on local community, regional or home area projects directly instills environmental agency. In a study done by Lane et al. (2005) students were able to choose what they wanted their project to be about, and most students chose a local issue. By the end of the study, students articulated a sense of responsibility for their projects and their local environments and a growing confidence in their ability to participate in social processes that concerned the environment. By employing community learning projects through informal environmental education, I am seeking to establish a sense of responsibility in students, along with knowledge that will give them power to control and act on their context. It will then be noted if there is any correlation between EE and community learning projects and a change in environmental agency and furthermore a change in pro-environmental behaviors for students.

Pro-Environmental Behavior (PEB)

Pro-environmental behavior defined. As can be seen in my research focus, this research has a built in assumption that individuals acting throughout their lives have a profound impact on the environment. If individuals contribute to the degradation of the environment while also presumably making informed decisions on democratic processes, then they also individually have the capacity to effect positive environmental change (Pongiglione, 2014). Pro-environmental behavior (PEB) is defined as any behavior that changes or alters the structure and dynamics of the environment in a positive way. PEB is

further defined by Courtenay-Hall & Rogers (2010) as any behavior that is virtuous and impacts the environment in a positive way. It can be direct environmental impact or indirect impact. An example of direct impact is not driving a car to work one day and an indirect impact can be donating money to an environmental charity. Courtenay-Hall & Rogers (2010) notes that behavior can be conscious or unconscious. Kennedy, Krahn & Krogman (2015) agree with the previous two PEB definitions but Markle (2013) adds that PEB is environmentally significant behavior that is defined by its impact, what is it about the behavior that it changes and is it significant?

What influences pro-environmental behavior? What influences an individual to adopt pro-environmental behaviors is hard to predict. Pongiglione (2014) discovered that direct risk of environmental degradation is not enough to motivate individuals to undertake pro-environmental behavior. Motivation for making change does not depend on how close the threat or danger of the environmental issue is to the individual. For example, people do not associate local flooding with rising sea levels and increased storms due to a change in climate from anthropogenic factors and therefore are not liable to adopt PEBs to try and mitigate the steady increase of floods in the area. People feel helpless and prefer to work on things they can control (ILOC), but motivation is a hard factor to instill, especially when people are acting alone.

Pongiglione (2014) also notes that there are many factors that come together to promote the adoption of PEB for individuals. Some of these factors include knowledge, environmental attitude and economic incentives such as government rebates. Yet, it is also noted that even though people are generally concerned about the environment, what holds them back is the feeling that they cannot impact the situation alone, they have a

lack of practical knowledge about what they can do to make an impact and there are insufficient rewards or approval mechanisms available. Lack of direct achievement, acknowledgement or rewards is a large factor in debilitating PEB (Kollmuss & Agyeman, 2002; Pongiglione, 2014). There needs to be more rewards or incentives for people who are acting environmentally responsible today. There is also a lack of punishments for people who act environmentally irresponsibly, such as a carbon tax. PEB develops within a social context and providing laws in order to shape that social context to nurture PEB is important (Pongiglione, 2014).

Diikstra & Goedhart (2012) also know that scientific knowledge, attitudes and pro-environmental behavior are interrelated, but in a complex manner. The relationship between them remains unclear. Another relationship that is non-linear is the relationship between knowledge and motivation for pro-environmental behavior (Chawla & Cushing, 2007). This was established in 1970, yet most environmental NGOs still base their outreach campaign on the idea that knowledge alone will inform new behaviors (Kollmuss & Agyeman, 2002). This is also what is being done in environmental education. Researchers have identified that developing a relationship with the environment involves not only reason but also feeling (EA). Children need to learn amongst their peers and community members but also directly with the natural environment such as plants and animals to be able to develop feelings. There is no single experience that can be recreated that produces active citizens that engage in PEB (Blanchet-Cohen, 2008). However, in order to find correlations between attitude and a particular behavior, in this case, PEB, the researcher has to measure the attitude towards that particular behavior. It is hard to incorporate all factors that contribute to PEB into

one model and some researchers like Kollmuss & Agyeman (2002) note that it is impossible, but nonetheless models and diagrams serve as visuals the help to categorize and clarify some factors. The figures below depict the evolution of PEB predictor models discussed in this paragraph.

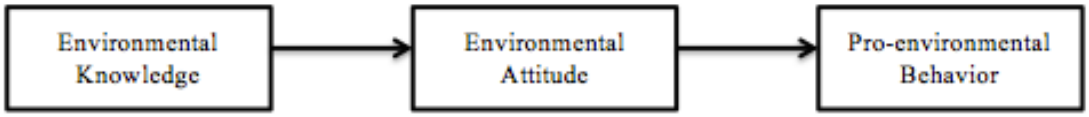


Figure 1. Early models of pro-environmental behavior (Kollmus & Agyeman, 2010).

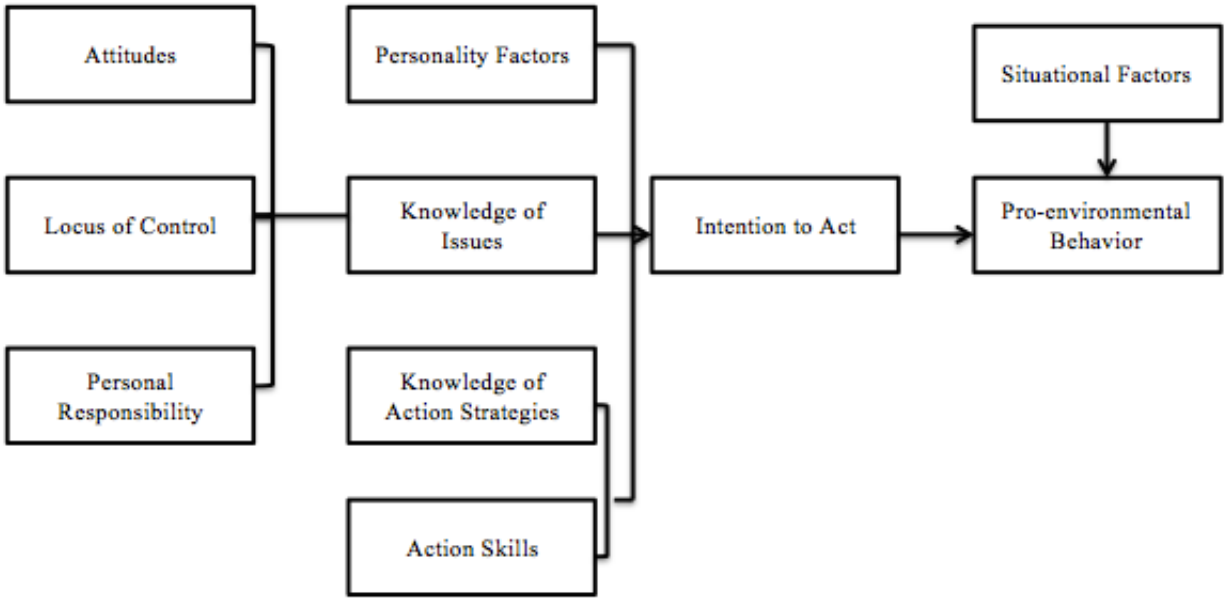


Figure 2. Models of predictors for environmental behavior (Kollmus & Agyeman, 2010).

Because there are so many factors that increase and decrease motivation and contribute to PEB, Markle (2013) says that there is also no consistent or standard measure for PEB. No published research has thus far examined consistency amongst pro-environmental behaviors. This is because not all PEB measures are equal and all PEB is not equal because individuals differ in the degree to which they perform them and what

they perform. Also private sphere pro-environmental behavior is hard to acknowledge and measure because it could be done unconsciously.

Case examples of PEB. One recent finding may have part of the answer to this. Price & McNeil (2013) studied students' PEB. They were surprised when they returned two years later and most students were still implementing the behaviors they took up during the formal environmental education course, while some were engaging in new pro-environmental behaviors they had not before. Price & McNeil (2013) acknowledge how astonishing this was and believed that because they allowed students community involvement during the environmental education and engaged in hands-on projects and personal experiences, it allowed students to further engage in personal and community pro-environmental behaviors. This is because they believed their students were impacted by the environmental education (EE) emotionally, socially and intellectually. I would also argue that students made connections with their community and developed a sense of responsibility for it (EA). Examples of pro-environmental behaviors students were still participating in two years later were, not eating sea turtles and communicating to their parents and community members not to either while explaining the dangers in doing so. Some students engaged in composting, not burning trash and telling other students not to litter. Students need to have knowledge of their context, understandings and feelings towards their environment to want to initiate this change. It will not be forced upon them. This being said, making pro-environmental choices is not easy if a student is uninformed or has little to no knowledge (Gifford & Nillson, 2014).

Social interaction and social context is a huge factor for influencing behavior because humans are largely shaped through observing and interacting with others. Social

context refers to a persons' family, friends, neighbors, community members, students at school, colleagues and peers. For example, recycling is a pro-environmental behavior that many people participate in and social context influenced it. Those within one's social context operate as a source of feedback and support that can sustain or ruin motivations towards certain behaviors (Pongiglione, 2014). This is why targeting a classroom for research purposes is a good idea because the students are involved together in the learning experience and can support one another in the future.

Implication of this study. Courtenay-Hall & Rogers (2010) recommend that case studies should be used to focus on closing the gap between motivations and rewards that keep fueling certain behaviors in order to make this long term. Unfortunately, whether formal or informal, currently most environmental education is not designed to achieve its goal of promoting environmentally responsible behavior. More recently "environmental education has produced citizens armed with ecological myths that lack the knowledge and conviction of their own role in the environmental problem" (Smith-Sebasto, 1995, p. 24). Adding to this burden is that peers and adults represent the biggest obstacles for children to interact with the environment on multiple levels. Even though international child rights include provisions for them to participate in the care for the environment, parents and peers influence how children view, shape and involve themselves with the environment (Blanchet-Cohen, 2008).

Community-based Learning

Outcomes of community-based learning. Community-based learning that takes place in informal settings allows students to engage with science and the environment (Barton & Tan, 2010). Lane et al. (2005) notes that the community acts as a place for

engagement and relation to local issues while allowing students to connect knowledge of the local environment to the global environment. Being a community member means that people share views on particular topics and work together to solve problems. In a recent study at a local community environmental meeting, students self-identified as community members because of common interests and concern about local environments they shared with others in the community (Lane et al., 2005). This suggests community plays a large role in the empowerment of students. Ways of knowing that inherently value and utilize community more centrally may be key to empowering individuals to act within their local contexts. Kahn (2010) and Stevenson (2007) have noted the decontextualization of environmental education (EE) from its goals. As weaved throughout this review of the literature, community-based learning is an integral part of the recontextualization of EE.

Literature Review Summary and Implications

The gaps, consistencies and inconsistencies presented in the review of the literature have influenced how I shaped and carried out my case study. Environmental education is currently decontextualized from its original goals. One of the ways to address this problem is to attempt to instill concern, attitudes, knowledge and agency (or what I am classifying as a change in the internal locus of control and environmental agency of an individual) by allowing students to gain experiences through community-based learning that incorporates aspects of traditional ecological knowledge. The contexts created from the implications discussed in the literature review hopefully allow meaningful experiences for students and influence their internal locus of control, environmental agency and their pro-environmental behavior.

Chapter 3: Methodology

Courtenay-Hall & Rogers (2010) talk about the gap that still exists between knowledge and action that results in changes to behavior. The gap involves the complex interplay of attitude, motivations, rewards and punishments, environmental agency and internal locus of control (to name a few). Most research concerning behavior has been conducted by narrative inquiry or action research methodologies (Courtenay-Hall & Rogers, 2010). However, they note that the richness of case studies would be the better research route; "the slimness of model can compete with the richness of case studies" (Courtenay-Hall & Rogers, 2010, p. 293). Research on behavior that yields statistics and mathematic relationships leave a lot of uncertainty. Greater insight into highly contextual cases such as those in education and for behavioral research might be gained by conducting case studies because they aim at particularities (Inderscience Enterprises Ltd., 2016).

Case Study as my Methodology

*"*Qualitative case studies allow researchers to investigate real-world phenomena which exhibit blurred boundaries between the context and the phenomena and encourages the documentation of multiple perspectives on the same phenomena" (Price & McNeill, 2013, p. 505). Price and McNeill's description of a case study correlates with Yin's (2009) twofold definition and it is the explanation of case study as a methodology that best captures how I approached this research:

- First a case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.

- The case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, as one result relies on multiple resources of evidence with data needing to converge in a triangulation fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis (p. 18).

The two-fold definition shows how case studies are a broadly applied methodology. Case study research can be single or multiple cased and can include qualitative and/or quantitative evidence (Yin, 2009; Stake, 1995). For this study, I will be drawing predominantly upon the application of case studies as described by Yin (2003 & 2009).

Although there are many considerations when deciding on the type of methodology, one deciding factor for case studies is whether or not a bounded system can be identified as the focus of the investigation (Merriam, 1998). Case studies need to take place within a bounded system; what will and will not be studied needs to be identified for the case (Mills, Durepos, Wiebe, 2010). The case needs to be carried out in a natural setting within the boundaries of a social system such as the classroom, organization, local community or even nation (Swanborn, 2010; McMillan, 2010; Stake, 1995). The classroom and its students bound the case as a social system in this study, along with the watershed geographically bounding the lesson plans for this unit, and the measurement of students' internal locus of control, environmental agency and pro-environmental bounding the studied variables for this case.

Since the 1960s and 1970s, case studies have gained their credibility in the field of education (Merriam, 1998). Case studies are excellent to use for educational research

because they approach a problem of practice from a holistic perspective (Merriam, 1998; Courtenary-Hall & Rogers, 2010). Swanborn (2010) concurs with Merriam (1998) and adds that case studies are particularly useful in education because it is difficult or impossible to isolate the phenomenon under study from its context or environment. In these situations, it is wise not to be too selective in regards to variables for the case while also recognizing that it is not possible or knowledgeable to observe everything. As Kollmuss & Agyeman (2002) note, there is no way to acknowledge, promote and measure all of the variables included in promoting pro-environmental behavior. Qualitative case studies look to understand human experience more often than look for a cause and effect (Stake, 1995).

Limitations of Case Studies

While some researchers challenge the application of case studies as a methodology because they often yield long and rich descriptions originating in the extensive data that is non-generalizable, this is precisely what was required for my research. Stake (1995) says, that particularization is the nature of case studies, not generalization. Education research studies are frequently generalized for the purpose of mass implementation of policy. This often cannot be done because education is incredibly context specific (Freebody, 2003). Also, to accommodate the extensive data, case studies actually earn their merit by providing thick and rich descriptions aimed at these particularities (Merriam, 1998). Also, many case studies do not solely focus on one specific case. Much of the time, more than one case study is conducted at once. The cases can then be cross-examined through a cross case analysis, which I have done in this study. By doing this, I was able to predict similar and/or contrasting results from the chosen cases (Yin, 2003).

As Yin (2003) suggested, every effort was made to carry out exact procedures with both groups.

Compared to other methodologies, case studies have fewer texts dedicated to it as a methodology and there was no journal devoted to case studies until 2007 (Yin, 2009; Inderscience Enterprises Ltd., 2015). For example, in 2007 the *International Journal of Teaching and Case Studies* was published. This journal allows access to case studies aimed at "supporting teaching, learning and research in academic and applied professional settings" (Inderscience Enterprises Ltd., 2015). Then in 2010, the *Journal of Case Studies* was published (The Society for Case Reserach, 2015). This shows that the importance of case studies as an academic methodology is beginning to be realized and that scholars and educators are using case studies in order to advance their professional practice. Traditionally, case studies were commonly used for research that lasted for long periods of time; however, ethnography is now usually used for that purpose (Yin, 2003). The timeline that was allotted for the Grade 10 Science Ecology unit did not allow for long-term research. Ethnographic research is also predominantly associated with investigating cultural and social dynamics by studying a group that shares the same culture and the researcher then immerses themselves within the context (Freebody, 2003; Creswell, 2013). This is not applicable to my research.

According to Merriam (1998), observations, interviews and the use of different types of documents are the most common for data collection in a case study, but it is not a requirement. Between both classes there were 45 students involved in the study. Grounded theorists usually interview twenty to thirty or as high as sixty participants (Freebody, 2003; Creswell, 2013). Since I researched the effects of community

engagement on internal locus of control and environmental agency (EA), the observations of student interactions with the environment and multiple sources of data were a requirement for this research and interviewing most or all students would have yielded too much data with an unreasonable amount of time required to analyze the data.

Method

Data Collection & Analysis

Unlike other methodologies, case studies have no set limitations on the types of tools that might be used for data collection or the methods for data analysis; researchers are free to choose the tools they wish (Merriam, 1998). Because case studies are compatible with many different data sources, using several data sources is key to conducting a good case study (Swanborn, 2010). For this study, I have chosen to collect data in four different ways: interviews, cognitive mind maps, observations and students assignments (pamphlets and poems). An overview of the types of data collected is described below; descriptions of how each data type was analyzed will be further discussed in Chapter 4.

Interview. Interviews provide an avenue of viewing the case that is recommended in qualitative research. There were nine pre-determined questions (Appendix B) as it is recommended that novice researchers use semi-structured interviews (Stake, 1995). Merriam (1998) notes that there are five types of questions that can be asked during an interview: experience, opinion, feeling, knowledge and background questions. The questions that were created were based on these suggestions and include at least one of each type of question from Merriam's (1998) categories. A total of fifteen students were interviewed between the two classes or cases. More students were interviewed from class one because it had more students than class two, ensuring equal representation. Students

were selected for interviews based on their signed permission to participate in the research and their availability to leave class during their period three class for five to ten minutes. An interview with the classroom teacher also took place (Appendix C) to ask about the effectiveness of the unit as a pedagogical tool and if he thought the unit created opportunities for students to develop ILOC, EA or PEB. I transcribed the interviews in order to have access to paralinguistic clues about the meaning of the text (Marshall & Rossman, 2006).

Cognitive Maps. Cognitive mapping as a pedagogical tool has been successfully used by Lourdel, Gondran, Laforest, Debray & Brodhag (2007) to measure a student's evolution of knowledge concerning sustainable development. This model can also be used as a method for evaluating student understanding on a subject or phenomenon. The goal for this research was to identify students' initial and final knowledge at the beginning and end of the research study, what was understood fully and the gaps that still exist in their knowledge.

Lourdel et als'., (2007) formula recommends asking for cognitive maps on the first and last day of the research study. For this research, the cognitive maps were used to determine if student's knowledge about the watershed had changed in order to have some insight if a student's ILOC was changing with their increase or decrease in knowledge. In accordance with Lourdel et als'., (2007) model, students received a stimulus word, *watershed,* that got them going and were allotted 15 minutes for the assignment or until they had exhausted their knowledge.

Lourdel et al., (2007) created six semantic categories to aid with the analysis of the maps. This is the only analysis framework that fits this the type of data collection

process; this will be further discussed in Chapter 4 and 5. Lourdel et al., (2007) recommend counting the words in the cognitive map that relate to each semantic category and then looking at the transformation in students' thoughts and knowledge as a pre and post map assignment. I also asked members of the Petitcodiac Watershed Alliance to create 'expert' cognitive maps in order to have a comparison for the students' maps (Appendix D & E). The cognitive maps were represented using spider graphs and are detailed further in the following chapter.

Observations. Observations are to some degree essential in qualitative studies. They are useful in providing additional information about the case. Participant observations require first hand involvement in the context chosen for the study. Because case studies are supposed to take place in their 'natural setting', this creates the perfect opportunity for direct observations (Marshall & Rossman, 2006; Yin, 2009) This allows the researcher to see, hear and experience the reality the participants are experiencing. Since the research unfolded in a team-teaching scenario, it was initially thought that there would be ample time for the classroom teacher and myself to take notes in each of our journals and reflect later on what had transpired, since personal reflections are key in gaining new vantage points for the researcher (Marshall & Rossman, 2006). However, there was less time to record observations than initially thought with both the classroom teacher and I team teaching. Thus, the observations that were recorded were few and infrequent. Nonetheless, Yin (2009) notes that the depth of observations can range and therefore the observations were still used to exemplify and accentuate findings from other aspects of the data collection process. Specifically, the observations were *participant*

observations because of the diverse role I assumed by team teaching the class, and also interacting with students and the environment (Yin, 2009).

Student Assignments. Student assignments such as poems from class two and pamphlets from both classes were collected. Again the discussion of how these were analyzed is discussed further in Chapter 4.

Research Stages

This research was carried out in four stages:

Stage One. Beginning with an in-depth view of the literature, I looked at reputable ways to teach environmental education through formal and informal practices. From the literature and the current New Brunswick Science 10 curriculum, I developed a two-week detailed unit plan using the outcomes in the Ecology section focused around the watershed in New Brunswick, Canada. Ethics approval was sought from UNB, the Anglophone East School District and from the principal at the selected high school. Approval was granted on August 6th, 2015. Since one of the foundations of this research was to motivate students to work in their own immediate environment, this school was selected because of its proximity to the watershed. Once the school accepted the proposal, the classroom teacher was contacted for his approval. He was the designated Grade 10 Science teacher for both classes and this made working with him and the transition of material easy from class to class.

Stage Two. Stage two consisted of carrying out the two-week unit plan by co-teaching the unit with the classroom teacher. One week prior to the unit beginning, I was in the classroom getting to know the students while also introducing myself and explaining the processes for the next two weeks. The permission slips for students and

parent/ guardian approval were also distributed at this time. Since the two-week unit plan covered the regular curricular outcomes, students and parents/ guardians who did not give permission to formally participate in the research were exempt from research observations, interviews and did not have their cognitive maps or class assignments analyzed for research purposes. However, they were still expected to participate in the lessons and engage with the material as per their normal participation in class. The classroom teacher and I each had a journal to take notes in and observe while the other taught. The classes alternated between the watershed and the classroom. When the unit began, all students created cognitive mind maps about the watershed. Cognitive mapping (Lourdel, et al 2007) was explained and modeled to students before hand. The cognitive maps were not a part of the student's grades.

Stage Three. Since the research unfolded in a team-teaching scenario, both the classroom teacher, and I did our best to record observation notes focused on student behavior, comments and reactions to the lesson, etc., as the other was teaching. I conducted the interviews with the students individually over the course of the last week of the unit. Once the unit was wrapping up, students prepared individual pamphlets on what they had learned, and then shared these with community members. Finally, they completed one final cognitive map on the watershed to see if there were any changes in their knowledge or in the way they perceived the river.

Stage Four. Once the unit was complete, feedback from the classroom teacher on how the students responded to the unit relative to what he typically did with his students was obtained through an interview. Questions about using the unit again, if he thought it was a useful pedagogical tool and if he thought it promoted PEB, ILOC or EA were

asked (Appendix C). The cognitive maps, interviews and observations and student assignments of those students who were participants in the research were analyzed as research data. All interviews with the students and teacher were recorded and transcribed. The data was compiled and then coded for each theme represented within this case study (ILOC, EA, PEB). More information about the coding processes is discussed in Chapter 4.

Context of the Case

The local watershed is one that houses a diversity of species and that is under great community debate still as the causeway was reopened in April of 2010 and there is discussion of removing the structure completely (Petitcodiac Watershed Alliance, 2014). The ecological diversity, social and political debate that this watershed warrants is a perfect geographical boundary for this case study (Swanborn, 2010; McMillan, 2010; Stake, 1995). The case was initially and intentionally bounded as two weeks of one-hour classes centered on the discussion of the watershed's ecosystem. However, time constraints, assemblies and professional development days scaled class one's class back four days (four hours) and class two's group two days (two hours). Adjustments were made along the way to accommodate for this.

The watershed receives a lot of community-based focus, and thus, is a point of interest for students. It shows the complexity of social, political, cultural and environmental factors that interact with regards to conserving and utilizing the watershed. The river is also a tourist attraction in Moncton, New Brunswick as it once held one of the world's largest tidal bores before the causeway was put in in 1968. The opening and closing of the causeway has affected biodiversity, tourism and the housing market as the

river is no longer a crisp blue, but now a silt brown (Petitcodiac Watershed Alliance, 2014). This context provides the boundary for students to experience outdoor and experiential learning, for students to gain a sense of feeling and responsibility for their local environment, to form a political, environmental, cultural or social position on the watershed and possibly seek to protect it.

Selection of Participants

This research sampled students from two separate Grade 10 classes. Only twenty-two out of forty-five total students from both classes provided consent to participate. The participant sampling was *typical case sampling* (Lund Research Ltd, 2012), as all students within the given context were given the opportunity to participate in the study; only some of students were interviewed as only some gave consent to participate in the research. In order to be included in the sample, students had to have not experienced any formal environmental education. This is because students with increased environmental knowledge are shown to already have an increased internal locus of control (ILOC) which could negatively influence the study (Gambro, Switsky & Harvey, 1992). Using Grade 10 students in New Brunswick makes this possible because they are not able to take an Environmental Science course until Grade 11 or 12 where it is then offered as an elective. Since participants were under the age of majority, consent was also requested from legal guardians through a signed consent form (Appendix F & G).

Position of the Researcher

A challenging issue for a researcher is to be able to demonstrate that their personal orientation to the research will minimally bias the study. A way to address this is to be sensitive to the methodological literature, to my own belief systems, and by trying to be

transparent in my orientations to the research when inquiring, analyzing and constructing final narratives (Marshall & Rossman, 2006). All researchers have great privilege, which is to pay attention to what they consider worthy of studying and drawing conclusions. A considerable portion of data collection and observations are impressionistic (Stake, 1995). The researcher can also take on many different roles such as teacher, advocate, evaluator, biographer or interpreter during data collection. For the purpose of this study, I took on the role of teacher for the majority of the time and observer for some of the time during the classroom-based lessons and outdoor learning during the data collection stage. I had to be careful when doing this because as an integral part of the study, students saw me every day; it was almost impossible to present a neutral stance (Stake 1995).

Students experienced learning and unintended learning and it is important as a researcher to remember that much of what is of interest to the study may not be of interest to the students. For example, I made it a point to create comprehensive lessons for students in grade 10 that were relevant to their context. In preparation for teaching, I was also able to have the classroom teacher look over lesson drafts and materials in order for him to give feedback as to whether the level of material was appropriate for his students and whether or not he thought they would engage with the material based on their interests. As I had grown up in the area, I am familiar with the community context and the layout of the village; however, my academic background is not solely science with the students and myself possessing little knowledge about the watershed, it was a new learning experience for all of us. I would argue that this was beneficial and much of the learning that took place was done alongside students.

Delimitations

The limitations I imposed on the study were that I only did a two-week unit because that is all the time allocated to this topic at the high school. In addition, the entire Ecology unit on average only lasts approximately a month. Not every student could be interviewed because it would have yielded too much data and I did not have the time to interview every student or the resources to help analyze the data for every student.

Trustworthiness

Qualitative research calls for the use of multiple data collection tools for methodological triangulation purposes. It ensures the credibility of the case study (Daytner, 2006). A cross-case analysis was used between the two classrooms or cases, making sure that the pedagogy carried out in each were as similar as possible to make for more accurate comparisons and increase the cases' generalizability (Yin, 2003). As specified by the methodology, this case study sought to yield rich descriptions of all processes within the research to again ensure trustworthiness (Creswell & Miller, 2000). The next chapter will summarize and discuss the data analysis process as a whole, but also for each data set collected.

Chapter 4: Data Analysis

According to Freebody (2003), analyses of case studies are typically done by comparing and contrasting interpretation, expanding on the relevance of the project by developing and exploring the findings that are anomalous to the original research questions and impressions. This has been done within this research with the four different data collection tools: observations, interviews, student assignments and cognitive maps.

This chapter will combine data collection and data analysis. Specifically, this chapter will discuss the over all theoretical analysis for the research study and the details of the analysis process for each type of data collected. Then it will specifically delve into class one and class two speaking to their individual data collection processes and analysis. The chapter will conclude with ideas that will take us into the discussion in Chapter 5 and then into the conclusions and recommendations in Chapter 6.

Data Sources & Analysis

Beginning to analyze data from a case study can be challenging, and as Yin (2014) states, "the analysis of case study evidence is one of the least developed and more difficult aspects of doing case studies. Unlike statistical analysis, there are few fixed formulas or cookbook recipes to guide the novice (p.127)." Although Yin (2014) notes that guides to case study analysis are in their infancy, I have chosen to personally transcribe and analyze my data through focused coding for the interviews and through semantic analysis for the cognitive maps. The plan used is listed below in Figure three.

Data Analysis Plan

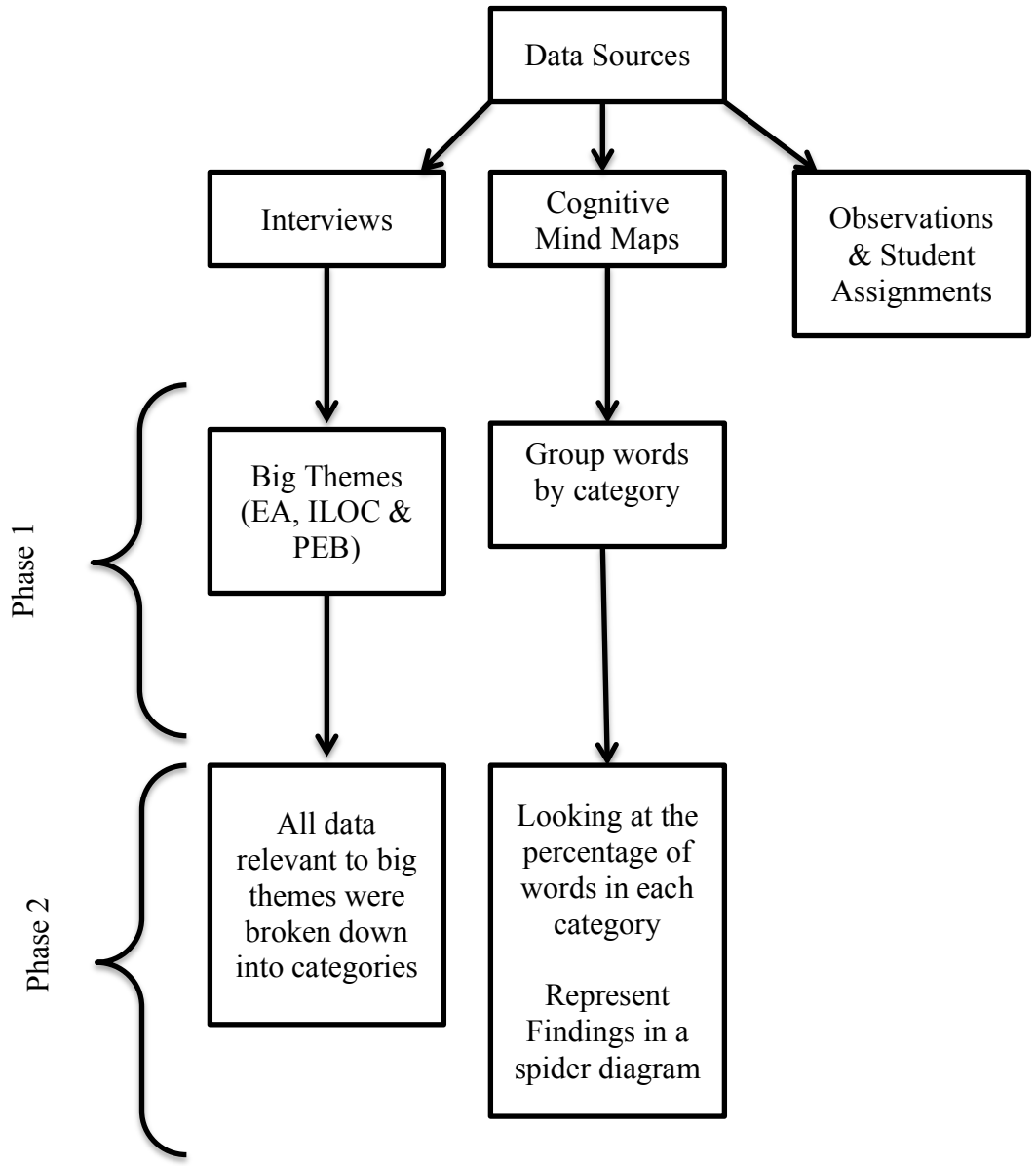


Figure 3: Data Analysis Plan.

Figure 3 depicts the three general types of data that were collected over the two weeks of data collection. Some were initially anticipated to be larger sources of data; however, as the research process unfolded, the interviews and cognitive maps became the most prolific source of data. The data that was collected and used in the analysis were: individual interviews from students, cognitive maps, student assignments and observations. Yin (2014) notes that a case study analysis should show that all the research

evidence collected is attended to, interpretations should account for all the evidence and leave no loose ends to avoid the research being vulnerable to too many alternate interpretations.

Throughout the analysis process these pieces were analyzed and used differently. Each data source went through different and separate phases of analysis. The interviews were analyzed through focused coding. This is further discussed later in the chapter along with the semantic analysis of the cognitive maps. The remaining data of observations and student assignments was used to aid in making claims about themes that emerged in the discussion portion of Chapter 5. This increased the rigor of the case study because it enriched the descriptions of the data.

Phase one of data analysis. Phase one of the interview coding encompassed searching for large themes in the interview data while phase one of the mind maps began by assigning words students used into categories chosen by Lourdel et al. (2007).

Phase two of data analysis. Phase two of the interview coding was done by taking the data from the separated big themes and further analyzing it for common codes that emerged. The mind maps in phase two were then analyzed in regards to the percentage of words that occured in each category, the difference in student categories over the two week period were then compared and spider diagrams were used to represent the change in student knowledge.

The overall approach to this analysis was a theoretical analysis. A theoretical analysis of qualitative data is used when there are already pre-determined large themes to consider (Percy, Kostere & Kostere, 2015). This analysis process compliments the research nicely because the research encompassed three big themes from the research

questions: environmental agency (EA), internal locus of control (ILOC) and pro-environmental behavior (PEB). Yin (2014) notes that analytic strategies for case studies "must exhaustively cover the research questions" (p. 160).

- **What is the impact of environmental community-based learning on students' internal locus of control?**
- **What is the impact of environmental community-based learning on students' environmental agency?**

Of course, a student developing an increase in pro-environmental behavior was still contingent on student developing EA and ILOC, amongst other complex variables.

A theoretical analysis is a two-step process. After the data had been looked at with the lens of the three main themes in this case, a second look was required for the researcher to remain open to the possibility of new themes or categories emerging (Percy, Kostere & Kostere, 2015). This process of theoretical analysis is also described by Auerbach & Silverstein (2003). They suggest that novice researchers should focus on the text with the research concerns or, 'relevant text' in mind to cut the vast amount of information down and revisit it later because it is difficult to immediately see connections amongst all the data. They recommend coding the data in groups and not in isolation, such as the themes and phases in this process. They suggest organizing the research into smaller themes by grouping repeating ideas into categories, then into theoretical concepts and finally to create a theoretical narrative. For all data sets, the theoretical approach to analysis is what I have used; I looked at the larger themes first, then at more finite and repetitive details. The individual analysis process for each data sets are detailed in the next sections.

Interviews

The process chosen to analyze the interview data was focused coding. Focused coding aligns nicely with the overall process of theoretical analysis described above. This is because it is also a two-step process that requires the researcher to code the interviews guided by specific themes and then to identify recurrent patterns, multiple layers of meaning and categories. Interconnections are found amongst sub-themes (codes) and then related back to the larger themes (Hsiung, 2010). For this research, the larger themes are EA, PEB and ILOC. Focused coding is specific to interviews and has mostly been used in grounded theory research, but has also been adequately used in qualitative case studies, but more importantly in case studies that investigate environmental science in particular. An example of this is a case study titled, "An investigation of the goals for an environmental science course: Teacher and student perspective" (Blatt, 2015). Blatt (2015) began her focused coding with codes that came from her research questions. It is this article that I have referenced to format the focused coding for this section of the analysis.

The second phase of the interview analysis is absent in Blatt's (2015) case study, but the research does show that there are usually two stages to focused coding as depicted in Figure 3. For this research, two phases of coding were done, one broader that focused on the research questions and big themes. In the second phase, sometimes called *axial coding* was used to delve deeper into the interconnections of these larger themes and other categories that seemed to emerge and overlap with one another (Saldana, 2009).

Cognitive Maps

The cognitive maps were done on day one of the research after the project was introduced to students. I have modeled Lourdel et al's. (2007) approach to cognitive mapping. Lourdel et al. (2007) designed their cognitive maps to be done on the first and last day of the study. This was my intention as well; however, with the unexpected complexity of working with the limitations of a class and teacher schedule that did not always provide the access needed, I was unable to complete the second cognitive map myself and it was not done until one month after the unit was completed. Nonetheless, students still managed to make a second cognitive map and I followed Lourdel et al's. (2007) data analysis procedure, which is a semantic analysis. Lourdel et al., (2007) focus specifically on how students' view of sustainable development changed and flourished throughout a unit they taught; Douglas (2011) also used this technique in her research. I used a variation of Lourdel et al.'s (2007) six categories for the semantic analysis (p. 171-172):

C1: Social-Cultural aspects

C2: Environmental aspects

C3: Economic aspects

C4: Multidimensional approaches of the concept: complexity, temporal relations, spatial dimensions

C5: Procedural and political approaches

C6: Actors and stakeholders

For the purpose of this research, category C3: Economic aspects, was omitted from the analysis and the spider maps. This was due to a lack of information about this section during the two-week unit plan, but also it was not well addressed by the experts

who were invited to contribute a cognitive map. Christine McLauchlan, the Executive Director of the Petitcodiac Watershed and Edmund Redfield who over sees the fish trap's coalition and research for the watershed in New Brunswick, were selected to do the two expert cognitive maps. Lourdel et al. (2007) also collected expert cognitive maps in her study in order to have comparison criteria when conducting her analysis of the student maps. The expert maps were analyzed in the same way as the students', and like the students' maps, category C3 economic aspects was omitted from the analysis.

The words from each map were counted and put into the designated categories listed above. Both Douglas (2011) and Lourdel et al (2007) chose to model their findings with spider graphs. I did the same as it provides a visual and understandable representation of the change in student's knowledge about the watershed.

Observations & Student Assignments

Observations by both the classroom teacher and researcher were anticipated to be one of the three sources of data collection during this research. However, during the data collection phase the classroom teacher's ability to take adequate notes during classroom time was more limited than expected. I was able to record a little bit every class, but again the collection was not as significant as was anticipated. The observations collected were still analyzed and they contributed to the research by adding examples to themes and codes and providing rich descriptions. In an attempt to mitigate this shortcoming in the data collection, student pamphlets and poems were collected to analyze as well.

The student assignments that were collected throughout the analysis were poems by students in class two and pamphlets done in groups in both classes. The student's assignments were analyzed to determine how they fit into each larger category: PEB, EA

and ILOC. Like the observations, the student assignments were used to add to the data and themes that emerge in Chapter 5.

Classes

Each class of students was randomly selected for enrollment in their Grade 10 Science class at the beginning of the school year. On paper, neither class was expected to differ dramatically from the other. However, because of the different personalities within each class, each class had its own sets of strengths and weaknesses that made the delivery of the material a little different in each class.

Class one took place during period one of the school day. Some students in this class were on special education plans, some loved science and some had other interests. There was minimal visible diversity within the class. Compared to class two, class one had more students. For example, class one had twenty-one students enrolled where class two had 15 enrolled. Due to professional development days and school assemblies, class one had two fewer lessons than class two and this could have affected the results.

Class two received all the lessons that were planned although, lessons were moved around to accommodate for PD days, weather and holidays. The main difference was that class two had fewer students than class one and over all was academically lower achieving than class one. However, this class received two more lessons than class one, so they were able to receive an introduction to what a watershed was and experience the local park and write what came to their minds.

Daily Agenda

Both classes were only able to go to the fish trap on the last day of the research, Day 10. Originally, students were supposed to attend the fish trap to view the biodiversity and be

able to test the water quality. This would have aided them and acted as a prelude to their next couple of lessons and made their experience richer in the classroom. Unfortunately, due to weather constraints, rain and silt in the trap, the trip to the fish trap was postponed until it was safe for workers and students. This happened to be the last day of the study. Alterations such as the one mentioned above were made as the study unfolded shown below in Table 1.

Table 1.

Daily Agenda: The Watershed Unit Plan for Class One and Class Two.

	Class One		Class Two
Day 1	**Introduction** - Introducing the research and myself. - Participating in the lesson. - Getting to know students.	**Day 1**	**Introduction** - Introducing the research and myself. - Participating in the lesson. - Getting to know students.
Day 2	**Introduction** - Participating in lesson. - Showing students the plan for next week.	**Day 2**	**Introduction** - Participating in lesson. - Showing students the plan for next week.
Day 3	**School Assembly** - No class.	**Day 3**	**What is a Watershed?** - Lesson on "what is a watershed". - Brief introduction to the local watershed.
Day 4	**Guest Speaker** - Executive director from the Petitcodiac Watershed Alliance.	**Day 4**	**Guest Speaker** - Executive director from the Petitcodiac Watershed Alliance.
Day 5	**Life Cycles** - Salmon and Bass. - Other life in the river.	**Day 5**	**Life Cycles** - Salmon and Bass. - Other life in the river.
Day 6	**pH** - Learning about pH and dissolved oxygen. Students graphed the level from the watershed over the last 10 years	**Day 6**	**pH and Stakeholder Meeting** - Learning about pH and dissolved oxygen. Students graphed the level from the watershed over the last 10 years - Students got into groups and took on the role of different

			stakeholders for the river.
Day 7	**Terry Fox Walk** - No class.	**Day 7**	**Highland Park** - Students were taken for a walk down to a local park that borders the watershed. - They were encouraged to sit and write down what they felt, saw and heard etc.
Day 9	**Pamphlets** - Students worked on their pamphlets in the computer lab.	**Day 9**	**Pamphlets** - Students worked on their pamphlets in the computer lab.
Day 10	**Fish Trap** - Students walked down to see the fish trap and hear Edmund speak about it.	**Day 10**	**Fish Trap** - Students walked down to see the fish trap and hear Edmund speak about it.
Day 11	**Hand Out Pamphlets** - Handed out pamphlets to the community with students. - Thank students for participating in the study.	**Day 11**	**Hand Out Pamphlets** - Handed out pamphlets to the community with students. - Thank students for participating in the study.

Analysis

Interviews. A list of the student interview questions is available in Appendix B. The interviews were conducted were done throughout the second week of the research. The interviews were semi-structured and lasted approximately five to ten minutes each. The interviews took place during period three, and some during period five for both classes. Students were brought to an empty classroom or to the staff room to participate in the interviews. Students' period three classroom teacher allowed them to be excused to do the interviews. Only students who gave permission to participate in the study were interviewed. A total of nine interviews out of fifteen students who gave consent to participate for class one were conducted.

On the whole I would argue that class two was less receptive than class one in regards to their interviews. All students from both classes were told they had the ability to pass on a question if they did not want to answer. Most students in class two passed on at least one question each during the interview. Primarily, their answers to questions were shorter and less in depth than class one; even when students were probed to explain their answer, their follow up was short or they did not want to. For class two, five out of fifteen students were selected for interviews. Only six of the fifteen students returned their permission slips for given consent to participate in the study. The sixth student who was not interviewed was not available to be released from their period five to participate in the study. Even though the interviews were shorter for class two and there were fewer students, these five accurately painted a picture of what class two was like. Their responses aligned with the themes represented above and they still had some note-worthy things to say.

Phase one. The following tables provide sample quotes from the first phase of analysis for focused coding. The quotes represent each of the major themes (ILOC, EA and PEB). Again, environmental agency in this case is mostly about communicative agency, looking at student's power and position in regards to the environment in relation to their social structure (peers/ family etc.) and evoking feelings towards the environment. Internal locus of control looks at student knowledge and how they use it to influence their context, and pro-environmental behavior is anything students do consciously or unconsciously that contributes positively to the environment.

Table 2.

Examples of 'Big Themes' for Class One

Big Theme	Sample Student Quotes
Environmental Agency	*(feeling)* Student: I dunno, I just like going for walks and stuff. Researcher: Why do you enjoy doing that? Student: I dunno… it's just like fresh air…
Internal Locus of Control	*(influencing context)* Student: "Well I do know that a lot of people here do litter, every body, well almost every body. Personally I still don't litter, but I do feel that it doesn't make much of a difference."
Pro-Environmental Behavior	*(positive environmental behavior)* Student: "In the summer I plant trees… volunteer with Green Eye." "…uhm we'll use plants, water plants and the water that comes out of the plants we'll collect and water more plants with it. Or say we boiled water for, to make soap or something, whatever is left of the water that we use we will use it to water plants or tea, we use tea to water the plants too so we don't waste the tea…"

Table 3.

Examples of 'Big Themes' for Class Two

Big Theme	Sample Student Quotes
Environmental Agency	*(power and position)* Researcher: "Do you think that your friends influence how you interact with the environment…?" Student: "Yeah because a lot of people wanna act cool in front of their friends or whatever. So, it kinda effects your decision if you see a piece of garbage you're just walking by…because you don't wanna look like a doofus or something".
Internal Locus of Control	*(knowledge for influencing context)* Researcher: "Why do you think that people don't do a lot of pro-environmental behaviors?" Student: "Cause the probably don't know about it" Researcher: "Okay, so if they did know about it do you think that they would do it?" Student: "Ya".
Pro-Environmental Behavior	*(positive environmental behavior)* Student: "I shut off the taps when I brush my teeth". Researcher: "Okay, is there anything else?" Student: "I don't litter much".

The data presented above from Tables 2 and 3 depict the larger themes of ILOC, EA and PEB emerging in the interview data. Examples of each of these for each class are given above to note the process of phase one for focused coding and discussion related to these will happen in Chapter 5.

Phase two. For phase two of the interview analysis, the bigger themes picked out from phase one were compiled together and then further looked at for repeating codes. The following fourteen codes were developed with some overlap between sections. The data that emerged from the second phase of focused coding from class one and class two are represented as examples in Table 4 and 5 below.

Aspects such as power and position, communicative agency, incentives and knowledge were continual themes throughout the literature review. This most likely influenced my lens, however, it was also reassuring to be viewing similar words, codes and themes as other researchers on this issue.

Table 4.

Big Theme	**Category**
Environmental Agency (EA)	*1. Communicative agency* 2. More informed 3. Aesthetics *4. Knowledge* 5. Exercise *6. Power & position*
Internal Locus of Control (ILOC)	*7. Knowledge* 8. Community impact *9. Communicative agency* 10. Ignorant 11. Incentives
Pro-environmental Behavior (PEB)	*12. Power & position* 13. Convenience 14. Relevance of PEB

Categories from Each Big Theme for Class One

Table 5.

Categories From Each Big Theme for Class Two

Big Theme	Category
Environmental Agency (EA)	1. More informed *2. Communicative agency* 3. Aesthetics 4. Exercise *5. Power & position*
Internal Locus of Control (ILOC)	6. Knowledge 7. Ignorant 8. Community impact *9. Communicative agency* 10. Incentives
Pro-environmental Behavior (PEB)	*11. Power & position*

Categories are organized by their larger themes. Categories are in order of how often they have occurred and those italicized are the recurrent themes. These serve as examples of the analysis process and are further discussed in Chapter 5.

Cognitive mind maps. The amount of data derived from class one and class two varied in regards to the analysis of the cognitive maps because of the different class sizes, but also due to the limited number of students who provided consent.

Phase one. Phase one of the semantic analysis conducted for the cognitive maps took place through looking at students' mind maps and categorizing the words they used into the categories mentioned in Chapter 3 (Lourdel et al., 2007).

Phase two. The second phase of analysis consisted of counting the data. For example, the data was arranged in an Excel spreadsheet and the percentage of maps, which contained at least one word in each category and the average number of words in each category. This was done individually for the expert maps, map one and map two.

The data was also separated based on which class the student was enrolled in. Each set of data was then represented in a spider map and are used in Chapter 5 to discuss the findings from each class.

Reading a spider diagram tutorial. Spider diagram are often called semantic maps. The following Figures 4 and 5 depict an example from Lourdel et al's. (2007) study of a student's cognitive map and how to read a spider diagram is discussed below.

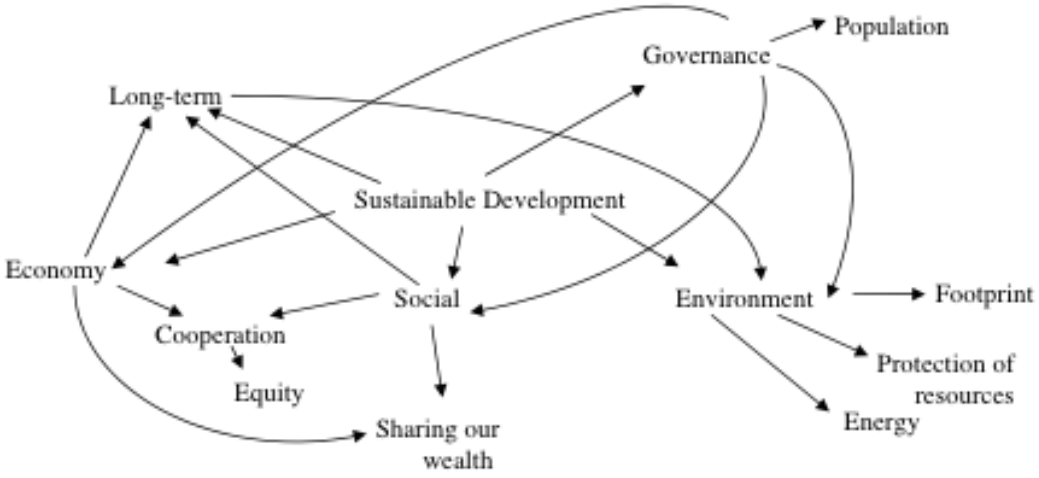


Figure 4: An example of a student's cognitive map (Lourdel et al. (2007), p. 174).

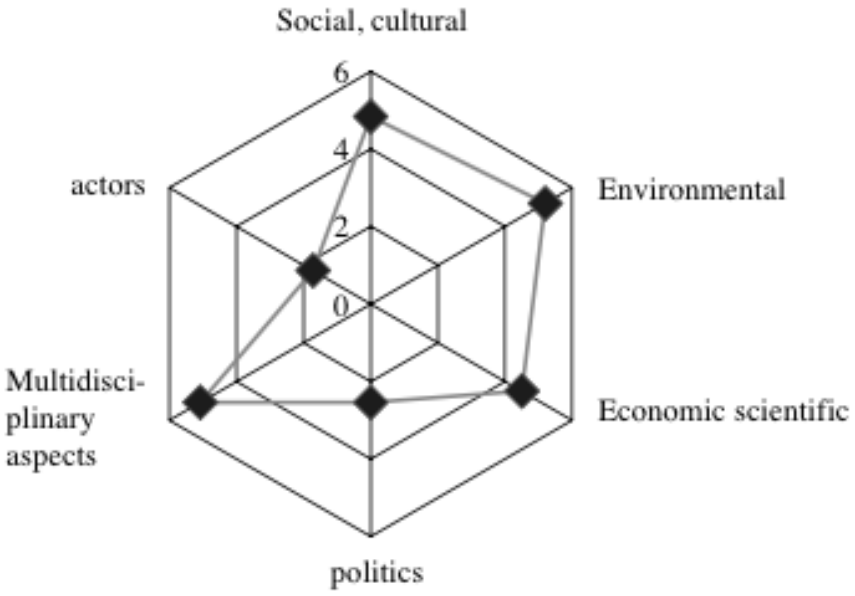


Figure 5: Depiction of a spider diagram. *"*Representations of the average number of words for each semantic category obtained from the answers of the researchers or sustainable development" (Lourdel et al. (2007), p. 178).

Figure 5 is unrelated to Figure 4. However, Figure 5 shows how Lourdel et al. (2007) took the words from the expert cognitive maps, selected each word from their cognitive maps and put them in their chosen related semantic categories from C1-C6. Once the number of words in each category is counted, the average number of words from each category from all the experts is determined and then graphed into a spider diagram. The spider map holds six axes, one for each of the different semantic categories from C1-C6. All axes share the numbers represented on the spider diagram. For example, this graph shows that the average expert diagram contained five words that related to social-cultural aspects for sustainable development or C1. Also, the average expert map contained three words that related to political aspects for sustainable development or C4.

Observations & student assignments. As noted above, the observations and student assignments are discussed in Chapter 5, as they are used to give more context to the themes that emerged. They are used to make allegations about these themes richer to promote the effectiveness of the case study.

Summary

The data analysis phase gave rise to multiple categories and themes in relation to internal locus of control, environmental agency, and pro-environmental behavior. Lichtman (2013) notes that the data analysis stage is completed when you have reached a point of logical saturation. I believe I have gotten to this point because the categories that have emerged from the interview data have reached a saturation point and the cognitive maps

have been semantically analyzed as per Lourdel et al. (2007) guidelines. The discussion of all the data presented in this chapter, along with more examples are presented in the following chapter. Yin (2014) notes the goal from a multiple case study approach is to construct a general idea that will fit each individual case, even though it is noted byYin, each case is unique and varies somewhat in detail. Again, this is further explored in the discussion of Chapter 5 and in the Conclusions and Recommendations of Chapter 6.

Chapter 5: Discussion & Results

Throughout the two-week unit and the data analysis process, findings emerged that were related to internal locus of control, environmental agency and pro-environmental behavior. This chapter will first discuss in detail the themes and categories that emerged from the interviews in both classes, then the results and themes that emerged from the cognitive maps, and finally how all the categories and themes overlap.

Interviews

As explained in Chapter 4, the interviews were analyzed using focused coding. Examples that emerged from the larger themes are represented in Chapter 4. It is important to acknowledge that all three of the large themes, ILOC, EA and PEB, were evident throughout the interview transcripts.

Interconnected themes. The following themes represented in Table 6 emerged as a byproduct from the first phase of interview coding. As the focused coding progressed, it was evident that many of the words and phrases identified as ILOC, EA and PEB overlapped with one another; that is, the themes of ILOC, EA and PEB were often linked together in the students' statements. For example, a students' explanation of how they would react of they saw someone littering could combine aspects of ILOC, PEB and/or EA. Table 6 below shows examples of these interconnected themes from both classes.

Table 6.

Examples of Interconnected Themes from Phase One of Coding

Example	Big Theme	Student Quotes
Ex: 1	**Internal Locus of Control & Environmental Agency**	Student: "To tell you the truth, I didn't know what a watershed exactly was. So I wouldn't have been able to say anything really."

Ex: 2	**Pro-environmental Behavior & Environmental Agency**	Researcher: "How often would you speak to someone you just saw litter?" Student: "Uhm, I probably wouldn't because I'm a shy person and I don't really like to go out of my comfort zone". Researcher: "what if it was your friend who littered?" Student: "I would say something".
Ex: 3	**Pro-environmental Behavior, Environmental Agency & Internal Locus of Control**	Student: (telling a person not to litter) "…he brought his friends' coca cola so it was one of those ring things and he just threw it on the ground, I'm like if that gets in the ocean, it's gonna kill turtles, so it's not a good thing, put it away".
Ex: 4	**Internal Locus of Control & Environmental Agency**	Researcher: "What is different about the way you feel today compared to the way you felt before we started this unit?" Student: "Uhm, I didn't know as much about the river and how it's all polluted and stuff, and how… can't really explain it. Researcher: "Okay, do you feel any different or do you think it's just a knowledge thing?" Student: "Uhm, it makes me feel different cause I kinda care about it now. You don't want it [the river] to just be ruined."

In Chapter 2, Figure 2 by Kollmuss & Agyeman (2002) notes the complexity of PEB and the number of variables but also situational factors that have to be present in order for PEB to flourish. Table 6 above represents this intermingling and variation of the variables required for PEB to flourish. Table 6 above shows four examples of how the larger themes developed in the research questions, (EA, ILOC and PEB) are all interconnected, and that data related to one is commonly found relating to the others as well. Each example will further be explained below.

Example 1 in Table 6 portrays the student exhibiting ILOC and EA by saying that they would not have been able to communicate much of anything about the watershed because they did not know what a watershed was. In this instance, the student is displaying a lack of knowledge about the watershed that exhibits a lower or external locus of control because they would have not been able to as easily influence their context without the knowledge of a watershed. The locus of control in this case also strongly correlates with the lack of environmental agency the student would be able to encompass. Environmental agency in this research can be broken down into power and position, and communicative agency. A student is subjected to the power and position of being a youth but this this statement also connects itself nicely to communicative agency. The student would not be able to communicate their knowledgeable opinion or communicate information about the watershed and therefore would be less likely to promote or consciously participate in pro-environmental behaviors related to it. After the two-week unit, this student felt more confident about their knowledge of the watershed.

Example 2 in Table 6 notes the limitations or situational barriers to promoting pro-environmental behavior. This student is comfortable using their communicative agency to consciously promote pro-environmental behavior amongst their peers; however, if the situation changes and it is a stranger, the student is less comfortable promoting the pro-environmental behavior of not littering.

Example 3 in Table 6 is complex because all three major themes are exhibited in this student's statement. The student is using their knowledge of how turtles are poorly affected by bottle rings from soda bottles to influence their context (ILOC), their communicative agency and their care for animals or turtles (EA) to influence another

student's poor environmental choice of littering (PEB). This student is unique as they and their family promote environmental values and discourse at home. This student mirrors this positive influence in their day-to-day life and in their example shown above.

Example 4 in Table 6 from class two shows again the overlap of ILOC and EA. Here the student displays EA noting that they care for the environment. The student is almost exhibiting aspects of an environmental steward with their care for the environment and the more they learned (ILOC), the more they developed a relationship with the Petitcodiac watershed in the community. If someone cares for something, they are more likely to protect it (PEB).

Recurrent Categories

Through the second phase of focused coding, many categories and similar reoccurrences in the types of student statements were noticed. These categories are displayed in Chapter 4 as Tables 4 and 5 but will again be displayed here in a combined fashion from Classes one and two. The following categories warrent isolation from the others below as the thesis categories reoccurred throughout the larger themes of the transcripts.

Table 7.

Recurrent Categories

Big Theme	Category	Total # Occurrence from each Big Theme
PEB	Power and Position	PEB – 17
EA		EA - 6
EA	Knowledge	EA – 6
ILOC		ILOC - 16
EA	Communicative Agency	EA – 15
ILOC		ILOC - 5

Power and position. Of the three recurrent categories listed in Table seven, power and position was the category that occurred the most in the second phase of coding. Power and position was related to environmental agency, but also pro-environmental behavior when it came to situational factors and context. Examples of power and position can be seen below. Many of the responses that relate to power and position were similar to student one.

Researcher: How often would you speak to someone you just saw litter?

Student 1: Well if it was one of my friends I would definitely tell them that you probably shouldn't do that. If it was someone I really didn't know, then I'd probably just pick it up behind him or her, I probably wouldn't say anything, so yeah.

In this case, student one is demonstrating a pro-environmental behavior, however the context that they are in does play on how and when they go about performing their PEB. Student two goes on to note that they would not speak up to either a stranger or a friend if they were littering.

Researcher: How often would you speak to someone you saw litter if you didn't know them?

Student 2:I don't think I'd speak to them I think I'd just go and pick it up myself.

Researcher: Okay. What if it was your friend?

Student 2: I don't know, I think I'd just pick it up myself

In the example from student two, one can assume that the student is shy, but nonetheless they are engaging in pro-environmental behaviors when they are comfortable, or alone in this case. In the example below, student three is again expressing

a concern about promoting PEB in the context of a stranger, but unlike other students, they note they could possibly be a danger involved or an awkward encounter if the stranger did not cooperate.

> Researcher: Yeah, so if someone was talking up in front of you, they just dropped like a coffee cup, would you call them out for it?
>
> Student 3: Well if I didn't know him, I'd probably just pick it up, if I called the guy out or something, you don't know what's going to happen next.
>
> Researcher: That's true. So what if it was your friend?
>
> Student 3: My friend? Well I'd say "pick that up" or something.
>
> Researcher: So you would tell them?
>
> Student 3: Yeah.

Like student 3, student 4 expresses this concern as well.

> Researcher: What if it was someone you didn't know?
>
> Student 4: it depends on like, if they seem approachable or if they look rude or if they're gonna like yell at me or something.
>
> Researcher: Ok. What if it was your friend?
>
> Student 4: Then yah I'd tell them to pick it up and tell them to wait until we see a garbage can.

All students one, two, three and four are expressing the barriers to engaging in pro-environmental behaviors. This is a legitimate concern for most people; I would argue a lot of adults would act in the same way as these students if confronted with the same situation. Power and position plays an interesting role in how we communicate the need for pro-environmental behavior, but also in what behaviors we choose to display in front

of different groups of people – older, younger or those perceived as more powerful. Many of the students interviewed are exhibiting existing PEBs and the promotion of a healthy community environment by telling their friends not to litter, but also setting examples for younger students. Student five below is aware that they are setting examples for younger students and is also conscious of how people their age are influenced by older students. When older students litter, some younger students think that it is ok, not a big deal, or the right thing to do.

Researcher: Do you think your friends influence how you interact with the environment?

Student 5: Like sometimes maybe because like when they throw something. I think that I should too.

Researcher: Okay.

Student 5: Like, I don't know how to explain, but like, I think that I should really do like them because I think they are doing good thing so I do the same.

Researcher: So you follow their examples?

Student 5: Yah.

Another example below depicts student six noting that again, depending on the situation, they are influenced by the people around them.

Researcher: Do you feel that your friends influence how you interact with the environment or which behaviors that you take part in?

Student 6: No, not really. Well it depends who I'm with and what I'm doing. If I'm just for a walk then yeah I'll do stuff but if I'm going going going then like…

Another student showed their feelings quite quickly and almost shockingly. This student was on a special education plan and absolutely flourished during this assignment and wrote this poem to be included in their group's pamphlet:

Roses are red violets are blue.
Rivers are polluted because of you.
To keep the world healthy and keep the sun bright.
Throw your garbage in the garbage when one is in sight.

This student is acknowledging several different things in this poem, but also exhibiting themes of power and position (EA) when performing pro-environmental behaviors. The student is saying, "throw your garbage in the garbage when one is in sight." This student is acknowledging that it is still considered somewhat 'uncool' to act environmentally responsible and that individuals should still do good, even if it cannot be seen or rewarded.

In 2014, Pongiglione stated that it is difficult to perform PEBs because of social trap situations. The examples above appear to support Pongiglione's assertion. Students are aware of what is acceptable in their social circle and what is not.

Knowledge. The second recurrent theme is knowledge. Knowledge is an important component of promoting PEB for multiple reasons. Knowing allows people the ability and option to communicate that knowledge. It allows them to be further informed on community issues that they wish to take part in or change. Even though Kollmuss & Agyeman (2002) note that knowledge does not directly translate to action in a linear fashion, it is still an integral part of promoting PEB. In the two-week unit, knowledge was paired with community-based learning assuming that this integration would give rise

to some new feelings for the students. Some examples of how students expressed knowledge in the transcripts are listed below.

Student 7: Cause when you said watershed, I actually thought it was a water-shed and like I thought I was like right in the middle of the water or something. You know that stuff on the ice where you cut the ice... ice fishing.

Researcher: Ice fishing?

Student 7: Yeah, that's what I think of, it could be this big friggen thing in the middle where the fish are coming out or something.

Researcher: But it's much bigger than that.

Student 7: Way bigger.

Many of the students like student 7 exhibited this same idea of what a watershed was. It did take a few classes, photos and examples of watersheds for students to understand the concept.

Researcher: What is different about the way you feel today compared to the way you felt two weeks ago?

Student 8: Well, I know more about it so I'd know what not to do I guess, so I feel more like, more I dunno, I dunno what the word is, feel more like, that I know things I shouldn't do now.

In the example with student eight, their newfound knowledge is informing them on how they should appropriately act now around and in regards to the watershed, now that they know.

Student 9: I just… didn't realize that there was all these bad things in the water and ecoli, I didn't realize there was those things in it, I thought it was clean water

I didn't realize that. Only things I really could visualize was how the river got big since it was small. I was like whoah, I heard about the causeway over in 2010 and uh yeah, I just didn't really this much like…

Researcher: Stuff was going on?

Student 9: Yeah all I remember was seeing was the river was small, I wasn't really worried about anything like that.

Researcher: Okay, and now you are?

Student 9: I mean yeah.

In the case of student nine, they are exhibiting that they are now worried about the condition of the river now that they know more about it. Their feelings have changed towards the river because of the acquired knowledge. This example strongly exhibits that it comes from the EA transcripts because the student's feelings have changed along with their knowledge.

Researcher: Is there anything you would like to add?

Student 10: Well, not really, well you said how confident I'd be to go and talk to people about it, it depends what I learn this week too. I want to go look up, look at some more stuff so I can get more of a grasp on exactly what it is.

Student ten is exhibiting a curious nature and a rise in knowledge that makes them want to look up more information on it because they are interested and want to stay informed. This sentiment was expressed as well by Huebner & Lipsey (1981); once you have some environmental knowledge you are more likely to pursue more.

Many of the students exhibited similar responses to student 11 below. The question asked in this case was "would you feel more confident sharing your views about the watershed after these two weeks we've spent learning about it, or before?"

> Student 11: Yah, I think I'd feel more confident about it after because now that I know a lot more about it, going to see it and everything, whereas before I didn't know much about the watershed, I didn't even know it existed like a lot of us.

Student 12 expresses this again:

> Student 12: I think after these two weeks because I learned more. I didn't know that it [the fish] was endangered so much, and the species, no fish is growing. Yah I think I would be more confident because I have more knowledge so I can tell more.

Some students expressed that they would want more information about the watershed before they spoke to a community member, like student 13 below:

> Student 13: Mmm, I'd have to have a lot more information about it.
>
> Researcher: So now that you have information you would feel comfortable or you would want more?
>
> Student 13: I would like a little bit more.

It was intriguing to me how the individual personalities of students varied when it came to their confidence on sharing their views. While some were growing more confident, some students wanted more knowledge to feel more confident communicating that knowledge. This again points to the complexity of PEB. The following student notes that if people just knew more about it, they would participate in PEBs and do something about the current state of watershed:

Researcher: You feel more confident?

Student 14: Mhm, like I think if more people knew about it, they would like get more involved with it.

The knowledge category is important because as displayed in the above examples, knowledge can give rise to feelings about an environmental issue within the community, it can promote students accessing more knowledge on their own, based on their own interest or simply to feel more informed. Knowledge can give rise to the ability but also the willingness or need to communicate that knowledge. There is a student perception here that if only more people knew about this community issue, they would be concerned and more likely to take action. Again, this is a common stigma for the promotion of PEB that knowledge linearly promotes a change in behavior.

Communicative agency. Communicative agency refers to how students communicate the knowledge they have acquired. Many of the examples of communicative agency, specifically from the ILOC transcripts (big themes), overlap with the knowledge category discussed previously. For example, student 14 above noted that if people simply knew more about the watershed, they might start to care and become concerned or involved with it in some capacity. The student was communicating this information with the intention of getting others to care. This is an example of communicative agency.

Many examples of communicative agency arise from the question, "how comfortable would you be speaking to a community member about the watershed?" Although I acknowledge that the question more or less promotes communicative agency

as a likely response, there was compelling variation in the students' responses. For example, student 15 below notes:

> Student 15: I think I could do it.

Student 16 notes that they would feel comfortable doing the same:

> Researcher: Okay, so what if you were just educating them?
>
> Student 16: Educating them, I'd do that.
>
> Researcher: Okay so you'd be comfortable doing that?
>
> Student 16: Yeah I'd do that.

Student 17 below says the same:

> Researcher: Ya. Like just in your plain language would you be comfortable talking to them about the river?
>
> Student 17: Ya
>
> Researcher: Ya?
>
> Student 17: Like I would say like that it's endangered [the fish] and we should do something about it and don't throw garbage in the river because its already all garbage and the muddy
>
> Researcher: Okay.
>
> Student 17: And fish can't live there so we need like protect them [fish] if we want fish and economic good we can go and fish and if you want fish you need to improve the river.

Like student 14, student 18 notes that we need to keep communicating these environmental messages to students with the purpose of educating others:

Student 18: That we need to educate the kids more about what's going on because they were like, "WHAT, WOW" (laughs). So, maybe a little bit more uhm education, but they do a lot more here than in other schools for nature stuff.

Researcher: So, more stuff like outside?

Student 18: Yeah…

This student is also advocating for more community-based and outdoor learning within their classes.

Categories

Table 8.

Categories that Emerged From the Second Phase of Interview coding, the Larger Theme of Transcripts They Come From and the Amount of Times They have Occurred

Big Theme	Category	Total # of Times Category Occurred
EA	**Feeling More Informed**	**15**
EA	**Aesthetics**	**11**
ILOC	**Community Impact**	**9**
ILOC	**Ignorant**	**8**
EA	**Exercise**	**8**
ILOC	**Incentives**	**3**
PEB	**Convenience**	**3**
PEB	**Relevance of PEB**	**3**

The categories above in Table 8 occurred less frequently than the three categories in Table 7. Since these categories occurred less frequently in the data, there will be fewer examples and less discussion devoted to each of them. It is important to acknowledge that the small sample size of students who participated in the interviews and therefore how these categories could change with a larger sample size. Each category will be discussed below.

Feeling more informed. This category emerged out of many students expressing that they felt different due to the knowledge they gained. This student expresses their ignorance about the watershed initially in response to the question:

> Student: Well, a few weeks ago I didn't really know a lot about these things, what's the word ignorant or arrogant?
>
> Researcher: Ignorant.
>
> Student: Yes, I was kind of ignorant as to what we were learning about until we started learning about it and I learned more. Yeah I feel pretty confident about what we've learned!

Another student notes that their feelings towards the environment were strong, but have grown stronger:

> Student: Well two weeks ago, I was still really, felt very strongly about the environment and I've always, like I've grown up and I've seen the changes and everything [with the river] and I always felt strongly and my parents were always like, "you should do something about that". So I guess maybe it's a little bit stronger, but it was already strong to start with.

The following examples demonstrate how the students are not just gaining more knowledge, but using that knowledge to inform the their behaviors:

> Student: I know a lot more now. Like, than I knew before, I know that I'm not going to be swimming in the Petti anymore (laughs)

Another example:

Researcher: So what is different about the way that you feel today, we obviously have two more days to do this unit, but what's different about the way you feel today compared to the way you felt two weeks ago?

Student: I had no idea what it was the first day, (laughs) so no I know a lot more… about it, like I feel like I can help more now with the situation.

Researcher: Okay, so the river and how bad it is and knowing how bad it is helps a lot

Student: I feel like I could help more yeah.

Aesthetics & Exercise. These two categories are lumped together because they both display the reasons students enjoy being outside. The aesthetics category comes from the EA transcripts in the second phase of coding. Two examples of the responses students gave that fall under the aesthetics category are provided below:

Student: Ya. I like running outside, cause it's so nice hearing all the birds chirping.

Another student notes:

Student: Well, just being outside in itself I enjoy doing. I really enjoy uh down at Highland Park, it's a nice spot there. Usually in the wintertime I like going outside just because the, just the white on the trees is just nice, the general atmosphere of outside is really nice.

Many of the responses for the exercise category were similar to the one below:

Researcher: Okay, so is there anything in particular you enjoy doing outside?

Student: I like playing football and sports with my friends outside.

Researcher: Okay, and why do you like doing these things?

Student: Uh it's because I'm a sporty person and I don't like being inside, just doing all that I like being outside with my friends.

Another transcript details a student who is extremely hyper and likes to get outside and exercise. They noted they have trouble sitting in a desk for long periods of time. Mostly all the students expressed some sort of happiness or satisfaction associated with being outdoors.

Community impact. Community impact emerged out of the ILOC transcripts. Examples are given below.

Student: I don't think it's impacted that much, picking up garbage once and a while probably doesn't make that much of an effect cause there's so much of it.

Another student expresses the same sentiment:

Student: Well I do know that a lot of people here do litter, everybody, well almost everybody. Personally I still don't litter, but I do feel that it doesn't make much of a difference.

It is interesting that both these students are aware of how many of their peers litter and how much it accumulates on the road, in the ditches, on school grounds and in the skate park. What is also interesting to note is that they cannot see and do not feel that their individual pro-environmental behavior of recycling does help cut down the accumulation of this garbage on the streets. If students could only be aware of how much they are helping the environment and acknowledge that they are setting good examples for the younger students in the school, I think that this conversation could turn and in part be powerful. They don't see their actions as negatively affecting their surroundings, but

many of them don't see them as positively affecting them either. This conversation will be further picked up in Chapter 6.

The example below shows how students can be positively influenced by their peers in regards to doing pro-environmental behaviors and feeling as though they are making an impact on their community.

Researcher: How often do you feel that your behaviors impact the community?

Student: Like, what do you mean?

Researcher: So the things that you do with your ... unplugging your energy, sometimes you pick up litter, do you think those make an impact on your community?

Student: Oh yes, yeah

Researcher: Okay

Student: But the only reason I started doing that now is because of my girlfriend. (laughs)

Researcher: Yeah?

Student: Yeah, like, she's like that. I used to see people litter and wouldn't say nothing. But then like, when she's like, if something fell out of my pocket, she would tell me to pick it up and I'd have to carry it and I carry her garbage until we got to garbage and throw it out.

Researcher: So she's a good influence.

C: Yeah that's what I'm saying. Like she teaches me a lot.

Again, this example exhibits an element of power and position from an environmental agency perspective; however, it is worth noting that the student feels as

though their girlfriend is positively influencing them to do good behaviors that positively impact the community. This student below had another interesting perspective on how they influence their community.

> Student: Well like going with Nature Conservancy and planting trees that's going to help not just today's community but 10 years from now and 20 years from now, so I'd say more than the average I guess.

The student above realizes how many of the good behaviors that they do, positively impacts their community environment.

Ignorant. Many of the responses for the ignorant category encompassed the idea that people in general are ignorant as to the knowledge of what is environmentally wrong within the community, are unaware of the consequences their behaviors have or if they are aware of issues in their community, what they could do to make a difference. One student simply noted that people in the community don't do anything about the river, "because they probably don't know about it." Other students' answers are below.

> Student: Because they just don't care about the environment, they just think about themselves and don't think that anything will happen because of it.
>
> Researcher: Okay, so they don't think that there's going to be an effect down the road?
>
> Student: No.

Another student notes something similar:

> Student: I just, some people aren't conscious of what it is and what they could be doing like leaving their light on, well it raises your bill (laughs) and it's bad for the environment.

Another example:

> Student: Because they think one person, what's it going to matter? But if it's just one person saying that and its like 10 people then its like 10 people, and then if its like 10 more people then its 20 people saying that, so the one person does make a difference cause if it's the one person then it's only 19 instead of 20, it does make a difference.

This example again suggests barriers to performing pro-environmental behavior expressed in Chapter 2 (Pongiglione, 2014). People are not engaging in PEBs because they do not think that they can make a difference or impact and influence their context (ILOC). This students' statement connects to the students above noting that they do not feel like they can make a difference by picking up garbage on the playground or by not littering themselves. Again, this student above notes that they believe everyone is thinking the same way. If one person believes they cannot make a difference and they throw their garbage on the ground, they are clearly not the only ones who think and feel this way.

Incentives, Convenience & The Relevance of PEB. These three categories are lumped together because they all share similar ideas of why individuals do not engage in pro-environmental behaviors. The incentives category comes out of the ILOC transcripts and largely relate to the point Pongiglione (2014) makes about why people do not engage in more pro-environmental behaviors. There is the social trap issue that students have stated in previous categories, but it is also an incentive issue. Some students' responses are similar to the point made below by this student:

Researcher: Why do you think that people your age or people in general don't do these pro-environmental behaviors?

Student: Because they don't think they can.

Researcher: They don't think they can… any other reasons?

Student: Uh, maybe if they did do something good, the effect they created afterwards would just be very minimal.

More than incentives, there are no natural positive rewards for acting environmentally responsible. Many of the PEBs done today will not show any noticeable change for approximately fifty years, and even at that rate, many of the changes or results will not be direct (Rachilnski, 2000). People engage in volunteer activities and donate their items to less fortunate families because it makes them feel good. They feel a sense of joy and that they have directly helped someone else, you do not get this as often or as easy when performing pro-environmental behaviors. Like the student above states, the effects are minimal or absent, so where is the incentive to keep going?

It is important to realize that like adults, students are busy people. They go to school five days a week and in the evenings they have homework, a part-time job, or clubs or sports events to go to. Many of the students expressed that they would be interested in volunteering if they had more time. Many of them were busy all week with part-time work as in the example below. Although this research is focused on increasing the pro-environmental behavior of students, it also needs to be realized that they cannot be the only ones participating.

Researcher: Would you be more likely to volunteer your time with either the Petitcodiac Watershed Alliance or other groups that take care of the river now that you know more about it?

Student: If I had time, ya but I, I kind of don't really have much time, but

Researcher: You're busy with work eh?

Student: Yeah.

Another example comes from a student who admits to littering because there are simply no garbage cans on their walk back to the school from lunch. They note it is just more convenient to throw it on the ground. How easy is it to throw your trash out when you are ready? Why do these students have to carry their trash all the way back to school grounds before they find a garbage can. Perhaps this is yet another call to make performing PEBs more convenient and accessible for individuals.

Researcher: Okay so why do you think that other people your age don't do good things for the environment?

Student: Because, they, like when it's lunch break here, we go in the shop

Researcher: Okay.

Student: and we get something to eat and we just throw it on the road or something cause there are no garbage cans near, so…

Researcher: Near where, the shop?

Student: No, no near, where we come on the way here. Because we take the stuff then we come here.

Researcher: Where? Oh… so you need garbage cans somewhere…

Student: Somewhere, yah.

The relevance of PEB theme grows out of students expressing that they or people they know feel disconnected from the environmental problems that plague the world such as a water shortage mentioned below. They express that if people were struggling themselves and issues hit closer to home, they would be more likely to take action.

> Researcher: And why do you think people don't do these things, don't do pro-environmental behaviors?
>
> Student: Well, because they don't see what would happen, they don't think that, oh we have like we have limited amounts of water; and we don't need to really turn it off, we can just get more by turning it on again and we'll never run out. Yeah you should conserve water because you probably could run out, and if like you're in a situation where the water is gone and you save your water so then you can drink it, but if it's wasted then it's wasted and you have no water.
>
> Researcher: So you think people aren't seeing the big picture?
>
> Student: Yeah
>
> Researcher: Like they're just seeing what comes out of the tap?
>
> Student: Yeah like if you see like poorer countries they have to get as much water as they can from the local pump water, the middle, the water mill to do the dishes and stuff, and they have to get as much as they can cause people are going to be surrounding that place and it's kinda crazy thinking about that you might not get water during the whole week or… in yeah.

From Pongiglione's (2014) article, we know that people still do not generally associate doing more PEBs with the relevance or feeling that the issue is plaguing closer to home. There are many reasons for this as is explained in Chapter 2; however, it is still

interesting that many students and people assume that if environmental issues just hit closer to home, it would help people to become more engaged in PEBs. I suppose that is what we are even trying to do here with community-based learning, looking for and trying to instill a connection.

Cognitive Maps

The cognitive maps were semantically analyzed as explained in Chapter 4. The section of discussion that follows is different from the interview category discussion above. In this section, an example of a student's cognitive map (Figure 6) shows the results of the semantic analysis. The data is represented in Table Nine below. The data is then further displayed in the form of spider diagrams from each class for comprehension. Categories and themes that emerge from the results will be discussed in sequence.

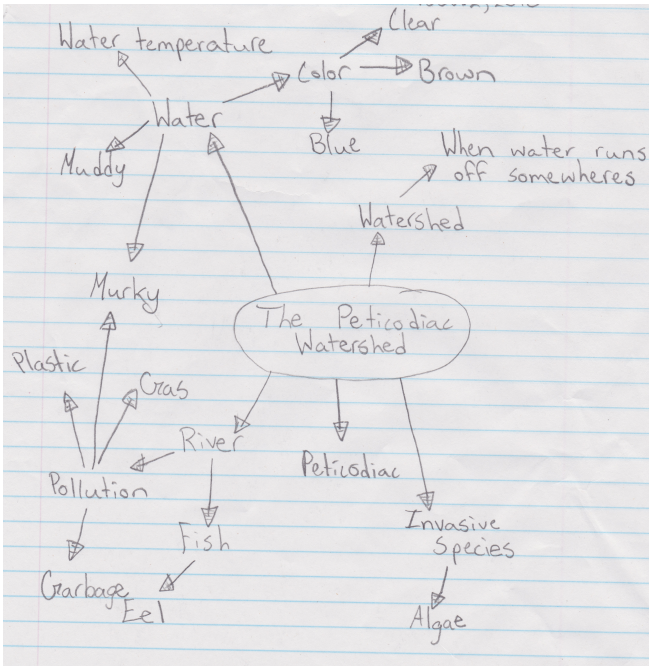


Figure 6: An example of a student's cognitive map.

Figure 6 illustrates a typical student's cognitive map. For the analysis process, each word was assigned to one of Lourdel et al.'s (2007) categories. As mentioned in

Chapter 3, this is the only analysis framework that fits this the type of data collection process as Lourdel et al. (2007) specifically used cognitive maps as a tool to asses the progression of students' knowledge concerning sustainable development. The semantic categories created are already relevant to the environmental language used by students and was also successfully used in another research study concerning environmental literacy (Douglas, 2011). From there, the percentages of maps that contained at least one word in each semantic category was calculated and put into Table 9 below.

Table 9.

*Percentage of Maps That Contain at Least One Word in Each S*emantic Category, C1, C2, C4, C5 and C6 From Both Classes, Maps One and Two.

Map One	**C1**	**C2**	**C4**	**C5**	**C6**	**Total # of Words**
Student Map Class One	44%	100%	33%	0%	0%	50
Student Map Class Two	17%	83%	50%	0%	0%	23
Map Two						
Student Map Class One	11%	100%	56%	22%	0%	79
Student Map Class Two	50%	100%	100%	17%	17%	44
Expert Map	100%	100%	100%	50%	100%	31

Table 9 shows how the data was assembled from each class after analyzing the student maps. From this data, spider diagrams were created in order to have a visual of the change in students' knowledge over the two-week unit, but also to facilitate looking at and making sense of the data. The spider diagrams from each class are displayed below.

C1: Social-Cultural aspects

C2: Environmental aspects

C4: Multidimensional approaches of the concept: complexity, temporal relations, spatial dimensions

C5: Procedural and political approaches

C6: Actors and stakeholders

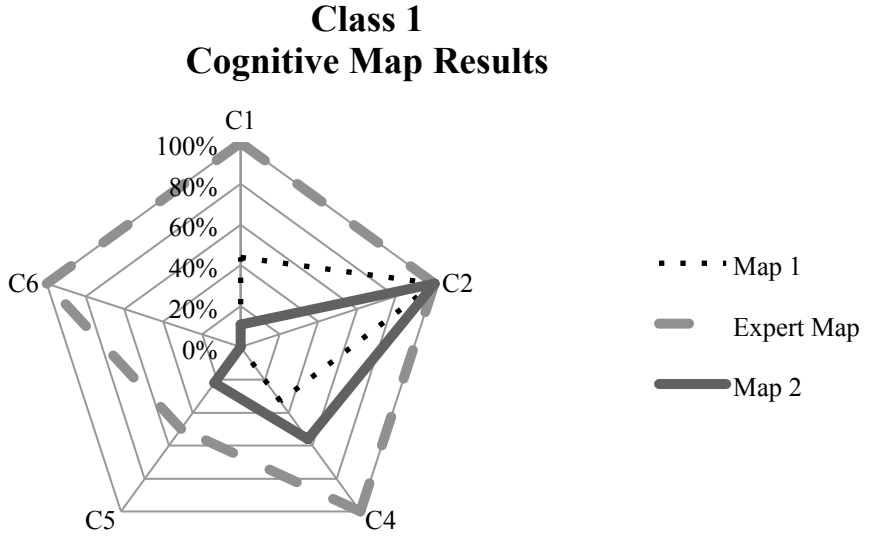


Figure 7: Cognitive Mapping Results for Class 1. Showing the percentage of maps which contained at least one word in each category.

As Figure 7 depicts, student knowledge about the watershed in map two compared favorably to the experts' knowledge in their initial cognitive mind map. It is evident that their knowledge is expanding along mostly C5: procedural and political dimensions and C4: Multidimensional aspects. The students were already well aware of many environmental issues (C2) concerning the river as depicted in Figure 7 according to their first cognitive map. The reason for this could be due to the watershed being a popular topic throughout the village. Figure 7 also shows that students did not expand

their knowledge in category C6: actors and stakeholders. This could be due to class one not having a lot of time to participate in their stakeholder meetings as shown in Table 1 in Chapter 4. Examples of two student's primary and secondary maps will be displayed below.

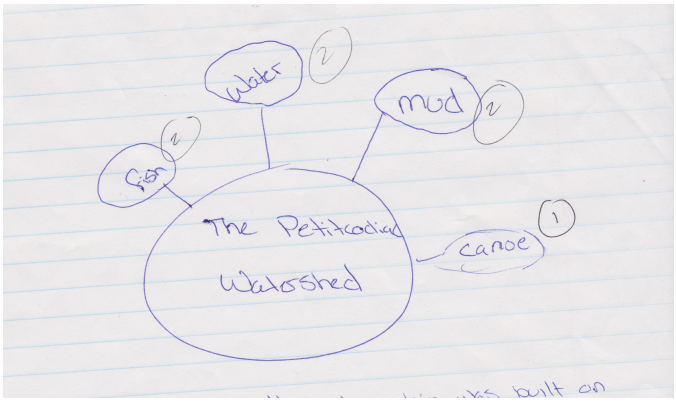


Figure 8: An Example of an initial cognitive map from Student A.

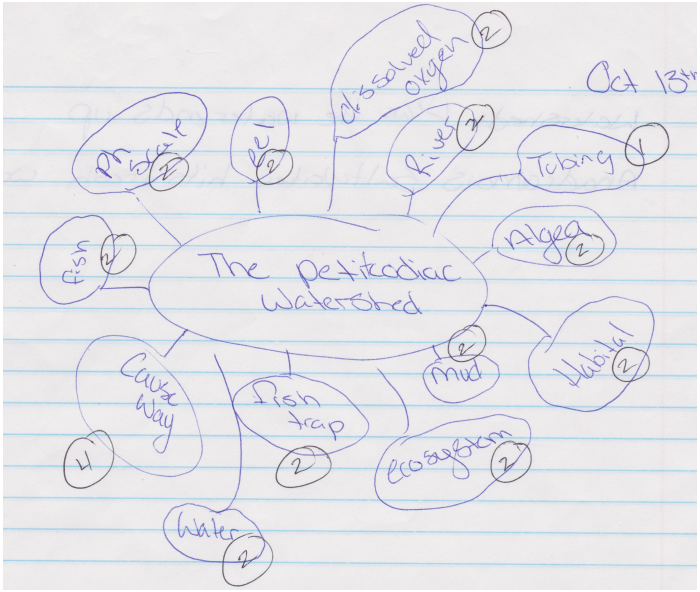


Figure 9: An example of the secondary cognitive map from Student A.

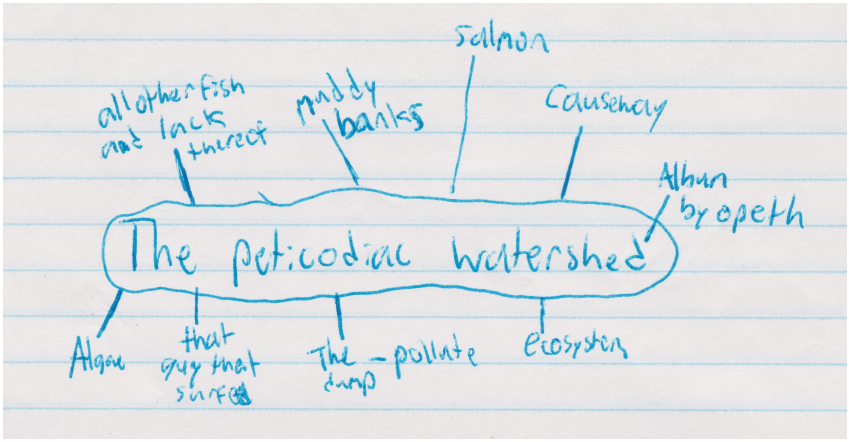


Figure 10: An example of the initial cognitive map from Student B.

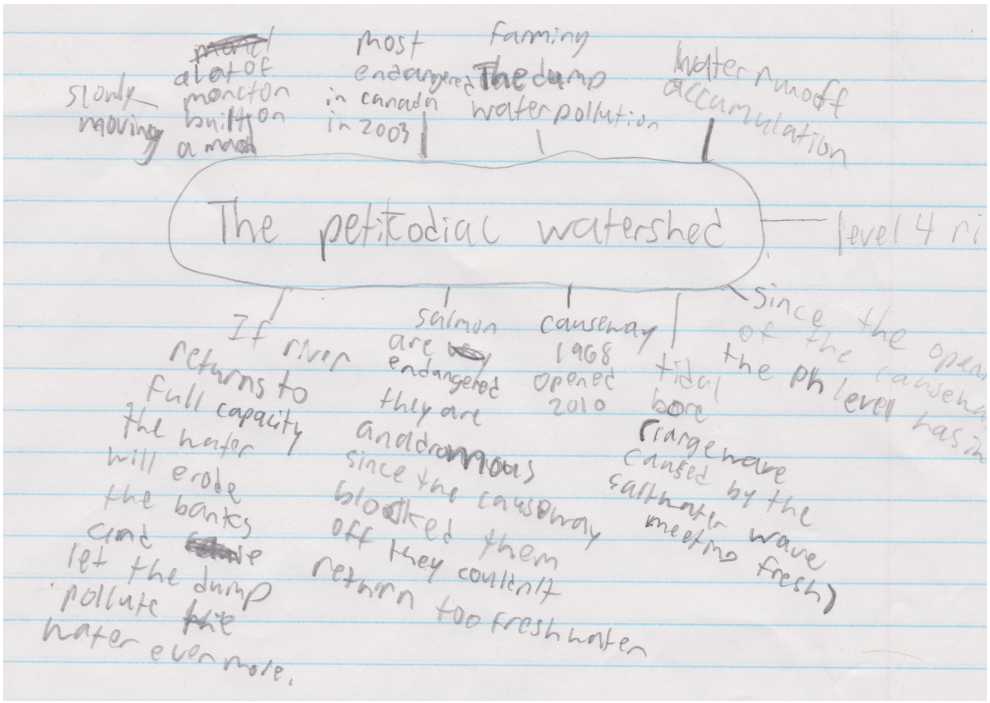


Figure 11: An example of the secondary cognitive map from Student B.

Comparing Figures 8 and 9, and 10 and 11, it is evident that each student A and B wrote significantly more on their second cognitive maps. This is evidence that their knowledge on the subject of the watershed is increasing. What the spider graphs do is show in what areas or aspects their knowledge is increasing in. class two's spider diagram is below in Figure 12.

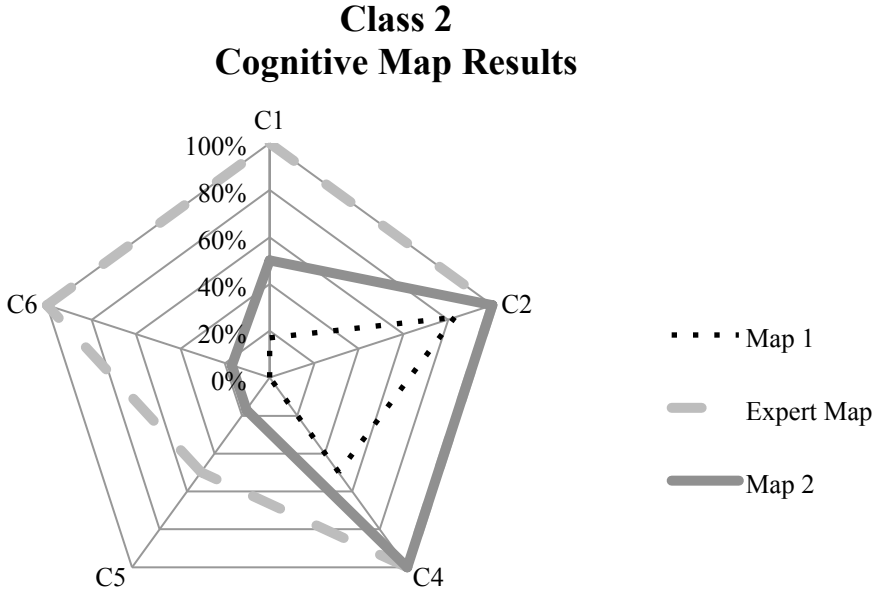


Figure 12: Cognitive Mapping Results for Class 2. Showing the percentage of maps, which contained at least one word in each category.

Like Figure 7, Figure 12 shows students' second map in comparison with their initial cognitive map and compared to the expert maps. Figure 12 suggests students in class two have expanded their knowledge in more areas over the two week period more than class one. Students in class two, like class one began with a larger focus on the C2 and C4 categories. However, unlike class one, their knowledge is expanding more in all categories. This could be due to the students having two more lessons than class one did.

Comprehensive knowledge. Another theme that emerges from the semantic analysis of the cognitive maps and is displayed in the spider diagrams is this idea that students' knowledge is becoming 'all-encompassing'. There is a noticeable increase in the last three categories (C4, C5 and C6), more so in class two than class one. Examining categories C1, C2 and the omitted C3 category, it seems that knowledge such as environmental aspects, economic aspects and cultural or social aspects are relatively

similar forms of knowledge. In fact, Lourdel et al. (2007) separates the first three categories from the last three, noting that they are "nominal or concrete approaches to a concept" (p. 171). The last three categories are concerned with the complexity or widened vision of the concept (the watershed). The spider diagram in Figure 13 illustrates the change from map one to map two for the last three categories.

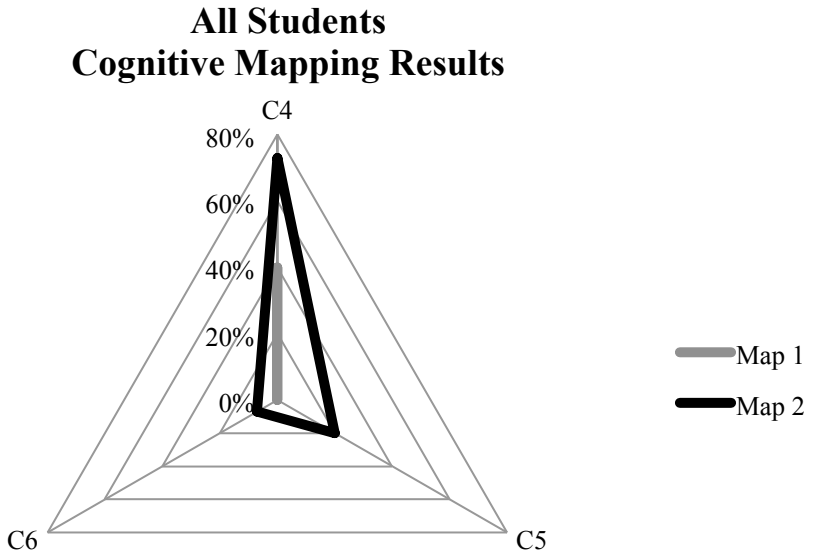


Figure 13: Cognitive mapping results from all students in both classes. Showing the results of semantic categories C4, C5, and C6 between maps one and two.

Figures 7 and 12 represent an increase in students' comprehensive or overall knowledge about the watershed; however, Figure 13 represents that students' knowledge about the complex issues that surround the watershed is increasing as well. An example of this can be taken from Figure 11. This student is noting the complexity of environmental decisions when they note, "if the river returns to full capacity the water

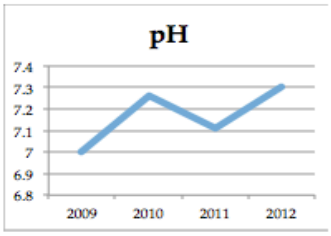
will erode the banks and let the dump pollute the water even more." This student is demonstrating an awareness that since the causeway was removed in 2010, the river is naturally starting to widen back to its original form. Unfortunately, in 1968 when the causeway was put in, land mass was created in the form of a garbage dump in Riverview, New Brunswick and eventually the land residentially and recreationally developed. Now that the river is widening again, there exists the issue that it will begin to erode this dump and it will pollute the river more.

This concept is also exemplified in an observation taken on Day 6 in class two during the stakeholder meeting. Each group of students was given a stakeholder concerned with the river. For example, some students were acting as Fort Folly First Nations, the New Brunswick government, students and homeowners living along the river, and an environmental group. The task was to take the perspectives of a particular group of stakeholders and discuss if it was logical to remove the causeway structure with the knowledge that the widening of the river could erode the dump and cause more environmental issues. When students went to present their ideas from their groups, this student who was part of the environmental group noted that it was important to remove the causeway so that the river could begin to widen back to its original width but that a concrete type structure could be built along the edge where the dump is to prevent it from eroding.

This same student displayed this information in their group pamphlet and the back noted,



pH Levels in the Petitcodiac River



DO Levels in the Petitcodiac River

DO (mg/L)	Year
9.50	2005
11.7	2006
10.1	2007
8.90	2008
10.9	2009
9.45	2010
10.1	2011
9.17	2012

What are Our Options with the Causeway?

1. The first thing we could do to help our environment is to completely remove the causeway and make a bridge in a better spot.
2. We could simply leave it the way it is.
3. We could remove the garbage from the old dump located next to the causeway, and build a wall to protect the water from any extra seeping into the river.

Verdict: Any option is better than no options. Although #1 and 3 would be very costly, but it would aid in improving the environment.

Figure 14: Student pamphlet example, showing options for the removal of the causeway structure.

This again shows that this student is thinking in complex and multidimensional ways (C4).

Another student wrote the following description of how they felt when the class went down to the local park. The park is in walking distance of the school. It has a playground, benches, beautiful trees and scenery and down a hill you can walk along the river. The students and I went down to the river's edge and spoke about how much the river had eroded since the causeway had opened. But yet, there was still a buffer area of trees that was slowing the erosion. One of the students wrote the following,

The river was flowing really fast due to all the rain in the past few days.

The river made me feel happy and full of energy as we jogged back.

This trip brought out my adventurous side as we were running past puddles.

Writing how one feels is not an easy task. A lot of students struggled with it. I was pleased to see that this student's poem showed the feelings (EA) nature can elicit in all of us. Much of the outdoor lessons were created with the idea that students had to have direct contact with nature to remember, or develop these feelings. Again this is one of the important variables that usually need to be in place for pro-environmental (PEB) to flourish.

The student's map from Figure 11 also notes, "salmon are endangered, they are anadromous and since the causeway blocked them off they could not return to fresh water." This student is recognizing that salmon live in the ocean, such as the Bay of Fundy, but spawn in fresh water such as the river behind the high school and further upstream. This student is noting that the issue is complex because when the causeway was installed in 1968, the river was a popular and clean area to fish salmon by the dozens (C. McLauchlan, personal communication, September 29, 2015). However, the causeway prohibited the movement of fish up and down stream, making it an illegal structure (The Petitcodiac Watershed Alliance, 2014). This student notes that the decline in salmon in the river exists because for so many years, they were not able to get upstream. Thus, salmon were not able to reproduce in the safe and shallower waters of the river upstream.

These examples are important because they show an increase in the types of knowledge students are learning, such as the complexity issue, but they also lend an aspect of environmental agency and an increase in feelings of responsibility towards the environment. For example, in another observation this student on Day 9 when they started working on their pamphlets, one student was observed looking through their phone at photos they had taken when they were at Fundy National Park. They noted that

they wanted to include these photos in their pamphlet. They specifically said they wanted to write about the photos and let people know that we should keep that area for nature. Again, we can see communicative agency come to light here as this student is using the pamphlet as a communication outlet, but also the care and feelings that go along with this. Some groups of students even went outside and took photos of their skate park and school grounds to note how dirty the area was so they could put it in their pamphlet.

Ownership. Another important thing that was kept in mind during the lesson planning for this unit was how to get students to "own it" (the river). How do you get students engaged and how do you get them to gain a sense of ownership for the river. These are two very different things, and so ownership became part of the theme of the pamphlets. The classroom teacher and I began to refer to the river and the school grounds as 'their back yard' and used language to promote the idea that they were responsible for it. This again came out in the pamphlets as illustrated below. One student wrote the following in their pamphlet,

> *The river is a river that everyone is aware of and for some of us it is literally in our back yard! Many of us don't realize how a little thing we do on one day of our lives could affect the species living in the river or even cost them their life. If you have ever thrown garbage in the ditch there is a good chance that it ended up in the river and we all know that can't be good for any species living in or near the river. Us humans can do so much more to save the species living in our back yard so next time you do something think about how much it could effect the ecosystem of a species.*

Other students took the photos of the skate park in the schoolyard and put them in their pamphlets.

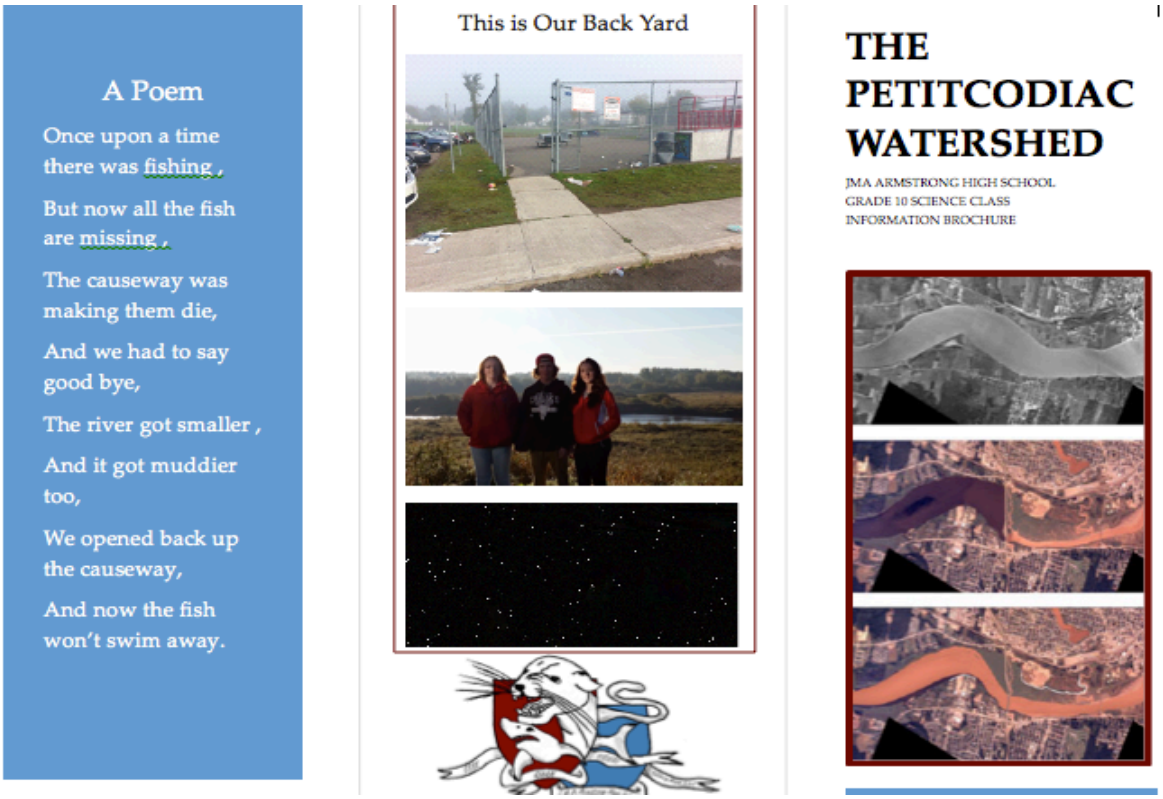


Figure 15: Student pamphlet example, showing a poem and their 'back yard' with photos taken.

Other students took photos at the fish trap when the class visited on the last day of the unit, then went back to school and imputed them in their pamphlets.

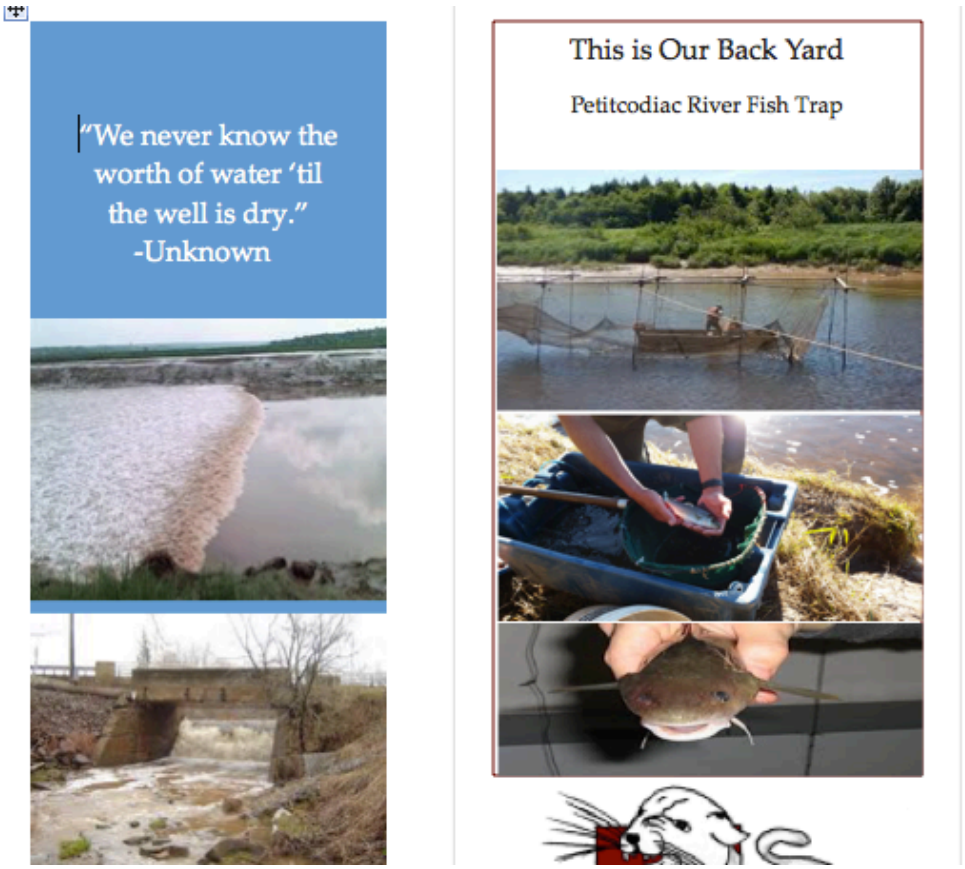


Figure 16: Student pamphlet example, showing personal photos of their back yard taken at the fish trap.

Summary

In summary, we can see the array of themes and categories that emerged from the data and data analysis. Many of them connected to the three large variables within this research, internal locus of control, environmental agency and pro-environmental behaviors. The categories that emerged out of the interview data were exemplified in this chapter, many relating to the larger themes within this research. The cognitive maps provided a description of increases of students' knowledge over the two-week unit. In Chapter 6, I will draw conclusions from the data and make recommendations for future research.

Chapter 6: Conclusions & Recommendations

This case study set out to address the need for a more community-based approach to teaching environmental science in a New Brunswick Grade 10 science context, as most students feel largely absent and disengaged from large environmental issues as a social and personal problem (Pongiglione, 2014). Was there a way that I as a teacher could start to bridge this gap that exists for so many of our students and us? Setting out on this journey, there were many complexities I encountered, which in hindsight was perhaps not a surprise since instilling or subtly advocating for a change in students' approach to environmental issues involves a lot of variables which make it both complex and contextual.

This research was driven by two research questions:

- **What is the impact of environmental community-based learning on students' internal locus of control?**
- **What is the impact of environmental community-based learning on students' environmental agency?**

As internal locus of control and environmental agency are just two of the many precursors or variables to individuals adopting or performing pro environmental behaviors, a third question was added but is contingent on the first two showing an increase. If there were an increase in internal locus of control (ILOC) and environmental agency (EA), would there be an increase or change in pro-environmental behaviors (PEB)by students? This chapter will seek to explain how this research has addressed these questions.

Throughout this chapter, the research questions will be answered below. Further, other significances will be discussed below as they emerged as byproducts of the research process. This chapter will then address some implications for future research and for future researchers and then close with a final word. Many of the section headings are metaphorical and were chosen based on the themes that emerged from the research.

Significance that Emerged from the Research Questions

The following sections will seek to answer the research questions by further making note of the significance of the data that was presented and discussed in Chapter 5. The following sub-sections ILOC, EA and PEB will each begin by noting the categories that emerged within each of these larger themes while then explicitly noting in a text box how the research was addressed by this research.

Internal locus of control (ILOC). The cognitive maps depicted in Chapter 5, Figures 7 & 12, showed an increase in students' overall understanding of the watershed as many of the semantic categories (C1-C6) showed increases in the amount of words in each category students were using. Since knowledge is a primary component of increasing an individual's internal locus of control, this can also be evidence of students' ILOC increasing as students' overall knowledge of all aspects of the river increases. From the maps, it was interpreted that students' knowledge of the watershed is becoming more comprehensive and extensive.

Another way to analyze the cognitive maps is to look at the last three semantic categories, (C4, C5 and C6). These categories specifically highlight increased knowledge of the complexity of environmental systems (Lourdel et al, 2007), in this case the watershed. If you look at categories C1, C2 and the omitted C3 category, knowledge such

as environmental aspects, economic aspects and cultural or social aspects are relatively similar forms of knowledge. The last three categories are concerned with the complexity or widened vision of the concept (watershed). The spider diagram again depicted below, Figure 17 from Chapter 5 illustrates the change from map one to map two for the last three categories.

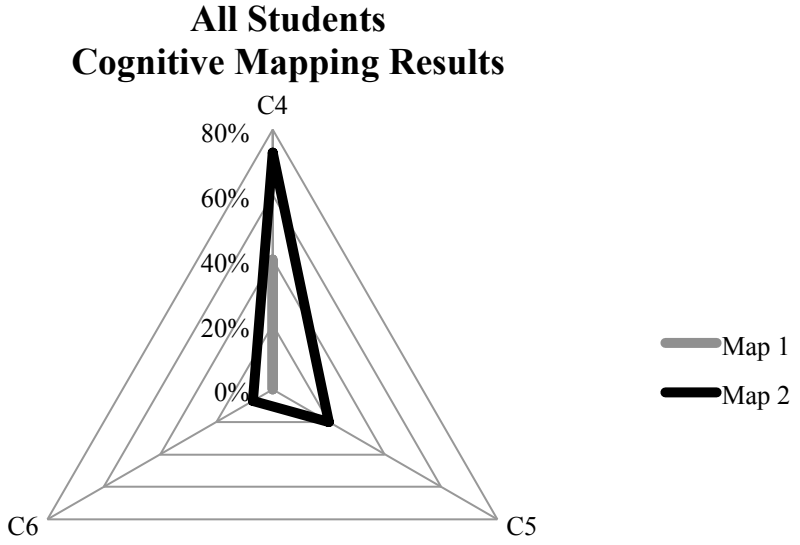


Figure 17: Cognitive mapping results from all students in both classes. Showing the results of semantic categories C4, C5, and C6 between map one and two.

We have also seen in the Chapter 5 categories that were derived from the interviews that students are beginning to *feel* more confident in their ability to tell others what they had learned. Thus, these spider maps are evidence of an increase in students' internal locus of control in this particular context. Perhaps most impressive was the increase in the ILOC of the students as indicated in the spider maps occurred over a mere two week unit. It leaves me wondering what might be possible with a pervasive use of

community-based learning techniques over an entire year. I can only hope that these dispositions that students are showing will be transferable for them to other contexts and in their futures. This finding corresponds with and reinforces the existing literature on locus of control, as an increase in knowledge is typically positively correlated with an increase in internal locus of control for a specific context.

As noted in Chapter 2, locus of control is a difficult thing for teachers to foster for their students; you have to develop the appropriate experiences, facilitate them and hope that these dispositions develop in association with both specific and more generalized contexts. Fortunately, there are experts from the classroom teacher's interview transcripts, which shed more light on this possible increase in ILOC. The classroom teacher had taught this group of students for two years and would be the best person to ask to see if he noticed a change in students' ILOC, EA or PEB after or during the two-week unit. He notes the following about ILOC and student behavior:

> I've taught this same group last year in Grade 9 and I do feel after our unit, and more particular your guest speakers, your lectures or your two-week practicum with me, I do see them [students] owning their behavior a lot more. I do notice they are commenting on garbage, they are commenting on different things in the environment. I think after this unit, their motivation has definitely increased, improved, even they are more aware of their actions and they honestly feel like they have more control than maybe what they thought over the environment. Before, it maybe might have been "oh I'm going to throw that here, it's just one piece of garbage", but now they understand that one piece of garbage can get into the watershed and it's usually not just one, it's many people with that mind set.

> Yeah I've definitely seen a huge difference. We've been talking ecology for a little while now. I think they understand it, I think they appreciate it and I think what you did really increased their locus of control. I know it is tough, but I do strongly feel like of our two groups of Grade 10, I can see definitely see a good group of students standing up for what they feel is right.

He also noted this example:

> Students can start to see…if I'm filling my four-wheeler up and I spill some gasoline, is it just that one spot that gets affected? No, it could spread out a lot further. I think if anything, it increases their intrinsic motivation, their -self-awareness, and their ability to say "I have an impact".

The fact that the classroom teacher is noting that the community-learning project had an impact on not only students' behavior but also their perception of having an impact demonstrates that this community-based pedagogical approach is impacting students in a positive way. The classroom teacher's perception of the students having more control over their own environment is a notable sign of an increase of an internal locus of control, as discussed by (Huebner & Lipsey, 1981; Gambro, Switsky & Harvey, 1992).

What is the impact of environmental community-based learning on a students' internal locus of control? It has been interpreted in the above paragraphs, from the classroom teacher's interview, student interviews and student cognitive maps that there has been an increase in students' internal locus of control surrounding the context of the watershed. I believe this is due to an increase in knowledge as the literature notes, but also due to the experiences created for students through community-based learning. In this specific case, the impact of community-based learning on students' locus of control

is quite substantial and significant. This research was largely successful in increasing students' internal locus of control through community-based learning surrounding a specific context.

Environmental agency (EA*).* Environmental agency was assessed indirectly in this research, since as Lane et al., (2005), Duvall & Zint (2007), and Barton & Tan (2010) suggest, it often appears as a feeling or action that is difficult to measure objectively.

> It [the unit] was very authentic, it's going to be very hard to replicate. The pamphlets really allowed students to take ownership of what they were learning and bring that forward to other people. Because when we were talking about their pamphlets, the one thing was – what did you not know about the watershed? And what did you not know about certain terms that you mentioned? And it was fun seeing them create those pamphlets and ask when we're going to be handing them out or if we're going to be handing them out. So it really allowed them to get that motivation to share what they've learned with others.

What is the impact of environmental community-based learning on a students' environmental agency? I would argue that these observations from the classroom teacher and I exemplify an increase in student environmental agency through the community-based learning and experiences created for students such as handing out the pamphlets and students having the opportunity for communicative agency through the pamphlets but also through conversations with community members that allowed agency to flourish in this context for some students. Like internal locus of control, I believe community-based

learning had a positive and large impact on student environmental agency. It was exciting to see some evidence of environmental agency and locus of control throughout the data collected.

Student pro-environmental behavior (PEB). The data suggests that some students saw an increase in their locus of control and this was being influenced by the increase in their knowledge and willingness to communicate that knowledge to influence their context. Environmental agency is also present in many of the students' pamphlets, interviews and acknowledged through direct observations. What was not obvious or presented in the data was the willingness of multiple students to engage in pro-environmental behaviors or the acknowledgement of new pro-environmental behaviors. This can be a result of the time span that was allotted for the research and the absence of a way to define and measure PEB (Markle, 2013). The literature notes pro-environmental behavior is difficult to measure and it is highly debated upon which methods could be used for testing PEB. There is also little consensus of what behaviors count as PEBs, and which do not (Courtenay-Hall & Rogers, 2010). The purpose of this research was to create experiences and opportunities that allowed for increases in ILOC and EA to happen, in order to promote PEB or to draw some sort of correlation, as the research has shown these are two key variables in promoting PEB (Kollmuss & Agyeman, 2002).

I believe this research was unsuccessful in promoting new PEBs in most students based on the analysis and in the discussion and results in Chapter 5. It is not that none of the students are picking up new PEBs; there is just no concrete evidence to support an increase in PEB. There is evidence provided in Chapter 4 of students engaging in PEBs

such as shutting off the faucet and lights or not littering, but this data is documenting pre-existing behaviors. Many PEBs, which individuals engage in, are also subconscious and therefore hard to identify. However, Kahyaoglu (2013) notes that PEB is a life long journey; it takes a long time for a new positive attitude or change in feeling to change into behaviors. Kahyaoglu (2013) also notes that environmental education (EE) should be and has to be a life long journey that starts in middle school. What I believe Kahyaoglu (2013) means for this research is that although good things happened from the two-week unit plan, it is not necessarily enough to promote PEB. This needs to be a longer journey for students and teachers together, but promoting PEB through community-based learning it is still a step in the right direction.

In attempting to measure the third, but contingent research question – *is there a correlation between an increase in internal locus of control and environmental agency for an increase in new pro-environmental behaviors?* Not only was there no qualitative evidence of new pro-environmental behaviors, but also the data was largely inconclusive in recognizing or promoting new behaviors. This again contributes to the literature as the complexities of promoting and measuring PEBs is exemplified in this research. As Kollmuss & Agyeman (2002) note, one cannot possibly know all the things needed to promote PEB but ILOC and EA are two major variables in promoting pro-environmental behavior.

Additional Significance that Emerged from this Research

As an educator, there is always unintended learning that happens for students during a lesson and as a researcher I found this phenomenon to be no different. What emerged

from the data as unintended outcomes or as byproducts is still arguably significant to note below as these themes either reinforced and contributed to the literature or identified further gaps and inconsistencies within the literature.

The social trap. The social trap is outlined in Chapter two, as Pongiglione (2014) notes that many people do not engage in PEBs because it is not only inconvenient, but performing PEBs can be socially detrimental. For example, giving up your car makes it harder to be social, or not wanting to pick up garbage as you are walking down the street for fear of peers judging you are examples of deterrents to engaging in pro-environmental behaviors. A solution or way to mitigate this social trap is to engage in PEBs with a group of people (Pongiglione, 2014). This thesis supports Pongiglione's suggestion as it was hoped that the classroom environment would act as a peer support system for these students who may feel uncomfortable speaking about environmental issues or performing PEBs on their own. Some ways to go about creating this cohesiveness and support between students is to do team building activities at the beginning of the year or unit to get students to connect with one another. Students can form a bond as they clean up the schoolyard, promote PEBs or even advocate for the removal of the causeway structure; they are being supported by the people in the class that they learned about this with. Creating this cohesiveness and peer support within the class can help mitigate some of the challenges of power and position or 'social trap' issues when promoting or engaging in PEBs.

Generational perceptions. In accordance with combating the social trap problem, I feel that this research also contributed to reversing generational perceptions of teenagers within the community. Stern (2005) notes that 'lazy, 'disrespectful' and

'spoiled' are the most commonly used words to describe teenagers from the older generation. There exists a not so surprising stigma about younger generations that they are destructive, likely looking for trouble and ultimately show little concern or respect for their environment. Often this stigma evolves from a couple bad students within a community that engage in negative behaviors. During the two-week unit, it was communicated to the students by me and the classroom teacher that this stigma did exist within the students' community and that by engaging with the environment, passing out pamphlets and showing community members they care about 'their back yard', it can help to combat this generational belief.

The community was incredibly receptive to students walking around and handing out their pamphlets. Students knocked on doors and spoke to the community members at the level they were comfortable about the Petitcodiac watershed and passed out the pamphlets their class had collectively created. Students and I walked up to community members working in their yards and had conversations about what we learned, but also the knowledge that community members had on the topic. If students are treating the community environment negatively, then community learning projects and outdoor environmental or interactive units can serve the dual purpose of negating these behaviors from these students if they begin learning more about it and develop feelings towards their environment.

My back yard. As mentioned previously, throughout the two-week unit, the community and the watershed were referred to as the students' back yard and were even noted on a section in their pamphlets. This was a direct attempt to try and instill some sort of ownership for students for their community environment. The classroom teacher was

interviewed at the end of the unit to give his opinion on it. When asked if he believed that the unit was associated with environmental community-based learning, he noted the following,

> I thought you brought the environment and more importantly community's environment to the classroom. When you talked about watershed, you didn't necessarily talk about, just a watershed that would happen in Canada or in the world, you brought it really home so the students could appreciate what their impact is. And I've heard comments from students that they now understand what a watershed is. They understand if you throw a piece of garbage out, it may affect our watershed and we really had some great discussions about the river in particular with farmers and their fertilizers going into the river and furthermore with the sewage treatment plant in Riverview. I thought that brought some great discussions on what living things need to live, what a habitat requires, it just really allowed them to see there's a lot of science and a lot of environmental science going on in their backyard.

I think that this is an important piece of information because he is noting that the community environment was brought into the classroom. There is an element of ownership created here for students and by students. Speaking about the different types of creeks and rivers that connect to form the watershed that drain into the Bay of Fundy provided a much more comprehensive outlook on the definition of a watershed instead of simply giving it to the students in the form of notes; everything is connected back to something they can visualize, visit and see within their community.

A realistic community-based pedagogy. Although not a direct attempt to answer the research questions from this thesis, a goal of this research was to develop a teaching resource that could be valuable to teachers, and could be adapted and used again in the future. Specifically in this research, community-based learning was the vehicle in which I was able to create experiences for students that would allow variables such as environmental agency and locus of control the potential to develop within students. The classroom teacher noted that the unit was significant and comprehensive enough that he will use it again,

> I 100% am going to use the watershed unit when I teach environmental science and when I teach Science 10, the Ecology unit more particular. I am going to definitely keep a lot of the same things. I love what you did with the extirpation of salmon, talking about the salmon cycle, using real life examples to hit home a curricular outcome. I think bringing everyone to the fish trap and to the river, talking about what's in their back yard really helps solidify a lesson and it really helps make the connection or bridge the gap to what they can control. And yes, I will 100% use this again teaching it again cause I love how it was real life.

His comments speak to the array of different experiences created within the two-week unit. It was something different every day, but it always related back to the watershed and hit the curricular outcomes for the Ecology unit. For example, one day students were learning about how polluted the water was, then next day they were testing the pH of that water from the river and discussed if the pH of water could have a correlation with how polluted the watershed was. As a teacher you have to teach your curricular outcomes, why not connect them to real life? As a teacher you get the added

benefit of engagement, new and exciting opportunities for you and your students and you are also creating an environment for agency, locus of control, trust and other positive behavioral variables to flourish.

The cognitive maps that were used during the two-week unit with the Grade 10s also served a secondary purpose beyond data collection. Lourdel et al (2007) mention that mind maps are simple and effective ways of getting students to demonstrate their prior knowledge when starting a subject, scaffolding through a unit and then formatively assessing what students learned and possibly what areas they need to focus on for an upcoming test, for future or personal purposes. Cognitive maps can also be great tools of formative assessment for teachers and as well a form of summative assessment when stricter guidelines of what to put in the mind map are communicated.

On top of having the community-based model and the cognitive maps as alternative teaching and learning tools, I am hesitant to make the claim that teachers should just do more. This is not the basis for this claim. As teachers there is always more to do and as environmental stewards and citizens there is always more to do when learning about and perhaps working to diminish local, regional and global environmental issues such as researching more affordable renewable energy resources. Community-based learning is something that can augment other types of pedagogies that exist as options for teachers, such as the inquiry model and service learning. In the future, I would recommend that curricular designers include ways for teachers to engage in community-based learning, service learning, and inquiry-based models at a local level. To structure the curriculum in a way that allows each teacher to take the outcomes and have the ability or the opportunity to adapt it locally if they wish, instead of having rigid or prescribed

outcomes that deal consistently with global issues beyond students' control. I am aware that not every unit can be done locally and that sometimes topics are better received in more cross-contextual, universal ways and that the student makeup-up of each class has a large influence on how a teacher approaches teaching their classes. However, this research has shown that the students and teachers resonated with the community-based pedagogical approach used in this research and that this will likely promote lasting pro-environmental behavior. For environmental educators, this result is presumably a central goal for the course, that has been shown, can be promoted not only in the content of the course but also in how the context is taught.

The academic master. Ideally, teachers within Canada and in other parts of the world are supposed to be or looked upon as disciplinary experts. Teachers are the people students look to for answers; however, in the age of the internet, Google and Facebook the idea of the teacher as the subject master is depreciating, because it is increasingly more unrealistic for a teacher to know everything about a subject (Hilbert, 2012). Along with this technology change, pedagogy is moving more and more to teachers facilitating the learning rather than being the *sage on the stage* so to speak. As Kolodner et al. (2003) suggests, this shift away from teacher-centered instruction toward student-centered can be difficult for a teacher to accept and employ because it requires a degree of releasing control and sometimes stepping outside your comfort zone, but it also potentially means the teacher shifts from being the academic master to an academic facilitator.

To employ community-based learning, teachers need to know where to reach out within the community, to network, to find individuals that are experts within their fields to bring in that academic, inspiring, raw and engaging aspect into your lessons. It is

difficult and time-consuming to assume that as a teacher, I could teach my students all about the different types of wildlife in the watershed, the history of the watershed and the causeway, the social struggles that ensued because of it and the financial aspects of it; it's largely impossible, or it would take a lot of time and preparation that teachers do not easily possess. As a teacher, how am I supposed to teach 'feeling' for the environment? I cannot, but I can facilitate it by bringing students down to the watershed and the park, exposing them more often to their environments and getting them to begin thinking about how they positively or negatively contribute to their community environment.

Community-based learning can be a daunting task to plan, as the teacher is essentially living in uncertain space for the remainder of the unit. Many of the aspects of this two-week unit unintentionally aligned themselves with the inquiry-based model in teaching and learning. Inquiry-based learning is often facilitated by presenting problems for students to solve instead of solely presenting knowledge to them. This was done periodically as students discussed potential solutions for the removal of the physical structure of the causeway during their stakeholder meeting and through other examples described in Chapter 5.

Scratching the surface. One of the goals of this research was to be able to create a variety of experiences for students such as going to the watershed, touching the eels that live in the water, writing poetry at the park that bordered on the river, providing guest speakers that were both engaging and knowledgeable. Not every student will develop feelings from simply hearing a guest speaker talk about how polluted the water is and not every student will develop feelings or a sense of ownership towards the river because they wrote poetry beside it. Promoting pro-environmental behavior is complex and not

every student will interpret knowledge or digest a situation in the same way because each one comes with their own set of knowledge and personality. It may also take multiple and a variety of experiences for variables such as ILOC and EA or others to begin to develop or take root. Community-based learning is the glue that largely holds this research together. It is the vehicle through which not only the curricular outcomes were delivered, but also meaningful experiences from their own environments were made available to the students.

The number of experiences students need in order to develop certain dispositions varies, but I believe that a community-based learning pedagogy increases the chances that these dispositions will develop. It resists the solely anthropocentric view of environmental science that can be created within the four walls of the classroom or through reading books about what other experts or scientists believe to be true about an environmental topic or issue. Even though much of the data within this thesis is being interpreted as students sometimes showing an increase in internal locus of control or environmental agency or no record of pro-environmental behavior, it was apparent to me how powerful this approach was to the participants. Going forward it would be more beneficial to carry on this unit throughout the entire year and relate not only the Ecology unit back to the watershed, but the Chemistry, Weather and Physics unit as well. This would create multiple opportunities for students to learn and develop some of these important dispositions to promoting PEB. For a middle school or elementary teacher, it might be easier to take on these community learning projects because they are likely to have the same students for the entire year and for most of the day while teaching multiple subjects that could be very beneficial to student learning comprehensive issues as they

could start to see realistic connection through cross-curricular teaching and learning. As a high school teacher, these units become somewhat more difficult to employ as you only have students for half the year for approximately one hour a day. However it is still a great tool to use.

Implications for Future Research

Lessons learned. Power and position concerning agency was an important category in Chapter 5, but there was little *concrete* evidence that agency was taking place. If I were to do this unit over again, I would focus more on trying to make students aware of their power, position and even privilege in the community, regionally and globally. As can be seen in this small excerpt from his interview, the classroom teacher would make the following changes if he uses the unit again the following year:

> Classroom teacher: I think the only change, just the pamphlets, I love the idea and I thought it was a great way to recap, summarize and to see their locus of control, but maybe give it to them at the start, that way when they see something relevant, when they see something they feel passionate about it.
>
> Researcher: So they're building it as they go.
>
> Classroom teacher: Exactly. What student A would put into their pamphlet might be different than what student B puts into theirs and what student C puts into theirs. But it would still, I feel it would increase, instead of saying "I'd like you to fill this this, and this", it would allow them to take charge and have control over it. I think that would be the only change.

Limitations. There were many limitations that presented themselves throughout the study. The main limitation was that there were fewer types of data collected than

anticipated, as the observations were initially supposed to be a focal point. However, as noted in Chapter 3 and 4, to mitigate this, other aspects of data were used to bring the data alive and help add thick and rich descriptions to the case study. If I were to do this research again, I would make sure I took the time to record the observations at the end of each class. Even though only a few observations were recorded, I would argue that they were a valuable piece of data that helped set the context for much of the discussion in Chapter 5, and they shed light on examples of student environmental agency taking place. Another limitation that existed was the methods used for data collection. I would like to incorporate video recordings at the watersheds and for more outdoor activities.

Another limitation was the limited number of students in class two who returned permission slips to participate. Class two was smaller than class one to start, but this made the sample size much smaller. This could have affected the categories that were created, as there was fewer consistencies within class two than class one. This could have had an effect on the cognitive map analysis as only a few students could have their maps analyzing, I would argue this did not give the best picture of what the class had accomplished.

Another limitation for this research was the unpredictability of the day-to-day lesson planning. The original two-week plan is shown in Appendix H. Disruptions such as student assemblies, events and professional development days all required some activities to be removed from the two-week plan or be condensed. For example, the mock stakeholder meeting was originally planned to be two full classes, but students were only able to engage with the stakeholder material for half a class. The weather was also an issue, as a couple of the days were scheduled to be outside. For example, severe rain

swept much of the silt in the river to the surface and Edmund was not able to safely put up the fish trap for a couple of days. Also, because of my employment schedule and with the fact that students needed to move on for curricular timing purposes, it was time to abandon the unit. For future researchers and teachers who attempt community-based learning, it is important to approach it holistically and over a longer period of time. Approaching a unit this way allows for more flexibility, more authentic learning and perhaps teachable moments.

It's not negative, but it's not positive either. Throughout the interivews, some students discussed or referenced the idea that they did not litter, but at the same time noted they felt as though they made little to no positive environmental impact within their community. This is an interesting dynamic because we think of not littering as a pro-environmental behavior, a positive behavior towards the environment. However, as Pongiglione (2014) notes, you do not see the positive results of PEBs such as not littering, but you see the negative results of littering everywhere and immediately. For example, if you look at the amount of garbage in the schoolyard at the high school, it is overwhelming, but one student not littering does make a difference, as it is not contributing to the massive amounts of litter on the ground and at the same time they are setting good examples for other and younger students. The responses from students can be related to low agency and external locus of control when it comes to certain environmental and community contexts. Much of this thesis research was geared towards not only promoting students to engage in new pro-environmental behaviors, but to uncover or expose the PEBs they already were doing on a daily basis such as shutting off the taps, lights or not littering. These small PEBs need to be acknowledged, celebrated

and continually reinforced. The literature largely focuses on how individuals do not engage in PEBs because there are not immediate rewards or results that you have done a 'good deed'. This observation of students' thoughts contributes to the body of literature, as there seems to be a shortage in acknowledging this specific dynamic of engaging in good behavior, but then thinking you are not positively contributing to the health of the community environment because you cannot see it. This showcases a large gap within the literature and would be a valuable research project to pursue in the future.

Traditional ecological knowledge (TEK). Initially this research was going to encompass and promote TEK or Traditional Ecological Knowledge during the two-week unit. TEK is a traditional or indigenous type of knowledge that largely concerns itself with sustainability. On the whole, environmental education (EE) curriculums are really good at addressing the issues of the environment and advising for technical solutions, but what they lack is a legitimate insight to the cultural contexts that allowed individuals to end up in this predicament in the first place (Stribbe, 2004). Sustainable solutions for the future lie at the intersections of nature and culture (Kimmerer, 2012), and TEK that is incorporated into learning experiences can offer that intersection.

The New Brunswick Environmental Science 120 curriculum was redesigned in 2012 as a natural process for curriculum update, but sought this time to incorporate a First Nation's worldview or TEK (M. Emberger, personal communication, April 9, 2015). Personally I believe this is a progressive call and acknowledgement of the value that TEK presents for living a sustainable lifestyle. TEK must be authentically generated between individuals and the land. Opportunities need to be created for students to engage with the land so that they can critique their own science framework. Being outside allows

all students' senses to be activated (Kimmerer, 2012). However, it does not have to be one or the other, both can be incorporated to provide a comprehensive understanding of the world. Although there exist few published examples of this, Service et al. (2014) noted researchers recently drew on both TEK and Western knowledge to investigate why the grizzly bear was so sparsely populated. For Western knowledge, the researchers investigated things such as genetic data, camera images and mortality rates. The First Nations groups lent TEK by drawing a map of the current and historical grizzly bear occupancy on the island. These two ways of knowing and learning compliment one another and offer a more comprehensive type of picture and knowledge. Although TEK is incredibly valuable and largely intertwined with community-based learning, the scope was simply too large to pursue for this research. Promoting TEK through community-based learning and environmental education would be a valuable study that would largely contribute to this gap that exists with in the literature but also continue to promote pro-environmental behavior and sustainability.

Final Word

This research developed largely out of the assumption that issues concerning environmental science can be overwhelming and intangible for adults and students. Even Girling (2007) notes that with all the disastrous and negative attention geared towards our futures, people should be running through the streets and panicking, there should be chaos, but there is not. Along with the lessons learned throughout this research, more and more articles are being published on the psychology of teaching about large environmental issues and promoting positive environmental behaviors, and they note that so far, we have gone about it all wrong (Brunhuber, 2015). As teachers and scientists we

hoped that educating students about the vast and devastating consequences of poor environmental behavior would ultimately scare or spring students into action. A psychologist communicates that this is “probably the largest science communication failure in history” (Brunhuber, 2015). Going forward we have to start communicating a positive future while giving students concrete, real and doable activities that start them on the path of owning their environment.

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APPENDIX A

Curricular Outcomes Achieved Throughout the Unit

- 114-1 explain how a paradigm shift can change scientific world views
- 318-1 illustrate the cycling of matter through biotic and abiotic components of an ecosystem by tracking carbon, nitrogen, and oxygen
- 318-2 describe the mechanisms of bioaccumulation, and explain its potential impact on the viability and diversity of consumers at all trophic levels
- 318-3 explain why ecosystems with similar characteristics can exist in different geographical locations
- 318-4 explain why different ecosystems respond differently to short-term stresses and long-term changes
- 318-5 explain various ways in which natural populations are kept in equilibrium, and relate this equilibrium to the resource limits of an ecosystem
- 318-6 explain how biodiversity of an ecosystem contributes to its sustainability
- 331-6 analyse the impact of external factors on an ecosystem
- 331-7 describe how soil composition and fertility can be altered and how these changes could affect an ecosystem
- 118-5 defend a decision or judgment and demonstrate that relevant arguments can arise from different perspectives
- 118-9 propose a course of action on social issues related to science and technology, taking into account human and environmental needs

APPENDIX B

Interview Questions Used for Students

1. Is there anything in particular you enjoy doing outside? Why?
2. How often would you speak to someone you just saw litter? What if it was a close friend? Are you aware of the fine for littering?
3. How often would you say that you perform pro-environmental behaviors? (Examples will be given to prompt participant).
4. Why do you think people do not engage in pro-environmental behaviors?
5. Do you feel as though your friends influence how you interact with the environment or which pro-environmental behaviors you take part in?
6. How comfortable would you be speaking to a community member about the watershed? Why?
7. How often do you feel that your behaviors change or impact your community?
8. Would you feel more confident sharing your views on the watershed after these two weeks? Would you be more likely to volunteer your time now that you are familiar with the organization?
9. What is different about the way you feel today compared to the way you felt two weeks ago?

APPENDIX C

Interview Questions Used with Classroom Teacher

And explanation of Internal Locus of Control and Environmental Agency were given before the interview.

1. Do you think this unit was associated with environmental community-based learning?
2. Do you think the unit was authentic?
3. Do you think the unit encompassed opportunities for students to develop environmental agency? Why or why not? How could this be improved?
4. Do you think this unit encompassed opportunities for students to develop their internal local of control (showing control and initiative etc)? Why or why not? How could this be improved?
5. (since you were the only person with the students before and after the unit) Do you see any differences within the students – whether it's attributable to environmental agency, locus of control, behavior, being outside more etc.
6. Would you use the watershed unit again? Why or why not? What changes would you make?
7. What parts of the unit did you find particularly powerful?

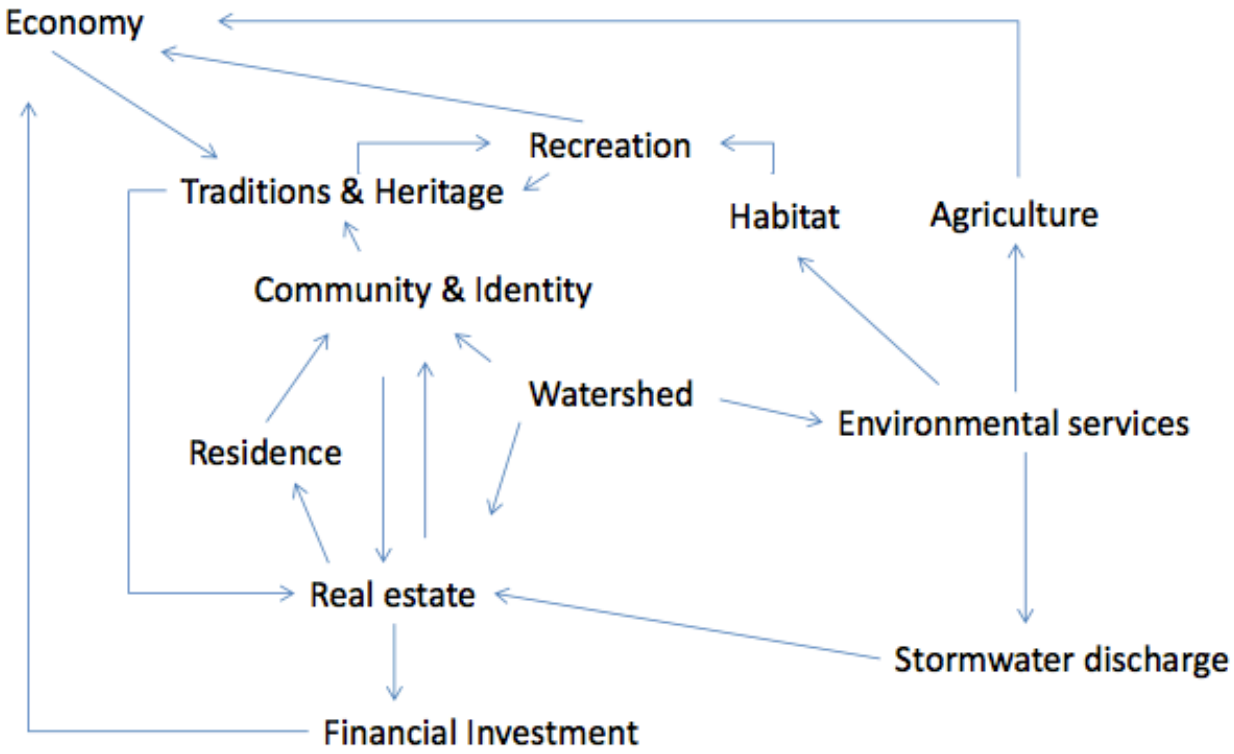
Research Questions – leave open ended.

1. **What is the impact of environmental community-based learning on a students' internal locus of control?**
2. **What is the impact of environmental community-based learning on a students' environmental agency?**

APPENDIX D

EXPERT COGNITIVE MAP

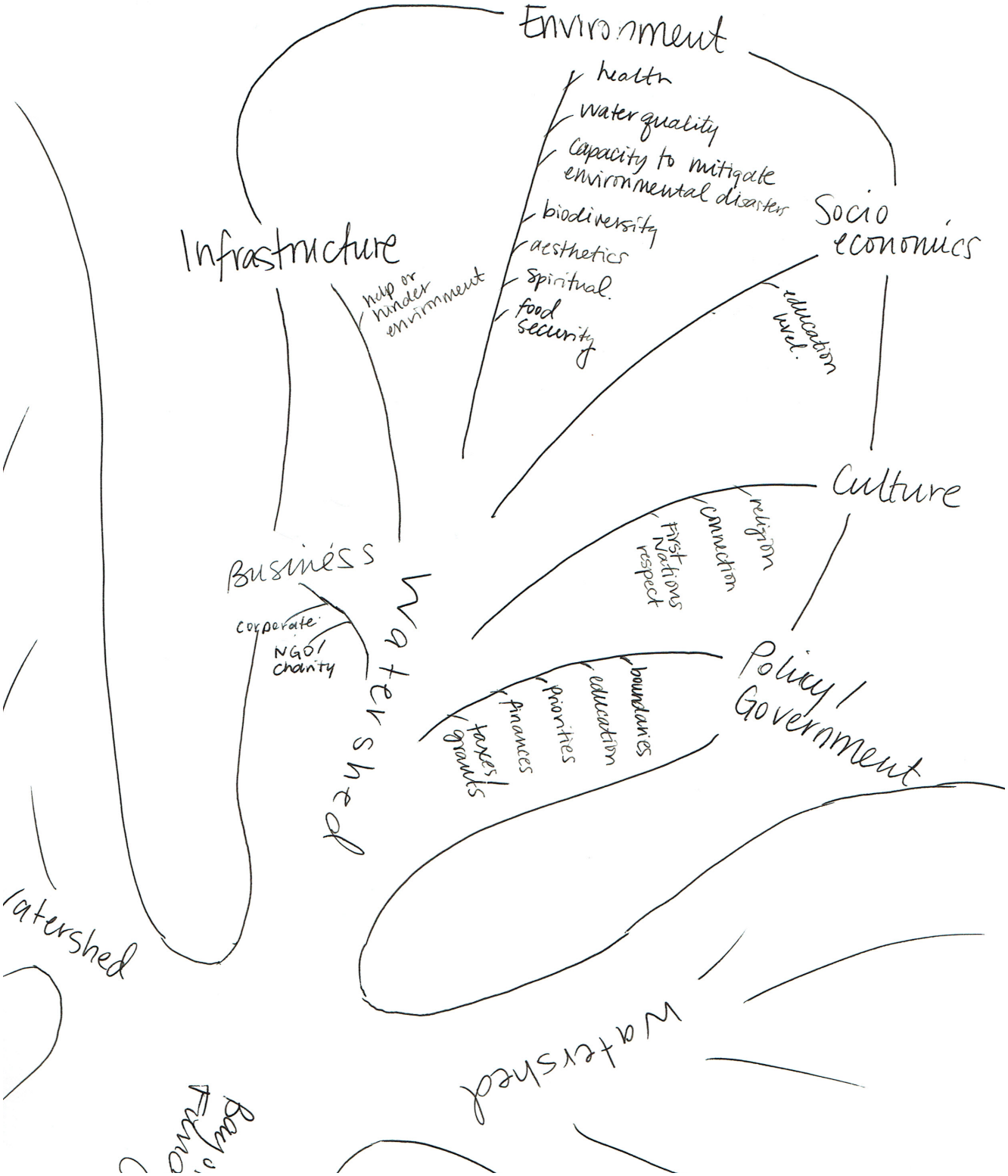
Edmund's Cognitive Map



APPENDIX E

EXPERT COGNITIVE MAP

Christine's Cognitive Map



APPENDIX F

PARTICIPANT ASSENT FORM

Dear student,

I, Amanda Lagace am a graduate student at the University of New Brunswick. I am conducting a research project and you are being invited to participate in it. The research topic is environmental education and pro-environmental behavior in youth. Before you are able to take part, you must provide consent. The purpose of this research is to gain a more in depth understanding of the different types of lessons and activities that can increase or decrease sustainable and pro-environmental behavior in youth such as you. Along with your consent (if you wish to participate), your parents will also need to provide consent for you to participate as well.

The research project will take place for two weeks during your normal science classes. Participation in this research involves observation during classroom time, potential one on one interviews (15-20minutes) with me at the beginning and end of the two week unit, and a couple of assignments that are relevant to the research. The research that will be conducted during the two-week period will be in addition to your regular unit. Regardless of consent, you as a student are still required to participate to the best of your ability in normal class discussions, assignments and projects for the course requirements. Once your assignments are marked, I will be looking further into the assignments of those students who participate for my research project. The assignments conducted for the research are still required to be completed for your grade, however if you do not wish to participate, the assignments will not be analyzed or looked at by me after they are marked.

The benefits of participating in this study are that you will hopefully gain an understanding and awareness of your experiences and future interactions with the environment, good or bad and how they impact your community environment. My hope is that you will develop new habits and outlooks that will contribute to the sustainability of your community and help you feel a sense of ownership for it.

Your participation is voluntary. This means you may choose to not participate or withdraw from the study at any time, and for any reason. If you choose to withdraw from the study, your participation will end immediately, without any penalty to you, your grades or assignments. Upon your request, your interview data can be removed and destroyed up to the point that it has been analyzed and afterwards. Any data that can be specifically connected to you (e.g., quotations) can also be removed. You will not be penalized in any way if you do not wish to provide consent to participate.

The information collected in this study will be used as part of my thesis research project and may also be used in scholarly publications, such as being written up for publication in a research journal or presented at research conferences. Names of participants, teachers, schools or any identifying information in quotations used will be removed. No one except the researcher and the supervisor (Mark Hirschkorn) will be allowed to hear the interview recordings, or see the written copies of the interview. The information collected from you will be kept in a locked cabinet or on a password-protected computer. The audio recording will be deleted immediately after the study is done. The written copy of the interview (with all identifying information removed) will be saved for up to seven years after the interviews have been completed, at which point it will be shredded or permanently erased.

Your signature on this form indicates that you understand to your satisfaction the information provided to you about your participation in this research project. This means that you agree to being observed, having your assignments analyzed and are willing to be interviewed. Should you have any questions or concerns regarding this study, please do not hesitate to contact me at 506-860-0194 or at L312F@unb.ca.

I, _____

(please print name)

provide consent for participation in the study described above.

_____

Date

Researcher:

Amanda Lagace, M.Ed. Candidate, Faculty of Education, University of New Brunswick.

Phone: 506-860-0194, Email: L312F@unb.ca

Supervisor:

Dr. Mark Hirschkorn, Professor, Faculty of Education, University of New Brunswick.

Phone: 1 506 447 3140, Email: mhirschk@unb.ca

If you would like to direct your questions to someone not involved in this research, please contact Ann Sherman at shermana@unb.ca/ 453-4862 or David Wagner at dwagner@unb.ca/ 447-3294.

This project has been reviewed by the Research Ethics Board of the University of New Brunswick and is on file as REB 2015-066.

APPENDIX G

PARENTAL ASSENT FORM

Dear parent/legal guardian,

My name is Amanda Lagace and I am currently enrolled as a graduate student at the University of New Brunswick. I am doing research at (school name) in the Science department and am inviting your child to take part in it. The research topic is environmental education and pro-environmental behaviour in youth. Before they are able to take part, you (as their legal guardian) must provide consent. The purpose of this research is to gain a more in depth understanding of the different types of variables that can promote or demote sustainable and pro-environmental behaviour in youth. The purpose is also to help students learn about their environment and their community by studying their local community environment. My hope is that students will engage and promote sustainability within their community through working with the environment, community members and with ecological group projects. These activities will also help students to understand the material they are learning in science class. I am also anticipating that the information collected from this research will be useful in understanding what sorts of activities and lessons are appropriate and engaging for students when teaching environmental education in any context.

The research will take place during the student's regular science period for two weeks. Students and their parents/guardians who provide consent to participate in the study will have their assignments analyzed, may be observed while the class is interacting with the outside environment or be selected for a 15-20 minute interview at the beginning and end of the unit. Once the assignments are marked, I will take the assignments of

those who have provided consent and look at them further for the research project. The classroom teacher and I will be conducting the observations, while I will be the only one conducting the one on one interviews with the students. Student's personal information and participation in the interview will be kept anonymous. If consent is not provided, students are still required to complete their assignments. If this is the case, they will be marked by their classroom teacher but not further analyzed by me.

The research that will be conducted during the two-week period will be in addition to the student's regular unit. Regardless of consent, students are still required to participate to the best of their ability in normal class discussions, assignments and projects for their course requirements. The assignments conducted by students during this two-week period will count towards their final grade and will be marked by their classroom teacher.

Participation is voluntary. This means you (as the legal guardian) or the participant may choose to not participate or withdraw from the study at any time, and for any reason. If you or the participant chooses to withdraw from the study, their participation will end immediately, without any penalty to themselves or their grade and/or assignments. Upon your or their request, their interview data can be removed and destroyed up to the point that it has been analyzed and afterwards, any data that can be specifically connected to them (e.g., quotations) can also be removed. No student will be penalized in any way if he/she or you as their legal guardian do not provide consent for them to participate.

There are some possible benefits to participation in this study, including participants gaining a personal understanding and awareness of their experiences with the environment and developing new habits and outlooks that will contribute to the sustainability of your community. In addition, findings from this study may help inform curriculum development for environmental education and community learning for the future.

The information collected in this study will be used as part of Amanda Lagace's thesis research project and may also be used in scholarly publications, such as being written up for publication in a research journal or presented at research conferences. Names of participants, teachers, schools or any identifying information in quotations used will be removed. No one except the researcher and the supervisor (Mark Hirschkorn) will be allowed to hear the interview recordings, or see the written copies of the interview. The information collected from students will be kept in a locked cabinet or on a password-protected computer. The audio recording will be deleted immediately after the study is done. The written copy of the interview (with all identifying information removed) will be saved for up to seven years after the interviews have been completed, at which point it will be shredded or permanently erased.

Your signature on this form indicates that you understand to your satisfaction the information provided to you about your child's participation in this research project, agree to providing your consent for a youth under your care to participate in the research project, and grant permission for a youth under your care to be observed, have their assignments analyzed for data analysis and to be interviewed.

Should you have any questions or concerns regarding this study, please do not hesitate to contact Amanda Lagace at L312F@unb.ca.

I, _____, the legal guardian of

(please print name)

_____, provide consent for

(please print name)

participation in the study described above.

_____ _____

Parent/Legal Guardian's Signature Date

Researcher:

Amanda Lagace, M.Ed. Candidate, Faculty of Education, University of New Brunswick.

Email: L312F@unb.ca

Supervisor:

Dr. Mark Hirschkorn, Professor, Faculty of Education, University of New Brunswick.

Phone: 1 506 447 3140, Email: mhirschk@unb.ca

If you would like to direct your questions to someone not involved in this research, please contact Ann Sherman at shermana@unb.ca/ 453-4862 or David Wagner at dwagner@unb.ca/ 447-3294.

This project has been reviewed by the Research Ethics Board of the University of New Brunswick and is on file as REB 2015-066.

APPENDIX H

INITIAL UNIT PLAN

Grade 10 Science
2 Week Unit Centered Around the Petitcodiac Watershed

Outcomes Covered:
318-4 Explain why different ecosystems respond differently to short-term and long-term changes
318-6 Explain how biodiversity of an ecosystem contributes to its sustainability
331-6 Analyze the impact of external factors on an ecosystem
331-7 describe how soil composition and fertility can be altered and how these changes could affect an ecosystem

215-4 Identify multiple perspectives that influence a science-related decision or issue
118-9 Propose a course of action on social issues related to science and technology, taking into account human and environmental needs.

Week 1

Monday, September 28th	Tuesday, September 29th	Wednesday, September 30th	Thursday, October 1st	Friday, October 2nd
- Collect permission slips. Explain 2-week plan to students. - Mind Map activity (1) - Global versus local problems – how do you feel? - Explore the history of the watershed and its definition. The Bay of Fundy – where does the water come from? - Group activity – make their own definition of a watershed with cards. Present findings. - You tube video https://www.youtube.com/watch?v=xUYWb8XTo58	- Guest Speaker from the Petitcodiac Watershed Alliance. - Speaking about water quality testing/ snap turtles and the fish trap behind JMA. - Speaking about the decision/ different perspectives to open the causeway 5 years ago. - Explain how to test the water.	- Visit the watershed. - Bring presenter with us. - Students will have a checklist of "what is a watershed" and will check off what they see. - Collect water samples. - Explore the space.	- Discuss the water quality of the river from our results. - Speak about nutrient cycling and species that depend on these nutrients. - Mention soil composition – nitrogen etc. - Video about pig farms, phosphorus and run off into watersheds that create algal blooms.	- Visit the watershed where the fish trap is located. - Experience the nature. - Students in small groups have to find something they don't know about (tree, plants, something in the water) and return on Monday with a short 2 minute blurb about what it is, what eats it, what it contributes to the ecosystem/ watershed. - Can take photos with their phones as they will not be taking things from the area.

Week 2

Monday, October 5th	Tuesday, October 6th	Wednesday, October 7th	Thursday, October 8th	Friday, October 9th
- 2-minute presentations from students about unknown object. - Google Earth – Where students live in proximity to the watershed. - Pollutants that can affect the watershed. - Read news article for homework.	- Discuss the life cycle of the Striped Bass – what it depends on and why opening the causeway helped them return to the river. - Video http://atlantic.ctvnews.ca/video?clipId=637921	- Discuss the Atlantic Salmon life cycle and what they depend on. Why has opening the causeway not helped them return to the river? - Clips from the Magic school bus episode. - What can we determine are the causal factors?	- Go to the River at a new location. - What can we do to help or support the Petitcodiac Watershed alliance? What can we do with in our communities to support them? ** Somehow get students to talk or present their knowledge to a group of community members.	- Closing remarks - Mind Map (2) - Questions

APPENDIX I

FRONT OF STUDENT PAMPHLET TEMPLATE

A Poem/ Picture By:

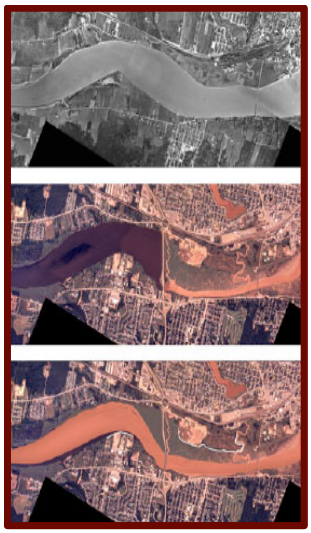
This is Our Back Yard

TITLE

SCHOOL
CLASS

INFORMATION BROCHURE

BY:



APPENDIX J

DAY ONE LESSON PLAN

B. Activities	C. Resources	D. Students are…
Administration/Homework - Attendance. - Collect permission slips. - Introduction to the unit plan and what the next two weeks look like. - A lot of what we will accomplish in the next 2 weeks will contribute to the pamphlets we will be making as a class to hand out to community members.	- Power point	- Listening - Handing in permission slips
1. Introduction/Set/Advanced Organizers/ Hook - Students are trying to figure out the riddles on the board (both answers are "water"). - Mind map activity, have students work independently and write in blue pen. - Discuss answers for mind map, have students write on it in red pen.	- Blank paper for each student. - Power point.	- Trying to figure out the riddle. - Filing out their mind map on a blank piece of paper.
2. Coached/Guide-Practice/Seatwork - Global versus local disasters – how does it make them feel? - Why is it better to focus on local disasters? What is right in our back yard? - What is a watershed? Talk about the Bay of Fundy.	- Power point	- Discussion
3. Clarifying/Creating-Understanding/Concept-Development - Group activity where they make their own definition of a watershed. - Students get into four groups. All groups get the same words and have to make up a definition for watershed. - Group 1 – area, land body, water, receives, runoff, land, drained, drops precipitation, joins, flow, particular, river, lake, stream, wetland. - Answers: An area of land surrounding a body of water that receives the runoff. OR The land area that is drained when drops of rain or precipitation joins others to flow to a particular, river, lake, stream or wetland. - Share as a class and put it on the board and compare it to the actual definition. - Students copy down the definition.	- Cards - Power Point	- Getting to groups based on the card they get. - Discussing with one another - Class sharing/ discussion
4. Closure/Summary - Review the lesson and what is a watershed. How does this apply to the Petitcodiac watershed? - Can we make a list of things that need to be in a watershed? Students write down the list of things that make a watershed a watershed. - Students come prepared to listen to a guest speaker the following day. - Not many people know what a watershed is.	- Video	
5. Homework - Nothing.		
6. Review/Assessment - Sharing watershed definitions.		

WATERSHED DEFFINTION ACTIVITY

Area	Water	Land	Body
Run off	Land	Drained	Drops
Receives	Precipitation	Joins	Flows
River	Lake	Stream	Wetland

Curriculum Vitae

EDUCATION

2016	**The University of New Brunswick** **Master's of Education (Curriculum Studies)** Thesis: Promoting Pro-environmental Behavior
2013	**The University of New Brunswick** **Bachelor of Education (Secondary)** Disciplines: Science and Social Studies
2012	**The University of New Brunswick** **Bachelor of Arts** Major: History/ Minor: Environmental Science
2008	**JMA Armstrong High School** **Diploma**

SCHOLARSHIPS & CERTIFICATES

2015	NBIF Scholarship
2015	Alternate candidate for SSHRC
2014	AMSI Education Scholarship
2012	Lloyd King Scholarship
2012/2013	Academic Scholarship
2012/2013	Dean's List
2012	Cecil Charles Rhodes History Prize
2011	Career Development Program Certificate

EMPLOYMENT EXPERIENCE

2016- present	**Anglophone East School District – Moncton, NB** **Position: Day-to-Day Supply Teacher & Tutor** - Executing lesson plans in a professional manner. - Managing students behavior within the classroom. - Exposed to an array of classrooms, students and school environments. - Providing one on one specialized tutoring for student's individual needs.
2015	**The University of New Brunswick – Fredericton, NB** **Position: Teaching Assistant** - Planned assignments and created rubrics. - Taught lessons at the university level. - Marked assignments, provided feedback and offered academic support to students as a teaching assistant.

2014 **Anglophone West School District – Fredericton, NB**
Position: Substitute Teacher
- Adapting to new teaching situations (students, schools & subjects).

2013-2014 **St Edmund's Catholic School – Dover, England**
Position: Full-time Secondary Science Teacher
- Created and taught independently and collaboratively while sharing resources within and between departments.
- Responsible for collecting and analyzing student data.
- Managed student conduct through implementing routines and expectations, recording student data, including escalating behavior when appropriate.
- Taught a range of age and ability levels and differentiated through tasks, homework, tests and instruction– very high to very low ability ranges.

CONFERENCE PRESENTATIONS

2016 CSSE (Canadian Society for the Study of Education) – Calgary, AB
"Preparing Canadian Teachers to Work Outside of Canada"

2016 Education Student Graduate Conference – Fredericton, NB

2016 Learn2Learn Conference – Rothesay, NB
"Promoting Community-based Learning"
"The Heart of Beginning Teachers' Learning"

2016 Thesis Dissertation – Fredericton, NB
"Promoting Pro-environmental Behavior: Community Environmental Education at Home"

2015 CATE (Canadian Association for Teacher Education) – Toronto, ON
"Preparing Canadian Teachers to Work Outside of Canada"