INCORPORATING PLACE AS A LEARNING INTENTION: A PLACE-BASED EDUCATION PROJECT TO BUILD ENGAGEMENT AROUND THE TEACHING OF GRADE 8 EARTH SCIENCE

by

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Abstract

In this project, the incorporation of *place* as a learning intention was examined to create place-based learning experiences that allow students to gain a better sense of place. The question of how to best design place-based learning activities is addressed through a review of literature on the elements of place-based education and place-based education design. Elements of environmental education, experiential learning, and connecting students with nature were examined along with inquiry based learning, and the role technology can play in place-based education. The research resulted in the creation of a grade 8 earth science unit plan, a website (http://kootsrootspe.weebly.com/), and number of connection/collaboration tools that are meant to encourage place-based learning activities in the West Kootenay region. The project is built primarily around connecting students and teachers with the geophysical landscape with the hopes that it will increase engagement around the teaching of intermediate earth science units.

*Keywords*: place-based education, environmental education, experiential learning, nature, geosciences, inquiry, technology
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Chapter 1 – Introduction

Background

Programs often exist in school environments because of a driving passion of a specific teacher or group of teachers. When those teachers leave the school, the program they built usually goes with them, or is taken over and changed to suit the needs of another teacher. When we see specific classes get pushed aside because of teacher expertise, or lack thereof, we are doing a disservice to our students. Students either miss out on the opportunity to explore their areas of interest, or must find alternative means, such as distance education, and miss out on authentic learning experiences. This appears to be more problematic in smaller communities where the number of teachers and diversity of expertise is limited.

In the early 2000’s, School District 20, Kootenay-Columbia, had a strong Geosciences program run by a number of passionate teachers. Earth Science 11, Geology 12, and Geography 12 were offered and included a 3 day field trip through the Kootenays and the Rocky Mountains, as well as an optional trip to Hawaii. When the teachers who offered these classes and ran these field trips retired, the classes went with them. Now Geography 12 rarely generates enough interest to run, Geology 12 does not run, and Earth Science 11 is only offered at one of the two high schools in the district and is usually taken by students who are looking to fulfill their Science 11 credit.

I originally found a passion for geosciences in grade 8. I followed this passion throughout high school and continued to follow it throughout university where I earned a Bachelor’s of Science in Physical Geography. One of the highlights of completing this degree for me was an overseas field school where the learning and inquiries were first hand, and I was embedded in the physical landscapes and culture. This is a learning experience I have reflected
on frequently since becoming an educator and I am always working towards creating this style of authentic learning environments for my students.

Throughout my district I am currently the only secondary school science teacher with an earth science background. I have experience working in both of the district’s high schools where I have noticed that earth science units throughout science 8-10 are being given the least amount of attention in comparison to the biology, physics, and chemistry units. Through collaborative groups and discussions with my colleagues, I have come to learn this lack of attention is for two reasons. The first is discomfort or lack knowledge with the curricular content; and the second is the struggle to find fun and engaging learning activities for students to partake in. My colleagues know I am an advocate for earth sciences in the district and through using me as a resource to support them they have unknowingly pushed me to explore and research how to create the best learning opportunities for our students.

This research and exploration of how to create beneficial learning opportunities within earth science units coincides with a personal 5 year goal I have to build a new geosciences program in the Kootenay-Columbia district. My vision for the geosciences program incorporates pieces from the programs that once ran with the incorporation of place-based learning, environmental education, and outdoor education experiences. As previously mentioned, there has been a loss of interest in the senior geosciences classes. I have a hunch that with little value and time placed on earth sciences units in the intermediate classes, students are not able to develop their knowledge or interest in this subject area and are therefore not enrolling in the senior level geosciences classes. I see growing engagement around this subject area, for both teachers and students, as my first step to achieving my 5 year goal. As the saying goes, you have to start somewhere.
With a new environmental education initiative across Kootenay-Boundary school districts, along with the current changes to the B.C. curriculum that include the incorporation of core competencies, I feel that the stage has been set for me.

The Kootenay-Columbia school district, along with 5 other Kootenay-Boundary school districts, has created the Kootenay-Boundary Environmental Education Initiative (KBEE). The initiative's vision is: supporting students’ understanding of their local environment, and the empowerment of thoughtful action, through outdoor, experiential, place-based and place-conscious learning. Some recent actions that the Kootenay-Columbia district has taken towards this initiative include the incorporation of outdoor professional development workshops, partaking in winter and spring “take me outside” days, and the formation of an environmental literacy group, which I have personal involvement in. The purpose of the group is to build capacity around environmental education within individual schools and across the district. My personal involvement in this group is to learn from other educators within the district, integrate more local outdoor and environmental learning opportunities in my own practice, help support teachers in looking for opportunities to connect outdoor and environmental education with their daily curriculum, and to promote more incorporation of the geosciences.

I believe that there is a perception that environmental education is strongly ecology based and all about environmental issues and implementing change. There is, however, a larger spectrum that allows for the inclusion of the physical environment. Environmental education is meant to create relationships with our natural world. This is a fact that I have reflected upon continuously throughout my research and it has forced me to think about why being an advocate for the geosciences is important for my current and future students. For me, it comes down to
building a strong sense of place and, therefore, I see place-based education (PBE) as the foundation to reaching my goal of growing more engagement around geoscience subject areas.

**Justification of Project**

The British Columbia Ministry of Education (2017) states that “deeper learning is better achieved through *doing* than through passive listening or reading” and has developed the core competency and concept-based learning models in order to engage students in authentic tasks that connect learning to the real world (British Columbia Ministry of Education, 2017). PBE naturally lends itself to this style of learning and evidence of this will be presented throughout the research done for this project. This style of education takes learning outside the four walls of the classroom and encourages creative and critical thinking, personal and cultural awareness, social responsibility, collaboration, and communication skills. These are all skills that support the development of the 21st century learner. PBE allows students to inquire about their local regions and build upon knowledge that is valuable to them in order to help students build a sense of place.

By using a sense of place as a curricular intention there “is the assumption that each of us has a relationship with the places where we live and that these places shape *who* we are and *how* we see our life” (Demarest, 2015, p. 8). Based on how much time students spend in their community or at home, I would argue that this is a fair assumption. In *How People Learn: Brain, Mind, Experience, and School* Bransford, Brown and Cocking (2000) state that students spend 53 percent of their time in the community or at home, 33 percent sleeping, and 14 percent at school. Based on these statistics Bransford et al. (2000) go on to suggest that schools need to develop better opportunities for students to connect classroom learning to other aspect of their lives.
Developing opportunities for PBE and using sense of place as a curricular intention is one way that classroom and everyday life connections can be made.

This style of learning is consistent with the type of learning that B.C.’s redesigned curriculum is aiming to achieve. The British Columbia Ministry of Education has created a Curriculum Parent Guide to give parents an overview of why a redesigned curriculum is being implemented and what they can expect their children’s learning to look like. The guide explains that “effective learning is not just memorizing, but being able to apply knowledge in real-world settings” (British Columbia Ministry of Education, 2017). Through PBE we can consistently connect the concepts students learn about with relevant and meaningful issues or activities that are happening in our neighbourhoods and communities to create connections that will be lasting and meaningful (Skoutajan, 2012).

The type of relationship one has with their surroundings will influence the way they care for, and contribute to, it. When somebody has a strong sense of place, this implies that they care for their surroundings and demonstrate responsible behaviour towards the landscape and living well in a community (Chawla, 1998; Haas & Nachtigal, 1998; Orr, 1992; Demarest, 2015).

Harvard sociologist, Robert Putnam, deemed the term ‘social capital’ to describe “the willingness and capacity of individuals to work for the collective good of a community” (Sobel, 2013b). In a community with high social capital you will see an abundance of social engagement amongst citizens which include a willingness to pick up trash along the roadside, run for civic committees and coach youth teams (Sobel, 2013b). “Increased social capital leads to a greater sense of personal well-being amongst citizens, which ultimately translates into economic well-being for their communities” (Sobel, 2013b, p. 52). In order to achieve such social capital a sense
of place must be strong. The education system can be used as a stepping stone to build such a relationship.

By fueling their curriculum with local questions, teachers offer their students opportunities to create a strong sense of appreciation and responsibility for their place (Elder 1999). There is a connection that can be built with nature and community that enhances students’ motivation and critical thinking skills (Smith & Sobel, 2010; Gosselin, Burian, Lutz & Maxson, 2016). This knowledge, and these skills, can be used to connect students to the rest of the world.

In *Place-Based Curriculum Design: Exceeding Standards through Local Investigations* Demarest (2015) states that “local places make up the whole of the world” (p. 13) and that “student understandings of the whole can be built from intimate learning experiences nearby” (p.13). By using PBE, teachers are striving to make learning more holistic for their students so they may come to understand that everything in the world is in a constant state of interaction (Chiarotto & Eric Jackman Institute of Child Study, 2011). The hope is that by enhancing a student’s learning experience with an intimate connection to the thing under study (Demarest, 2015) the big ideas are better retained and transferable to learning about the different corners of the world. A global understanding and knowledge of global relationships is best built from local learning opportunities that come from an education system that is grounded in the deep knowledge of a particular place (Barnhardt, 2008; Demarest, 2015; Greenwood, 2013). When students are given the opportunity to connect their learning with the complex, interconnected systems of their own corner of the world, they begin to develop a global understanding (which is one of the multiple learning outcomes listed for the redesigned curriculum in the Parent Curriculum Handbook).
The PBE opportunities presented by this project are primarily related to connecting students with their geophysical landscape. Understanding one’s geophysical landscape allows students to connect to their communities and build social capacity, as well as make global connections. However there are several more reasons why PBE opportunities built around the geophysical landscape are important.

The geophysical landscape determines the limitations and opportunities of any region. It determines what natural resources are available, where and how infrastructure can be built, settlement and weather patterns, the ecological environment, and what natural hazards pose a threat. It is one the biggest players in how we live our lives. The limited exposure to geosciences in our education system “minimizes the extent to which people can use geoscientific concepts, ways-of-thinking, and principles to make informed personal and societal decisions about the many Earth, environmental, and natural resources issues society faces currently and in the future” (Gosselin et al., p. 532). Understanding the workings of the earth is vital to understanding crucial global threats in the coming century: shortages of water, declining availability of fossil fuels, coastal inundation, the collapse of ecosystems, and global warming (Bralower, Feiss & Manduca, 2008). When students have the opportunity to study the natural phenomena of their place and observe the limitations, opportunities, and current threats posed to this environment they will better understand the workings of earth and global systems as a whole.

In an educational sense, geosciences are naturally cross curricular (Bralower et al., 2008). The traditional curricula, often named “rocks for jocks”, where students memorized dozens of fossils and minerals, are a dying breed (Bralower et al., 2008, p. 23). “New earth science curricula stress problem solving and active learning, taking advantage of the opportunities presented by real-time data of our planet” (Bralower et al., 2008, p. 23). Studying the
geophysical landscape can be used for the purposes of subject integrations as it connects many different aspects of study and leads to real world learning experiences. It can be taught beyond earth science units and senior geology classes and can easily be included as a topic area in the realm of environmental education.

In his book *Look to the Mountain: An ecology of Indigenous education* Gregory Cajete (1994) states that a “basic understanding begins with exploring how things happen. Observing how things happen in the natural world is the basis of some of the most ancient and spiritually profound teachings of Indigenous cultures. Nature is the first teacher and model of process. Learning how to see nature enhances our capacity to see other things” (p. 223). This project helps guide teachers in giving their students the opportunity to discover their natural world rather than just be told about it. When this style of learning occurs, the learning is long lasting and transferable, allowing students to become informed local and global citizens.

**Purpose of the Project**

The nature of Place-based Education (PBE) allows it to occur anywhere; rural, urban, and anywhere in-between. The diverse landscapes of the West Kootenay region of British Columbia offer excellent PBE opportunities within the realm of physical geography and geology. It is an area well known for its rural towns set amongst picturesque mountains, valleys, rivers, and lakes. It is an area that lends itself to outdoor enthusiasts as a high quality natural/outdoor playground.

Many students already have a connection to the land. I hear about their backcountry skiing adventures, hikes they took with their family over the weekend, and I see them skipping rocks along the river banks. They motivate me to create authentic learning experiences that let them further understand and explore a landscape that shapes their everyday life. District budgets and provincial funding make it difficult to explore beyond the region, or even beyond walking
distance of the schools. PBE pedagogy allows for the surrounding area closest to schools to be used as an outdoor classroom that focuses on the diversity of the region.

For this project I have incorporated knowledge of the local landscape and have built resources that teachers across the region can use as an engaging way to connect students with their surroundings. Resources include ideas to create real life connections within an intermediate geoscience unit in order to encourage a sense of place amongst local students. When I sat down and really asked myself why I want my students to know more about their geophysical landscape and why it was worth pursuing for my thesis/project it came down to the bigger picture of instilling a sense of place and a sense of wonder before they leave high school.

If you were a tourist amongst any of the small West Kootenay towns you would find that the residents of these towns are very proud of where they live and have a strong connection to their communities. You might hear slang terms such as *koots roots*; a term that depicts how proud the residents are to be from this area, *running on Kootenay time*; a phrase used to describe the low key lifestyle where residents are so embedded amongst the natural beauty that they do not care about the hustle and bustle of the rest of the world; and *Kootenay mountain hug*; the phrase used to describe the serenity one feels when surrounded by the local mountain ranges. Yet, you will find that many of the youth and adolescent citizens of this area are counting down the days until they can escape to the bigger cities. Although as a child and adolescent I spent the majority of my free time outside, it was not until I moved away that I really appreciated my *koots roots*. This is a common theme I continue to see amongst the youth of this region; there appears to be a piece of appreciation for the natural world missing. I believe that by creating opportunities for students to explore their natural world through this project it will allow them to form a stronger appreciation for the region before they leave high school.
Research Question

I believe that the redesigned curriculum has opened the doors for teachers to be more creative in their lesson design, and has given teachers the opportunity to explore new styles of teaching and learning. There is an expectation that students will be given the opportunity to investigate topics that are important and of interest to them. Students need to be able to make a connection between their daily lives and the subject matter being taught for learning to be meaningful and long-lasting. I believe one of the best ways to achieve this is to connect their students with their place by incorporating place-based instructional practices. I also believe that if students are given the opportunity to learn outside the walls of the classroom, and connect with the world around them they will begin to develop a stronger sense of place.

These beliefs, along with my passion for the geosciences, has led me to the following research question: If I incorporate place as a learning intention, what kinds of place-based learning experiences could I create to increase engagement around the teaching of intermediate earth science units for local teachers?

Overview of Study and Project

Throughout this study I will discuss the benefits of place-based learning, and the elements for consideration when designing place-based education activities. The connection between place-based learning, environmental education, experiential education, and connecting students with nature are examined. Design aspects, such as inquiry based learning, and incorporating technology into place-based learning design are also discussed.

As a result of my research I have created multiple pieces to help create engagement around the teaching of the earth science 8 unit, and connect place-based educators throughout the region. All aspects of this project come together in the form of a website.
The website consists of four different sections for teachers. First, there is a list of resources I have used throughout my research of place-based education, as well as a number of useful websites with suggestions for place-based learning activities. Second, there is the grade 8 earth science unit plan and a link to a number of lessons (which I have titled Geology in your Backyard) that I created about the local landscape. Third, there is a blog page which will be used to share my experiences with local educators. Fourth, is the contact page which leads viewers to my twitter account (@kootsrootspbe) which will also be used to connect with local and distant educators.

**Definition of Terms**

**Place-based Education:** Place-based education is an approach to learning that immerses students in any aspect (ie. geography, culture, history, environment, politics, and economy) of their place by actively exploring the schoolyard, neighbourhood, community, and/or region.

**Sense of Place:** To have a sense of place is to have a personal attachment and appreciation for the place in which you live. Sense of place can be held by a single person or can be felt by whole communities. Those with a strong sense of place are more willing to protect, and engage with, their surroundings, than those without. Having a sense of place is often referred to as place attachment.

**Environmental Education:** Environmental Education encompasses so many different workings of the world that it has become difficult to define. It naturally allows itself to be interdisciplinary which allows students to acquire knowledge of, and awareness for, all aspects of the natural world. It requires actively exploring the workings of an environment, as well as the
impact humans are having on such systems. Environmental Education should start locally to allow students to gain a global perspective. It encourages sustainability and stewardship.

Authentic Learning Experiences: In simplest terms Authentic Learning Experiences is real life learning. It is used to describe instructional approaches that encourage students to apply knowledge to real-life situations. In

Geosciences: Any science that is concerned with the earth (geology, earth science, geophysics, geochemistry, physical geography).

21st Century Learning: Learning that allows students to develop the attitudes and skills that are being favoured in today's workplace. The critical skills and attitudes laid out by the B.C. Ministry of Education are: communication; creative and critical thinking, personal awareness, identity and responsibility; and social awareness and responsibility. A 21st century learning environment/activity ensures students are gaining and aware of at least one of these skills.
Chapter 2 – Literature Review

Introduction

*I hear and I forget. I see and I remember. I do and I understand.* – Confucius

While surveying literature on place-based education I came across the above quote from Confucius. It served as a reminder of the style of education that I have found most valuable for myself as a learner. Learning is doing. Earth science is one of the more difficult subject areas to create hands-on laboratories for and my passion has pushed me to search for more valuable ways for students to connect with the subject.

Throughout my survey of literature I have found that place-based education is one of the possible solutions to my problem. PBE allows students to connect with their surroundings, not just by seeing it, but by actively investigating the workings of their environment. I have found that there is a long list of benefits associated with this style of learning that reach beyond instilling a sense of place.

The main themes related to my research are 1) place-based learning, which includes looking at the importance of environmental education, connecting with nature and experiential learning, and 2) place-based education design, which includes research on inquiry based learning and how technology can enhance this style of learning.

Place-Based Learning

Teaching is a creative process and “with the pedagogical pendulum forever swinging to and fro, schools are constantly redefining best practices” (Skoutajan, 2012, p. 36). However, when redefining best practices the end goal seems to remain relatively the same; to ensure students have the skills required to succeed in a forever changing world. So if our goal is to create students who are critical and creative thinkers, communicators and collaborators, and
problem solvers who can adapt to the new parameters of time, space, and resources then we need to align our teaching practices more towards real, authentic and meaningful experiences (Skoutajan, 2012; B.C. Ministry of Education, 2017). “When a classroom is centered around authentic experiences we are laying the foundation for a future generation of engaged students ready to innovate and experiment to generate the “good ideas” to take on the known challenges of the future” (Skoutajan, 2012). Place-based education is one style of pedagogical practice the leads to this style of learning and student success.

Place-based education “teaches about both the natural and built environments” (Sobel, 2013b). It takes into account the history, folk culture, social problems, economics, politics, aesthetics, familial, ceremonial, spiritual, scientific and environmental aspects of a community (Semken & Freeman, 2008; Sobel, 2013b). One of the core objectives of place-based education is to look at how each of these facets interact with and shape each other, and the ways that individuals and communities know and experience it (Semken & Freeman, 2008; Sobel, 2013b).

David Sobel, one of the leading philosophers and writers of place-based education, states that place-based education is “a simple proposition really. Bring education back into the neighborhood” (Sobel, 2013b, p. 11). “Get teachers and students into the community, into the woods, and on the streets - closer to the beauty and true grit” (Sobel, 2013b, p. 12). By taking students outside the four walls of the classroom to teach any concept or subject area, students get the opportunity to explore the facets of their local community and make real world connections. It is these “relevant and authentic connections that hard-wire learning and help students grasp concepts embedded in our school and curriculum” (Skoutajan, 2012, p. 36). Other benefits of emphasizing hands-on, real world experiences include academic achievement, an enhanced appreciation for the natural world, an increased commitment to being a contributing citizen,
When teachers use the surrounding environment as a learning intention, students have the opportunity to first connect with, and understand, their own environment before being asked to make larger connections. All people “attach value to places and experiences that are familiar and relevant to their everyday lives” (Chiarotto & Dr. Eric Jackman Institute of Child Study, 2011, p. 39). “Therefore, when teachers afford students regular opportunities to get to know the surroundings of their school, they help to foster students’ sense of place and their understanding of the relevance of community in their lives (Chiarotto & Dr. Eric Jackman Institute of Child Study, 2011, p. 39).

In their study that looks at sense of place as a measurable learning outcome of place-based science teaching, Semken and Freeman (2008) claim that “place and sense of place are concepts that have been defined and characterized thoroughly enough to be accessible to science educators. Sense of place - meaning and attachments, cognition and affect - is in essence what place-based education is tended to teach” (p. 1054). Semken and Freeman (2008) explain place-based science as focusing on local and regional environments and synthesizing different ways of knowing them.

Semken and Freeman’s definition of place-based science aligns with Sobel’s description of place-based education, where there is an emphasis on learning about the natural environment. For this design project the natural landscape, specifically the geophysical phenomena, are being used to help build a better sense of place. Although building a sense of place is the primary objective of the project there are many other significant gains that come from place-based learning. In order to better understand these gains, as well as how to best use
environmental education as a learning intention, I felt it necessary to explore three different avenues that are commonly associated with place-based education: environmental education, the benefits of connecting students with nature, and experiential learning.

**Environmental Education**

The term ‘environmental education’ is a complicated one. In my experience the term environmental education is often limited to studying ecology and human impact on the biosphere. Environmental education, however, is more complex than that; environmental education is a broad umbrella that encompasses local and global relationships between food, water, energy, air, land, and the interaction of all living things (Glenn, 2000; Monroe & Krasny, 2015; Ontario Ministry of Education, 2009). It requires systems thinking which involves drawing on many disciplines such as science, math, history and political science in order to understand cycles, feedback loops, resource flows, and the interactions of different events over time (Monroe & Krasny, 2015; Sobel 2013b).

No matter the definition, the purpose of environmental education remains relatively the same; to create “educational opportunities for learners to gain knowledge, attitudes, and skills to understand and adopt action that enhance the environment” (Monroe & Krasny, 2015, p. 30) for a more sustainable future. In order to achieve this, educators must embrace environmental education as the interdisciplinary subject it is.

Most environmental education in schools is being taught as a separate unit and lasts only a matter of weeks or months where depth is being sacrificed for breadth and there is little opportunity for immersion in the landscape (Sobel 2013b). When educators embrace environmental education as a “chameleon that changes color in various contexts” (Monroe & Krasny, 2015, p. 30), it becomes more of a pedagogical practice that reflects best practice in
education, rather than a separate subject area. When environmental education reflects best
practice in education it is interdisciplinary, learner-centered, experiential, place-based, project-
based, requires active engagement of the student, and is an opportunity to build lifelong learners
who have a sense of place (Glenn, 2000; Monroe & Krasny, 2015).

Building a sense of place is just one of the gains in student achievement that can be noted
from incorporating environmental education into classroom practices. Environment-based
Education: Creating High Performance Schools and Students is a report that outlines many other
students’ achievements of environmental education. The report was commissioned by the
National Environmental Education & Training Foundation (NEETF) and written by the North
American Association for Environmental Education (NAAEE) and consists of five case studies
from schools across the United States, as well as two Environmental Education programs. Each
school and program is using a number of different environmental education approaches to
enhance student motivation and improve academic performance in all, or most, subject areas.

Some of the academic findings of the study include: improvement in reading and math
scores, in some cases this improvement was quite drastic; an overall better performance in
science and social studies; and the ability to make connections and transfer knowledge (Glenn,
2000, pp. 3-4). The report justifies these findings with quantitative data showing percentages of
students passing specific testing in relation to statewide percentages, percentage point increases
compared to previous years, and comparing ACT test scores of those who took part in some form
of environmental education vs those students in traditional programs. The study also found that
classroom discipline problems declined and that students began learning at higher levels.

“Improved classroom behavior was observed by virtually all of the teachers in the schools
studied” (Glenn, 2000, p. 4) as disruptive students found the hands-on approach more engaging.
Teachers from the studies found that environmental education is a way to reach every child and those students who were previously performing at low academic levels “came alive” (Glenn, 2000, p. 4).

One of the main arguments of the report is that now is a good time to mainstream environment-based education. The report argues that “the environment as a subject is naturally-interdisciplinary, place-based, and lends itself to inquiry-based learning and team teaching” (Glenn, 2000, p. 13). Therefore using the natural environment aids in integrating the curriculum which results in students becoming more aware of their surroundings and making real world connections where they are transferring concepts between familiar and unfamiliar contexts (Glenn, 2000).

There is an “increasing complexity and interconnectedness of global environmental issues” (Monroe & Krasny, 2015, p. 51) facing the world today. By incorporating all the best practices that come along with quality environmental education we are providing students the opportunity to build the necessary attitudes and skills needed for a sustainable future. However, if we want our students to flourish, to become truly empowered, then we must first allow them to love the earth before we ask them to save it (Sobel, 2013b). This idea, of connecting students with the natural world, is further explored in the next section of this literature review.

**The Benefits of Connecting Students with Nature**

Richard Louv is a child and nature advocate, a journalist, and the author of nine books. One of his books, *Last Child in the Woods: Saving our Children from Nature-Deficit Disorder*, Louv uses research from experienced environmental educators, environmentalists, physicians, conservationists, teachers, along with anecdotes and storytelling from neighbours, friends, and
university professors, to introduce the world to the concept of nature-deficit disorder and magnifies the role that nature plays in our physical and mental well-being.

Nature-deficit disorder is the term Louv uses to “describe the human costs of alienation from nature, among them: diminished uses of senses, attention difficulties, and higher rates of physical and emotional illnesses. The disorder can be detected in individuals, families, and communities (Louv, 2005, p. 34). In *Children and Nature 2008: A Report on the Movement to Reconnect Children to the Natural World*, the impacts of nature-deficit disorder are further explored and the list of negative impacts is extended to include: childhood obesity, childhood diabetes, behavior disorders, higher stress and aggression, reduced cognitive and creative capacities, lower school achievement, and diminished productivity (Charles, Louv, Bodner & Guns, 2008).

Children benefit immensely from being exposed to nature. Not only does being outdoors encourage creative play and enhance the use of sense but “a growing body of evidence indicates that direct exposure to nature is essential for physical and emotional health” (Louv, 2005, p.34). Louv goes on to suggest that “the exposure to nature may reduce the symptoms of Attention Deficit Hyperactivity Disorder (ADHD), and that it can improve all children’s cognitive abilities and resistance to negative stresses and depression” (Louv, 2005, p. 34). The 2008 report put out by the Children and Nature Network also explores the benefits of exposing children to nature and add enhancement of cognitive flexibility and creativity, higher self-esteem, more self-discipline, and higher school achievement to the list of positive side effects (Charles et al, 2008).

Louv (2005) believes that environmental education is often out of balance because students are lacking direct experience with nature. Environmental education often consists of learning about global issues and looking at the doom and gloom of the world, rather than
experiencing what is happening in our backyards. This dissociation is leading children to associate nature “with fear and apocalypse, not joy and wonder” (Louv, 2005, p. 133). Sobel tackles this exact issue in *Beyond Ecophobia: Reclaiming the Heart in Nature Education*.

Sobel (2013a), previously introduced as a leader in the development of PBE pedagogy, fears that by filling our classrooms with scenarios of environmental abuse we will end up distancing children from the natural world, rather than connecting them with it. He believes that what is emerging is a strange kind of schizophrenia, where children are using electronic media to connect with endangered animals and ecosystems around the globe instead of the outside world closest to them (Sobel, 2013a). Just as a dissociation between math and the real world can create a phobia, the dissociation of students with the natural world is also creating a phobia. Sobel defines this fear of ecological problems and the natural world as *Ecophobia* (Sobel, 2013a). Ecophobia includes the fear of large globally known issues such as ozone depletion and rainforest destruction and also includes just the fear of being outside (Sobel, 2013a).

Sobel (2013a) recommends a balance between consideration for developmental stages from K-12 and carefully choosing environmental curricula in order to cure Ecophobia. He argues that during childhood (which he defines as ages four to seven), curricula should be centered around developing empathy for, and with, the natural world. Elementary years (ages eight to eleven) should be where exploration of local surroundings takes precedence. Early adolescence (twelve to fifteen) is where social action and global learning should begin to take place (Sobel, 2013a).

Studies show that “any adults with environmental awareness had some transcendent experience in nature when they were children (Charles et al., 2008, p. 10). So, before we can expect students to develop the knowledge and skills needed for a sustainable future, we first must
connect them with their place; we must give students the “opportunity to bond with the natural world, to learn to love it and feel comfortable in it, before being asked to heal its wounds (Sobel, 2013a, p.13). One way to build this connection with nature is through different avenues of place-based learning that include actively exploring the nearby world. This type of place-based learning is a combined style of environmental education and experiential learning, which is further explored in the next session.

**Experiential Learning**

Experiential learning is best described as a process where the source of knowledge is no longer a textbook but rather a continuous exchange between experiences and reflections (Chiarotto & Dr. Eric Jackman Institute of Child Study, 2011). The goal is to have students actively engage with their surrounding environment through the use of their senses (Charles et al., 2008, p. 10). This does not need to be a grand excursion to a distant location, a walk around the school’s community is enough to awaken curiosity (Charles et al., 2008, p. 10). By simply taking a class outside, students have the opportunity to use their whole environment and experience the complexities of their natural surroundings (Foster & Linney, 2007).

By using their whole environment as a source of knowledge and continually reflecting on their experiences, students begin to reassess their previously held beliefs which, in turn, influence their experiences and behaviour in real-life situations (Chiarotto & Dr. Eric Jackman Institute of Child Study, 2011; Dewey 1938; Foster & Linney, 2007). So by taking students out of the classroom to experience their environment in order to learn about relevant and meaningful issues or phenomena, the connections become more lasting and more meaningful (Skoutajan, 2012). With lasting and meaningful connections comes a kinship with the environment which can be deemed as having a strong sense of place.
In 2007 The Council of Outdoor Educators of Ontario, a volunteer-based organization that promotes high-quality outdoor and experiential education (OEE), put out a research summary titled *Reconnecting Children Through Outdoor Education*. The goal of the summary is to provide evidence as to why outdoor and experiential education should become an essential part of publicly funded education (Foster & Linney, 2007). As part of the summary the connection between OEE and place-based education is explored. The overlapping attributes of the two are summarized as:

- They use students’ whole environment as a source of knowledge
- They use the local community and local environment to teach numerous curricula
- They use the outdoors - both natural and human made - to promote learning from direct experience
- They both encourage students to make links between their studies, real people, and their communities. (Foster & Linney, 2007)

“Together OEE and place-based education relate curricula to real-life situations and the complexities of our natural surroundings (Foster & Linney, 2007, p. 13). When students are exposed to the style of learning associated with OEE and place-based education, they benefit academically, socially, and emotionally.

Foster and Linney (2007) state that there are multiple academic benefits when students experience learning in their local environment. Academic benefits include increased engagement and enthusiasm for learning, better language skills, a greater sense of pride and ownership of accomplishments, and a variety of increased critical thinking skills (Foster and Linney, 2007). Social and emotional benefits are also explored and include: self-motivation, independence, self-confidence, effective communication, cooperation, decision making, problem solving, reduction
in the symptoms of Attention Deficit Disorder, as well as leadership skills and social competence (Foster and Linney, 2007).

When students are given the opportunities to be successful and grow confidence in themselves and in their learning, the door is opened to create positive and lasting connections. When these connections can come back to the natural environment we begin to see informed and proactive students who have the knowledge and skills that are essential for a healthy and sustainable future (Foster and Linney, 2007).

**Designing Place-Based Education**

In the Goals and Rationale of the redesigned B.C. science curriculum, there is an emphasis on a place-based approach to learning and a better understanding of the natural world (British Columbia Ministry of Education). Through their science education, students should be given the opportunity to experience their local environment and “develop place-based knowledge about the area in which they live” (British Columbia Ministry of Education). This provides a basis for a respectful, lifelong, harmonious, relationship between students and the natural world (British Columbia Ministry of Education). In order to accomplish this style of learning teachers must create opportunities for students to relate the curricula to their local environment.

Amy Demarest is a leader in place-based curriculum design. In her book *Place-based Curriculum Design: Exceeding Standards through Local Investigations* Demarest uses the term “engaging the local” to explore different ways teachers can create authentic and local learning opportunities for students. Throughout the book four different curricular elements of local learning are explored:

1. Personal connections are the foundation of all learning
2. Local investigations deepen subject understanding
3. Local investigations build holistic understanding of places
4. Local investigations build opportunity for civic engagement (Demarest, 2015).

In an effort to better understand and allow for application of these four elements, Demarest follows up by posing them as questions:

1. How can I better relate school to my students’ life experience?
2. How can I help students better understand how this big idea works in the real world?
3. How can I help students better understand this place?
4. How can I help students better understand themselves and their possible futures? (Demarest, 2015).

These two lists represent the complexity of designing local learning and teachers must create their own answers to these questions (Demarest, 2015).

In answering these questions educators must take into account what is available to them. A teacher’s vision of place-based learning is going to develop from a mix of theory and practice, as well as what their local surroundings has to offer (Demarest, 2015). The environment surrounding individual schools varies dramatically as you move from town to town, city to city, province to province; therefore the term environment and exploring the local may mean different things at every school (Lieberman and Hoody, 1998). In an attempt to answer Demarest’s four questions listed above, educators must take into account their specific locale, resources and student needs (Lieberman and Hoody, 1998). They must also incorporate new ideas, readings, conversations with colleagues, personal values and experiences, and professional training (Demarest, 2015).
In Place-Based Education: Connecting Classrooms and Communities, Sobel (2013b) creates an analogy between designing place based pedagogy and the finches of the Galapagos Islands. He states that “curriculum undergoes speciation when it adapts to local conditions” (Sobel, 2013b, p. 17). He believes that if educators are attentive to the particularities of their place, including climate, community, environment, and parental concerns, then a unique species of curriculum will evolve (Sobel, 2013b). By taking the necessary steps, such as answering Demarest’s four questions when designing learning opportunities, and adapting the curriculum to the local conditions, educators will allow for completely different and unique learning finches to evolve (Sobel, 2013b). I believe the flexibility that comes along with the redesigned B.C. curriculum and the emphasis on place-based learning in the realm of science, allows for these new learning finches to evolve. Just like all aspects of good teaching, it takes time, collaboration, creativity, and a willingness to take a risk.

When Demarest’s four elements of local learning, along with their corresponding questions, are taken into consideration when designing place-based learning opportunities, we begin to see the isolation that exists between schools and students’ everyday life disappear. Students are given the opportunity to build and explore questions they have about their place. When this type of approach is used, ongoing connections are built, and even further questions about the places in which we live are developed (Demarest, 2015). When students participate in this style of learning, where the big ideas and big questions focus on a local answer, the remote ideas that once came from a textbook become real-world, applicable knowledge (Demarest, 2015). So while place-based education heavily relies on the local environment, one also must also consider the importance of asking good questions.
Asking good questions, both on the teacher’s and students’ part, becomes an important part of making lasting and meaningful connections. Therefore, when designing place-based education, educators must take into account that there is a degree of inquiry that needs to be incorporated. To use inquiry, students must be given the chance to experience hands-on learning, or experiential education (see previous section), as well as gain new knowledge through the use of resources. Because many schools are moving away from the traditional textbook these resources often incorporate the use of technology. In the next two sections the use of inquiry in place-based education is further explored, followed by a brief look at how technology can enhance place-based education.

**Inquiry**

“Imagine children who continually question why things look and function the way that they do. Where their natural sense of wonder is at the centre of their learning and informs the direction it will take. Where children’s formative conceptions are welcomed as opportunities for idea improvement. Where knowledge is dynamic, collectively constructed, and informed by many sources instead of ensconced in a single textbook, adult or classroom. Where information is investigated, analyzed, and negotiated between students. Where children are invested in the learning process because they have been given a key role in directing how and what they will learn. Where children learn from each other. Where the teacher learns from the children. This is Inquiry-based Learning.”

(Chiarotto & Dr. Eric Jackman Institute of Child Study, 2011, p. 1)

Given that place-based education largely consists of investigating the local environment, it seems natural to include some or all aspects of inquiry-based learning. In inquiry-based learning, teacher’s step away from the front of the classroom and take on more of a facilitator
role. They worry less about covering the curriculum and focus more on the process of student learning (Chiarotto & Dr. Eric Jackman Institute of Child Study, 2011). Teacher’s need to be actively involved in the learning process with their students. *Natural Curiosity: A Resource for Teachers. Building Children’s Understanding of the World through Environmental Inquiry* examine the responsibilities of a teacher during inquiry-based investigations and suggest the following key roles:

- Model Inquiry-based thinking processes for students
- Plan in a flexible and responsive way
- Prompt students into “design mode”: Encourage them to suggest how to investigate their ideas
- Know and focus on broad key concepts rather than Specific Expectation
- Establish a culture of psychological safety
- Facilitate frequent Knowledge Building Discourse
- Document and reflect on student questions and ideas
- Guide students to a variety of different resources and experience that will assist them in the investigation of their questions
- Provide opportunities for students to express what they know in multiple ways
- Be on the lookout for teachable moments arising from problems of understanding
- Be a co-learner: Don’t be afraid to say to students, “I don’t know. Let’s find out!” (Chiarotto & Dr. Eric Jackman Institute of Child Study, 2011 p. 18).
This list highlights the importance of a teacher’s willingness to learn with their students as well as the need to be flexible and resourceful.

Inquiry involves asking good questions and embracing student curiosity. While inquiry may look different in every school or classroom, three considerations should always be taken into account for place-based inquiry to occur. First, students’ questions should drive the learning process forward (Chiarotto & Dr. Eric Jackman Institute of Child Study, 2011). So while there may be an essential question posed around a subject area, as there is in this design project, students should be given the opportunity to branch off from that question and follow a path that interests them in relation to the class topic. Second, students must be given the opportunity to deepen their understanding of the topic by seeking evidence through hands-on and real-world experiences both inside and outside the classroom (Chiarotto & Dr. Eric Jackman Institute of Child Study, 2011; Demarest, 2015). Third, students need time to reflect, connect, and revise. This leads to a process where more questions may be formed and students become more curious about their place.

The learning that needs to happen throughout place-based inquiry cannot solely rely on experiences. Students must be able to access materials and resources to drive their learning forward. Being able to find appropriate resources to help facilitate their learning is an important skill required for inquiry investigations. The majority of these resources are now found online and/or through other sources of technology. Students need access and the skills to navigate these resources, making technology an important part of inquiry and place-based learning.
Technology

Richard Louv (2005) suggests that the link between technology and current educational trends is part of the nature-deficit problem younger generations are facing. Whether or not this is true, the use of technology in education is an inevitable part of our future. We cannot just expect our students to leave, what is now a central part of their lives, at home. What needs to occur though is a balance between outdoor experiences and proper use of technology for the purposes of enhancing the educational experience. When technologies are used appropriately they bring more potential to both indoor and outdoor learning experiences (Hougham & Kerlin, 2016).

Technology has the capacity to create new opportunities for curriculum and instruction by bringing real-world examples into the classroom (Bransford et al., 2000). In a time where budgets and logistical constraints make it difficult to give students experiences through field trips and labs, technology offers a solution (Bransford et al., 2000). Through computer simulations, interactive videos and communication systems (just to name a few), technology allows students to experience the world far beyond their surrounding environment. Teachers can use locally made videos, pictures, google earth, and other resources to help students further inquire about their place.

Bransford, Brown and Cocking discuss multiple ways technology can be used to help meet the challenges of establishing effective learning environments. “Technology allows for videos, demonstrations, simulations, and internet connections to concrete data and working scientists” (Bransford et al., 2000, p. 243), allowing the real-world to enter the classroom. It also provides scaffolding which “allows learners to participate in complex cognitive performances, such as scientific visualization and model-based learning, that is more difficult or impossible without technical support” (Bransford et al., 2000, p. 243). It also allows for the building of communities, whether it be teachers, students, parents, or administrators (Bransford et al., 2000).
The role of the technology in the classroom should allow for a connection between human cognition and practical applications, where it allows learners to do more complex tasks and engage in more advanced thinking and problem solving (Bransford et al., 2000). There are many websites, hardware, and mobile applications (apps) specifically designed for education, allowing for this type of connection to be made.

Hougham and Kerlin explore different technologies that are bringing more potential to outdoor experiences (2016). They embrace the fact that both students and teachers are bringing technology into the classroom with them and seek to advance the uses of these tools. They explore hardware, app, software, and field data considerations and make recommendations of innovative technology that teachers can explore to enhance, not obstruct, outdoor learning experiences.

When incorporating the use of technology, it is important to remember that “technologies are tools that help you meet your learning objectives and are rarely a lesson or activity alone” (Hougham and Kerlin, 2016, pg. 6). Technology has much to offer environmental and place-based educators, however time must be invested in reviewing and selecting such technologies so that they are truly enhancing the experience and not becoming the experience themselves (Hougham & Kerlin, 2016). So when incorporating technology into place-based education, teachers must first acquire the skills to use any hardware, software or apps before they can expect their students to use it.

In place-based inquiry and science learning environments, we are asking students to document their learning and findings. If we do not allow for even the simplest forms of technology, such as word or excel documents, or even photos to be used, then we are hindering their ability to demonstrate and reflect on their learning. Technology has allowed to us to reach
the indoor classroom from outside its walls and this is something educators should choose to embrace and teach as a useful skill set if we truly wish to set our students up for success.

   On paper, I think all of this makes place-based education design appear complex and difficult, where in practice it actually feels more creative and purposeful. I agree with Sobel’s statement about place-based education and design: “It’s a simple proposition really. Bring education back into the neighborhood...Get teachers and students into the community, into the woods, and on the streets-closer to the beauty and true grit.” (Sobel, 2013b p. 12)
Chapter 3 – Rationale for my Project Design

January 20th, 2017: I’m sitting at a north facing window in the Selkirk College library. The mountains and hills are dusted with snow and the clouds are hanging just below their peaks. I can just sneak a peak of the Columbia River meandering its way through the steep valley and around the bench that the college is built upon. It looks majestic out there today; even without the sun. I love this place.

I can still picture the view I had when I wrote the above piece in my researcher’s journal. It reflects the appreciation and knowledge I have of the place that I live. It has also served as a constant reminder throughout this process of the vital role the landscape plays in the lifestyle of the Kootenay region. My appreciation for this region comes from both experience and knowledge.

I was lucky enough to grow up in a family that valued outdoor experiences; not every student I see has that opportunity. I would not say, however, that my knowledge of the region was acquired throughout my K-12 schooling; so how do I change that for my students? How do I give them some experience and some knowledge? How do I create even the tiniest bit of the feeling I had when I was looking out that window that day? In other words, how do I help my students acquire the knowledge and experiences that help foster a sense of place? This question became the driving force throughout this project design.

There are two pieces to this project that are brought together in the form of a website: http://kootsrootspbe.weebly.com. The first piece of the project is a locally structured unit plan for grade 8 earth science (Appendix A), which includes a series of lessons (titled Geology in Your Backyard, Appendix B) that allow students to build knowledge of the local landscape. The second piece is the website itself, along with a twitter account (@kootsrootsPBE) that both serve as a connection point for educators who are interested in place-based, environmental, and outdoor education. The two pieces designed reflect the literature that was surveyed for Chapter 2
as well as my research question: If I incorporate place as a learning intention, what kinds of place-based learning experiences could I create to increase engagement around the teaching of intermediate earth science units for local teachers?

**Unit Plan Design**

> Then one day, with a happy splash that shook the weeds, the frog jumped into the pond.

> “Where have you been?” asked the fish excitedly.

> “I have been about the world - hopping here and there,” said the frog, “and I have seen extraordinary things.” - Leo Lionni (1970)

In the children’s book *Fish is Fish* by Leo Lionni (1970), a small fish and a tadpole become friends. The tadpole eventually grows into a full size frog and hops off to discover the world. When he comes back to the pond he tries to explain to the fish some of his sightings, such as birds, cows, and people. The fish forms colourful images in his head of fish with wings, fish with four legs and horns, and fish walking on two feet. The fish can only guess what these creatures look like based on knowledge he has, which is limited to the pond. The fish’s ability to grow his knowledge of the outside world would be expanded if one of two things could happen: either the fish would need to find a way to safely and realistically leave the pond or the frog would have to start bringing what he could from the world to the pond’s edge.

This unit design does exactly those two things. First, it takes the students out into their communities to experience their surroundings and build knowledge beyond facts in a textbook. Second, it brings local knowledge and images of the region into the classroom.

As previously mentioned my background is in physical geography and earth science so I decided to build a unit plan around the grade 8 earth sciences unit. The big idea for this unit is
The theory of plate tectonics is the unifying theory that explains Earth’s geological processes (B.C. Ministry for Education, 2017). Throughout this unit students are expected to know:

- Plate tectonic movement
  - Types of plate movement
  - Plate boundaries
  - Earthquakes and volcanoes
- Major geological events of local significance
- First Peoples knowledge of:
  - Local geological formations
  - Significant local geological events
- Layers of earth

The unit design consists of a number of lessons formed around two essential questions that incorporate the big ideas set out by the B.C. curriculum while keeping the learning focused on the local landscape. Within the unit I have incorporated a series of lessons, titled Geology in Your Backyard, which give students a small glimpse of some of the geological aspects of the West Kootenay region.

**The Lessons**

While designing the lessons that make up this grade 8 earth science unit, I took into account the foundations of place-based learning explored in the first part of chapter 2; environmental education, experiential education, and connecting with nature. Students rely on the local environment as a source of knowledge and take part in a series of lessons that encourage systems thinking. They have the opportunity to explore the complex relationships that
exist between the geosphere and hydrosphere, while thinking about how these systems influence the way we live. Students are also directly exposed to nature where they are encouraged to use a number of senses to actively engage with their surroundings.

In designing the lessons I also heavily depended on Demarest’s four curricular elements or local learning and their corresponding questions:

1. Personal connections are the foundation of all learning (How can I better relate school to my students’ life experience?)

2. Local investigations deepen subject understanding (How can I help students better understand how this big idea works in the real world?)

3. Local investigations build holistic understanding of places (How can I help students better understand this place?)

4. Local investigations build opportunity for civic engagement (How can I help students better understand this place?) (Demarest, 2015).

There are two essential questions of the designed unit. The big idea essential question based on the curriculum is How does the earth’s surface change? The second essential question takes the big idea into account but creates a local focus by asking How was this land formed? (Demarest, 2015). The introductory and formative lesson ideas explore these essential questions through further questioning and inquiry, direct outdoor experience, specific investigations, and laboratory assignments.

The introductory lesson is setup to achieve two goals: activate prior knowledge and get the students outdoors. To activate prior knowledge students first brainstorm what they know about the two essential questions. Finding out what students already know is essential to good teaching (Wiliam and Leahy, 2015). Learning is enhanced when teachers pay attention to the
knowledge and beliefs held by individual students or the class and then use this knowledge to guide their instruction, and monitor how new learning changes previous conceptions throughout the unit (Bransford et al., 2000). So while I have created a template and series of lessons for this unit I will strongly encourage teachers to make appropriate changes based on class knowledge, interest, and ability.

The second part of the introductory lesson involves taking students on a walk to investigate nearby evidence of how the earth’s surface has changed; looking for evidence from cracks in the sidewalk to visible faults in the mountain side. This begins the students’ investigation of place. In Chapter 2 I discussed Sobel’s three recommended stages for exploring environmental curricula. One of these was the bonding with the earth stage from age eight to eleven where exploration of the local surrounding takes precedence (Sobel, 2013a). He suggests activities for this stage could include following streams and pathways or exploring the landscape (Sobel, 2013a). Even though grade 8 is slightly older than this bonding with the earth stage, I believe it is an important step to take anytime we are going to ask our students to think globally. Demarest believes that “a basic curricular construct for a local study is my place, your place, all places” (Demarest, 2015, p. 57). In order to understand any idea students can begin their learning locally - my place - then investigate a distant place - your place - creating an opportunity for students to understand how things work in all places (Demarest, 2015).

The introductory walk also speaks to one of Demarest’s place-based education curricular design questions: How can I help students better understand how this big idea works in the real world? (Demarest, 2015). Demarest (2015) suggests that when teacher plan learning activities around this question they are trying to find ways to offer firsthand evidence of concepts in local places. Students should be exploring the big ideas that manifest in the local landscape and should
have an opportunity to question and validate key concepts (Demarest, 2015). During this walk, students are looking for local evidence of surface change while taking in and observing all their local landscape. They are looking for a local answer and are using their senses to experience their place.

Following the introductory lesson are a number of formative lesson ideas for teachers to use. Each lesson consists of investigative questions that, when answered, provide a piece of the puzzle for answering the unit’s essential questions. The lessons are designed in such a way that students partake in a number of small inquiry investigations as a class to acquire new knowledge. A number of extensions are suggested to teachers in how to carry out these small inquiry investigations. Suggestions include laboratory exercises, in class readings and assignments, and the use of technology through webquests, interactive websites, and videos. I have laid out each lesson in such a way that teachers using this unit plan can easily see what the outcome and purpose is. Teachers are encouraged to go outside as much as possible and allow for the real world to act as a curricular laboratory in order to deepen students understanding of the content (Demarest, 2015).

The benefits of going outside and exploring the landscape first hand allow students to experience their natural, outdoor laboratory which helps create conditions conducive to learning (Glenn, 2000). “Students natural interest in the environment motivates them to learn and understand the complexities of their world” (Glenn, 2000, p.4). Getting outside also allows for a connection with nature which, as explored in chapter 2, can help alleviate the nature deficit disorder and ecophobia that today's youth are facing (Louv, 2005; Sobel, 2013a). Getting into nature helps awaken the senses and inspires creativity which in turn allows for active class participation and increased motivation (Bransford et al., 2000; Louv, 2005).
All lessons, except one on the Earth’s layers, incorporate some aspect of local learning. Students are encouraged to test their newly acquired knowledge by asking “how does this play out in my community?” or “How do these big ideas, concepts, and events play out where we live?” (Demarest, 2015). Engaging the local “gives deeper meaning to the place-less, generic packaging of knowledge so predominant in our schools” (Demarest, 2015, p.54). This movement away from the regurgitation of facts is also why the suggested summative assessment pieces are not quizzes or tests.

The suggested summative assessment pieces include artifacts of evidence gathered through small group inquiry projects, as well as an individual reflective piece on how our local land was formed. I have intentionally left the summative assessment pieces somewhat vague to allow for and to encourage class participation in deciding what the class culminating piece should look like. Teachers should explore what good research looks like with their students and decide with them how they went to present and celebrate their findings.

One other consideration for this unit is the use of science journals. I have used science journals in the past with great success. They allow students to keep all of their learnings and thoughts together in one place. This allows for easy reflection on the students’ part and has given me insight to individual students’ thought processes. Demarest (2015) also suggests the use of science journals for local studies. She states that “whatever big concept is under study, students can keep a journal asking the question, What is happening here?” (Demarest, 2015, p. 65). Journals allow for “writing, thinking, observation, and delving into scientific phenomenon the way real scientists do” (Demarest, 2015, p. 65).
The Geology in your Backyard Lessons

The second piece of this unit design is a series lessons focused on local geology. The lessons are found as individual links on the website and include a number of images taken throughout the region. While field trips are highly encouraged for place-based learning they are often met with many logistical and financial obstacles. This is one example of how technology can enhance the place-based learning experience.

The lessons are used to bring visuals and tidbits of knowledge of the surrounding region into the classroom. The lessons are short and are meant to give a brief overview of some of the geological events that have led to the development of our landscape. They are not intended to answer all the questions or go too far in depth. They are intended to spike interest, curiosity, and enhance students’ knowledge of their place. They also offer a stepping stone for the research assignment piece of the unit plan.

Each lesson consists of three parts: a starter activity to activate prior knowledge, a brief overview of each geological aspect, and a discovery challenge for classes to participate in. The lessons and their associated discover challenges are as follows:

- The Columbia Mountains
  - Discovery Challenge: What marks the borders of each of the four larger subranges of the Columbia Mountains. What subrange of the Columbia Mountains do you live in? Discover some of the names of the local peaks and mountains you can see from your school and/or home.
• Exploring our Valleys
  o Discovery Challenge: How did your valley form? Are there any unique characteristics of your valley? What is the difference in elevation from your valley bottom to one of the highest peaks around?

• Role of the Rivers
  o Discovery Challenge: How have the rivers historically influenced the economic activity of the West Kootenay region?

• Local Lakes
  o Discovery Challenge: How long ago was the most recent major glacial episode that sculpted this region? What was the name of the major ice sheet that covered this area? What evidence (other than what has been listed above) still remains of glacial events in this region?

• Our Local Treasures
  o Discovery Challenge: What are some of our local geological treasures? Is there a particular spot that is important to you?

When planning out the lessons and their associated discovery challenges I took Demarest's four curricular elements of place-based learning into account, specifically the third one along local investigations build holistic understand of places along with its question how can I help students better understand this place? In her description of this element, Demarest states: “Teachers pose questions about local places as organizing themes for students to learn about the place where they live. The character, history, details, and needs of a place emerge as students explore the “stories of places” through a multidisciplinary or an interdisciplinary lens. The stories they uncover may combine subjects in different ways
that reflect the complexity of places, the emphasis remains on understanding the place.”

(Demarest, 2015, p. 70)

The lessons allow students first to see and hear about some of the aspects of the place they live. They then have the opportunity to further unpack that knowledge and those stories by doing small investigations themselves. When students bring back the information they have discovered, they can share their stories of their place together. Based on individual interest and experience I believe we will find that students bring back knowledge and stories that allow for the multidisciplinary and interdisciplinary lenses, mentioned above, to emerge.

Something else that the discovery challenges, along with the lesson sequence, are supposed to allow for is collaborative and inclusive opportunities. The ability to collaborate and communicate are directly linked to the core competencies model of the redesigned curriculum. “The communication competency encompasses the set of abilities that students use to impart and exchange information, experiences and ideas, to explore the world around them, and to understand and effectively engage in the use of digital media” (B.C. Ministry of Education, 2017). This is directly related to the discovery challenges in that students must use the information available to them (in most cases this is digital media), to bring answers back and effectively share and communicate them with their class. Demarest (2015) also expresses the importance of inclusive learning in local investigations. She believes investigations that are collaborative in nature invite the sharing of stories and allow for students of all backgrounds to benefit from experiencing the questions together (Demarest, 2015).
**Brief Overview of the Website Design**

Being a teacher can feel very isolating at times. While there tends to be more opportunities for collaborative meetings taking place one can still feel isolated when they want to take risks and try new methodologies. I wanted to create something to help take down those barriers. I want local teachers to have a space where they can share the place-based experiences they are participating in with their classes. Place-based learning can feel very overwhelming and I hope this space will provide teachers with the knowledge and support needed to try something new.

The website consists of three pieces: the unit design discussed above, a list of resources that support place-based education, and a blog spot where I will share my experiences and hopefully the experiences of others. The other piece to this is a twitter account. I want to actively communicate with educators across the Kootenay region and British Columbia and see this as the most appropriate tool to do so.

The name of the website and the twitter account are based on one of the Kootenay region’s slang terms *koots roots*, which is explained in the introduction. I chose this name because I feel it represents what I am truly trying to accomplish, which is gaining a sense of place. Those with a strong sense of place in this area, truly have *koots roots* and a strong appreciation for the local landscape.

Throughout this process there was a lot of wavering back in forth. I asked myself *Is what I am doing meaningful? Is it big enough, good enough?* And then I read a piece in Demarest's book that put my troubles at ease. She said “Try something. No matter how small. It will feed you. It doesn’t have to mean that your students are going to change the world right away. Just
start. Your students will show you the way” (Demarest, 2015, p. 160). So here I am, starting something, and I am interested to see how it all evolves.
Chapter 4 – Conclusion

Summary

The B.C. education system is in the midst of redesigning what learning looks like for our current and future students. The research and science behind of how people learn is fueling this change. In the redesigned curriculum, there is a shift from teaching large amounts of content and unconnected facts to helping students explore big ideas in ways there are of interest to them. It is an education system that values quality over quantity. It values the skills needed for students to thrive in their life outside of, and beyond, high school.

The core competencies -communication, creative and critical thinking, personal awareness and social responsibility- are changing the way educational design looks. Through research the B.C. Ministry of Education has decided that these competencies meet the needs of the 21st century learner. Educational experiences should allow students to build on their skill set around at least one or more of these competency areas as these are the skills that are valued and needed in order to compete in today's workplace.

The idea behind the redesigned curriculum and incorporation of the core competencies is to meet the needs of our students. In order for this shift to actually occur educators need to make changes to the educational opportunities they are providing for their students. I believe that as this shift occurs there is a degree of risk taking and trial and error that must take place. For teachers this requires administrative support, collaboration, and research of new teaching methods. I also feel that for many it involves stepping out of one's comfort zone.

The creation of this project was guided by current research and resources of Place-Based Education. The project design allows for students to experience a holistic learning environment that incorporates lessons that are designed through an environmental and experiential lens. The
lessons are designed in such a way that students are allowed the opportunity to connect with
nature and experience their surroundings. Through the incorporation of community walks,
collaborative brainstorms, labs, inquiry research, the use of online simulations, and incorporation
of locally focused lessons, students are given the opportunity to explore a big curricular idea
through a local lens. The focus on the local then becomes a curricular intention within a unit,
rather than a stand-alone investigation.

In *Place-Based Education: Connecting Classrooms and Communities* Sobel (2013b)
identifies a number of guidelines for “educators who are wishing to initiate small scale place-
based education projects” (p. 68). The four guidelines he recommends are: administrative
support, a cadre of committed teachers, active dialogue between school and community, and an
environmental learning centre willing to join forces (Sobel, 2013b).

I believe School District 20 is currently meeting these recommendations. There is strong
support from administration at both the school and district level. Our directors of instruction are
actively involved in the Kootenay-Boundary Environmental Education Initiative (KBEE) and
helped form the environmental literacy group that has formed in the district. The recently formed
environmental literacy group represented the cadre of committed teachers and is working to
develop more outdoor and place-based education opportunities in the district. Throughout the
last couple years, stronger connections between schools and community have been developing.
From relationships with the major industrial employers to volunteering at community events, we
are seeing more community members in our school, as well as more staff and students out in the
community. Lastly, the connection between the school district and the Columbia Basin
Environmental Education Network ([http://cbeen.ca/](http://cbeen.ca/)) is flourishing. Environmental educators are
offering a variety of opportunities for classes to participate in and staff are benefiting from professional development opportunities.

**Action Plan**

**Unit Design**

This project has been designed while on a maternity leave and I have not yet put any of the design into action. While I am excited to share my new found knowledge I will not be releasing the unit for use until I am back in the classroom with a Science 8 class, which will be the end of January, 2018. My reason for this is that I would like to experience the unit myself alongside my colleagues in order to make adjustments and offer support. Throughout the unit, I will share my experiences and exemplars of the work being done on my blog.

This unit has been designed to help my colleagues teach grade 8 earth science in a meaningful way. After I have released my unit for use and gone through the process at least once I will be looking to provide mentorship opportunities throughout the district. Our district often offers workshops for teachers designed by local teachers during district professional development days. I would like to share my research on the benefits of place-based education as well as provide some food for thought around designing place-based educational experiences. I would also like to support teachers by holding mini-field trips for them. I will explore geological features around local schools and help teachers gain knowledge that they can share with their students.

**Webpage**

At this time I plan to have the release of the webpage coincide with the release of the unit plan. I want to share my knowledge and dedication to this style of learning and I do not believe it
would be authentic unless I am practicing it myself. If I find that upon my return to work I have rich learning experiences to share out then I will activate the web page sometime between November, 2017 and January, 2018. In the future my webpage and blog will also coincide with my participation in the environmental literacy group and I hope it will help gain traction around place-based education in the region. It will provide a place where other teacher’s stories and classroom journeys can be shared and inspiration can be acquired.

The @kootsrootsPBE twitter feed will be active throughout the fall and I will start to connect with like-minded educators. I feel as though the number of followers will expand when I release both the unit and website for use. My hope is that it will provide an easy connection point for educators across the Kootenay region and B.C. I sincerely want to know how other teachers and their students are building connections with their place and will be sure to continuously share mine with everyone.

**Suggestions for Further Development**

There are three specific areas that I would like to concentrate on in the near future for further development of this project: community outreach, further use of technology, and assessment.

The research surveyed for this project strongly encourages a relationship between the school and the community to enhance the richness of place-based educational experiences. Students should find ways to be actively involved in the community and community organizations should be actively involved in the school. I would like to build more community partnerships between SD20 schools and the surrounding communities. There was some intention to leaving lists of community organizations out of the unit design. Part of this reason was to allow for students to take ownership of their own inquiry and be resourceful. I would like my
students to play a role in developing relationships with community members. I believe this will allow students to build more knowledge about the resources available throughout our community and build community connections for themselves that may lead to future possibilities. Both Demarest (2015) and Sobel (2013b) express the importance of community partnerships and believe benefits include community vitality, environmental quality, improved education experiences.

For further use of technology, I would like to explore more software to use within the classroom and apps for portable devices that will enhance the outdoor learning experience. In *To Unplug or Plug In: Adopting the right mobile digital technologies to enhance environmental education* Hougham and Kerlin (2016) have suggested a number of online programs and apps for educators to explore and consider in regards to outdoor and environmental education. There are a number of apps and software options that can be used for data collection, observation, and global connections. I would like to collaborate with like-minded educators to explore some of these options to see what technology is worth spending money on.

In the future I would also like to turn the Geology in your Backyard lessons into a series of videos. These videos would continue to be accessible from the website. This was the original plan in designing this project. Unfortunately, one of the worst fire seasons in the history of British Columbia, left our region covered in smoke for many months and closed the back roads for use. The amazing views that would have made these videos worthwhile were not accessible and were covered by the smoke lingering in our valleys.

At this time I have not included suggestions for assessment for the designed unit. I believe the assessment of core competencies and inquiry based learning is just beginning to gain traction across the province. I am interested to see the types of resources the B.C. Ministry of
Education will provide to teachers to aid in the assessment of this new style of learning. I also believe that each school and teacher have their own unique way of assessing their students. Some may still incorporate quizzes or tests and some may allow for assessment criteria built as a class. As I work through the unit myself I will be sharing the types of assessment models built by both myself and my students.

**Final Thoughts**

As the needs of our learners change so must their learning environments. The B.C. education system is currently transforming to meet the needs of 21st century learners by placing more value on skill development than ever before. There are many styles of teaching and learning environments that can and are being used to build such skills, or competencies in B.C. students. No one way can be deemed the absolute right way. Teacher’s need to be creative, collaborative, and spend the time researching and exploring different options that provide the right fit for them and their students.

For me the right way is to incorporate more place-based learning opportunities. Place-based education emphasizes hands-on, real world learning experiences, increases motivation and academic achievement, helps students develop strong community ties, increases social capacity, and builds an appreciation for the natural world (Sobel, 2013b). It allows for in the inclusion of outdoor, experiential, environmental, and inquiry based learning experiences. Through this style of learning it is my hope that students will build an appreciation for where and how they live.

Having a sense of place is built around personal experiences and personal connections. By using *place* as a curricular intention and providing opportunities for students to build knowledge around their landscape I hope to help students strengthen their bond with the
Kootenay region. I am not blind to the limitations of this area, specifically for employment and education, and I think it is important that the youth have experiences beyond our local communities. I do believe, however, that I can help students see how amazing their home truly is and help them appreciate it while they are here and when/if they return.
References


http://dx.doi.org/10.1080/00958969809599114


Sobel, D. (2013a). *Beyond ecophobia: Reclaiming the heart in nature education* (2nd ed.). Barrington, MD: The Orion Society


Appendix A

Grade 8 Earth Science Unit Plan

<table>
<thead>
<tr>
<th>THE BIG IDEA</th>
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<td>ESSENTIAL QUESTION: HOW DOES THE EARTH'S SURFACE CHANGE?</td>
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<th>THE LOCAL FOCUS</th>
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<td>ESSENTIAL QUESTION: HOW WAS THIS LAND FORMED</td>
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Introductory Lesson #1: What evidence is there that shows how the earth’s surface has changed

Begin by exploring the essential questions with students. Activate prior knowledge by allowing time for students to discuss what features make up the earth’s surface and what type of evidence they can think of that proves that the earth’s surface does change. Take the time to set up observation/science journals with your class. Take your students on a walk to investigate nearby evidence of how the earth’s surface has changed. Encourage students to look for both large and small scale items. Discuss in groups or as a class.

Formative Lesson Ideas:

1. **Hypothesis of our landscape: How did our landscape form?** What processes have taken place over time for our landscape to look the way it does. OUTCOME: a roughly illustrated timeline of how local hill, mountains, valleys, and rivers formed **Consider being outside where views of the landscape are easily accessible.**

   **SUGGESTED GEOLOGY IN YOUR BACKYARD LESSON:** The Columbia Mountains

2. **Earth’s Layers: What are tectonic plates? Explain why they move?** Discover the different layers of the earth and how convection currents move tectonic plates. OUTCOME: labelled diagram of earth’s layers including notes on thickness, temperature, density, and elements. (See extensions list for ideas and labs)

   **SUGGESTED GEOLOGY IN YOUR BACKYARD LESSON:** Exploring our Valleys

3. **Plate movement around the world: Explain how plate movement creates different landscapes around the world?** How was our landscape formed? What plates were involved? What are the other ‘players’ in forming our landscape. OUTCOME: identify different types of plate movement, plate boundaries. (See extensions list for ideas and labs)

   **SUGGESTED GEOLOGY IN YOUR BACKYARD LESSON:** Role of the Rivers

4. **Tectonic Activity: What type of geological events occur to prove tectonic plates are in constant motion? Are there any local risks?** OUTCOME: identify how and when volcanoes and earthquakes occur, explore past and present local evidence of tectonic movement

5. **Land and human connection: How does our landscape affect the way we live?** Think local. Think about the relationship we have with our land? In what ways do we value and use our landscape? What type of limitations are set by our landscape?

   **SUGGESTED GEOLOGY IN YOUR BACKYARD LESSON:** Local Lakes

6. **Begin local landscape research:** groups of students will focus on one geological phenomena associated with shaping our landscape. (See extensions for ideas) OUTCOME: Criteria for research project developed by class

   **SUGGESTED GEOLOGY IN YOUR BACKYARD LESSON:** Our Local Treasures

7. **Planning for Culminating Activity:** Research Learning Circles: Students share research in near final drafts. Allow for questions and critique which should lead to revisions. Discuss how the class would like to compile, present and celebrate their research.
**CULMINATING ACTIVITY:** Summative Assessment to Essential Question

**RESEARCH SUMMARY:** students use the material they gathered through their investigative research and contribute a piece to the culminating assignment the class agreed to put together.

**PERSONAL RESPONSE: I used to think...but now I think...** Revisit your original hypothesis: How did our landscape form? How does this compare to your original hypothesis? OUTCOME: students write a reflection piece and incorporate a new roughly illustrated timeline of how local hills, mountains, valleys, and rivers formed.

*The design of this unit and essential questions have been adapted from resources presented in *Place-based Curriculum Design: Exceeding Standards through Local Investigations* by Amy Demarest*

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**Extensions for Formative Lessons**

Check out Crash Course Kid’s videos on landscapes to get started
https://www.youtube.com/watch?v=FN6QX43QB4g&t=58s

**Lessons 2 and 3:**

- Below are a number of online simulations, diagrams, videos and games for layers of the earth and plate movement
  - [https://ees.as.uky.edu/sites/default/files/elearning/module04swf.swf](https://ees.as.uky.edu/sites/default/files/elearning/module04swf.swf)
  - [https://www.learner.org/interactives/dynamicearth/plate.html](https://www.learner.org/interactives/dynamicearth/plate.html)
  - [http://www.amnh.org/ology/features/plates/loader.swf](http://www.amnh.org/ology/features/plates/loader.swf)
  - [https://www.youtube.com/watch?v=tcPghqmnTVk](https://www.youtube.com/watch?v=tcPghqmnTVk)
  - [https://phet.colorado.edu/en/simulation/plate-tectonics](https://phet.colorado.edu/en/simulation/plate-tectonics)

- Below are some ideas for laboratory investigations or demonstrations
  - Model of Earth’s layers:
  - Convection Current Labs
    - [https://www.stevespanglerscience.com/lab/experiments/colorful-convection-currents/](https://www.stevespanglerscience.com/lab/experiments/colorful-convection-currents/)
    - [https://www.youtube.com/watch?v=B8H06ZA2xmo](https://www.youtube.com/watch?v=B8H06ZA2xmo)
  - Plate Boundary Lab (word document)
Lesson 4

- Below are a number of online simulations and games to explore volcanoes and earthquakes
  - [https://www.cosmeo.com/braingames/makequake/?title=Make%20a%20Quake](https://www.cosmeo.com/braingames/makequake/?title=Make%20a%20Quake)
  - [http://www.sciencecourseware.com/VirtualEarthquake/VQuakeExecute.html](http://www.sciencecourseware.com/VirtualEarthquake/VQuakeExecute.html)

- Below are some ideas for laboratory investigations or demonstrations
  - [https://www.youtube.com/watch?v=KZaI4MEWdc4](https://www.youtube.com/watch?v=KZaI4MEWdc4)

Suggestions for Culminating Pieces of Student Research

- Dedicate a large space/wall of your classroom to showcase what your students learn through their research and discovery challenges
- Create a class book on your local geology
- Have each student create a website (weebly is easy to use!) on their research. Create one class website with links to each student made page!

Other notes regarding this unit

- This unit is best ran throughout the months of September, October, April, May and June to allow for easier access to the outdoors.
- Remember than a lesson may take more than one class block to complete
- Get outside!! Go for a walk, take pictures, encourage the use of senses…
- Observation journals: There is no right or wrong way to create an observation journal, this is at your own discretion. The journal should be used for the entire unit and should provide a detailed exploration of student observations and knowledge.

Did you create something for your class to use? Be sure to connect on Twitter @kootsrootsPBE and share your experience

One of the best resources I can recommend to learn more about the geology of the West Kootenays is the GeoTour Guide which can be found here:
Lesson: The Columbia Mountains

STARTER ACTIVITY

Let’s see what we already know about our mountains.
Before reading the information below, see if you can answer these three questions.

1. What mountain range do you live in?
2. How old are your mountains?
3. Why are the mountains important to this region?

LET’S TAKE A LOOK...
The West Kootenays lie within the Columbia Mountain Range. The Columbia Mountain Range runs North-South and stretches slightly down into the United States. To the east the Columbia Mountains are separated from the Rocky Mountains by the Rocky Mountain Trench, and to the west they end at the Interior Plateau.

The Columbia Mountain Range can be divided into four large subranges: The Monashee Mountains, The Selkirk Mountains, The Purcell Mountains, and the Cariboo Mountains. Each of these four ranges can be broken down into many smaller subranges. The well-known Valhalla range is a subrange of the Selkirk Mountains.

During the collision that led to the formation of the Columbia Mountains the mountains were built from the SW to the NE. Their formation began approximately 185 million years ago and ended approximately 55 million years ago.

Did You Know?
Although the Rocky Mountains and the Columbia Mountains are two separate mountain ranges, there is currently a tourism campaign trying to rebrand an area of the Columbia Mountains as the Kootenay Rockies? What are your thoughts? Why would this be a good and/or bad idea?

DISCOVERY CHALLENGE:
This is a three part challenge:

1. The four large subranges of the Columbia Mountains are listed above (Selkirks, Purcells, Monashees, Cariboos). What marks the borders of each of these subranges? As in, what area do each of these subranges cover?
2. What subrange do you live in (go even further, find the subrange of the larger subrange)
3. Find the name(s) of a local peak you can see from your school or house.
Lesson: Exploring Our Valleys

STARTER ACTIVITY

Before we have a quick look at the valleys of the West Kootenays let's see how we might describe them.

First, on your own, write down 5 words you would use to describe the valleys of the Kootenays.
Now find a partner, and see if you can narrow it down to 3 descriptive words.
Now create a group of four, are any of your words the same? As a group choose the 1 descriptive word to share out with the class.

LET'S TAKE A LOOK…

Along the valley bottoms of the West Kootenays you will find numerous small cities, towns, and villages. The valley bottoms are home to our deep lakes and rushing rivers, as well as areas of rich, fertile land, and amazing views!

Due to erosion, the Columbia Mountains have steadily lost elevation over the last 55 million years, so why do the surrounding peaks appear so tall and rugged and the valleys so deep? The answer is that the valleys have deepened even faster than the mountain tops have eroded. This makes the difference between valley bottoms and mountains tops even more grand than when they were young.

There are two major geological processes that have eroded and determined the shape of our valleys. They are rivers and glaciers. Glacier valleys are characterized as large U-shaped valleys with flatter bottoms and steep sides. River valleys create the V-shaped valleys with steeper bottoms and steep sides; they often still have a stream or river flowing through them or evidence that one once did.

Did You Know?
That most our valleys run from North-South. Hmmm interesting. Why might this be?

DISCOVERY CHALLENGE:

Two parts:
  1. Do you live in a valley? If so, how did it form? Are there any unique characteristics?
  2. What is the difference in elevation from your valley bottom to one of the highest peaks around?
Lesson: Role of the Rivers

STARTER ACTIVITY
Two Truths and a Lie
Below are three statements. Two of them are true, one of them is a lie. Either write down individually which one you think is a lie, or take a blind (eyes closed!) class vote.

1. Both the Slocan River and the Kootenay River are tributaries to the Columbia River (this means that the waters of Slocan River and Kootenay River eventually flow into the Columbia River)
2. The Kootenay River flows south enough that part of it flows through the United States before pulling a u-turn and flowing back into Canada, near Creston.
3. The Columbia River originates in the Rocky Mountains, it crosses through the Rocky Mountain trench and drains into and out of the Columbia Lake, near Canal flats.

LET’S TAKE A LOOK...

All streams and rivers in the West Kootenays are part of the Columbia River Basin. They play a large role in the shaping of our landscape, and provide to us a source of energy, an area for outdoor recreation, and beautiful views. Though we may not see it happening they continue to shape our landscape by downward cutting; meaning they are continuously eroding the land that lies beneath them. The Kootenay River and the Columbia River are the two largest rivers in the West Kootenay, while the Slocan River is a local favourite for rafting, kayaking, floating, and swimming. Below we explore the individual characteristics of each of these three rivers.

Slocan River
The Slocan River is the smallest of the three. It is approximately 156 km long and is fed by Slocan Lake. From Slocan Lake it follows mostly a southern path, with a small stretch of it flowing southeast, until it meets the Kootenay River around Shoreacres (half way between Castlegar and Nelson).

Kootenay River
The Kootenay River is approximately 781 km long. It’s journey begins in the westernmost ranges of the Canadian Rockies where it follows a path south down the Rocky Mountain trench and into the United States. The water takes a turn and begins flowing north again where it crosses back across the border near Creston and flows into the southern tip of Kootenay Lake. The water drains back out of Kootenay Lake on a western arm near Nelson. From there it follows a narrow and steep southwestern valley until it meets up with the Columbia River near Castlegar.

The Columbia River
The Columbia River is approximately 2,000 km in length, but only about 800 km of it resides in Canada. The Columbia River is responsible for draining the entire West Kootenay region, and is the largest river to flow into the Pacific Ocean from North America. The river originates in Columbia Lake, from there it flows north-northwest around the Selkirk Mountains and eventually makes a sharp southern turn into Lake Revelstoke. From there the waters flow through Upper and Lower Arrow Lakes where it drains near Castlegar. It continues to flow south past Trail and crosses the U.S. border.

**Did You Know?**
- Both the Kootenay and Columbia River have been re-routed multiple times due to ice damming, ice melting, and glacier deposits!
- The Kootenay River, as well as sections of the Columbia River, belongs to the traditional territory of the Ktunaxa people. The tribe lived along the river banks for hundreds of years, using the flowing waters for hunting, fishing, and transportation.

**DISCOVERY CHALLENGE:**

Throughout the world rivers have played a significant role in human settlement and economic activity. We are no different here in the Kootenays. Your job is to discover:

1. How have the rivers historically influenced the economic activity of the West Kootenay region?
Lesson: Local Lakes

STARTER ACTIVITY
Each of the cities/towns/villages below are found along the shores of the three largest lakes found in the West Kootenays. Can you match each city/town/village to their lake?

Lakes: Kootenay Lake, Slocan Lake, Aarow Lakes

Cities/towns/villages: New Denver, Kaslo, Nakusp, Creston, Revelstoke, Nelson, Crawford Bay, Silverton, Galena Bay, Rosebury

LET’S TAKE A LOOK...

Three of the largest West Kootenay Lakes can be found hidden amongst the mountain ranges in deep troughs. The troughs were formed during the same tectonic collision that created our surrounding mountain ranges. The collision caused rocks to crumple and break, this created weak faults in the land. Rivers began to run over these weak faults, carving the valleys deeper and deeper. The valleys were further deepened and widened when glaciers carved their way through them during the last ice age. As water from the glaciers melted it found its way into these deep valleys creating the large lakes that we all enjoy today.

Slocan Lake
Following the valley, Slocan lake runs North-South and is drained by the Slocan River at the south end. It is surrounded by subranges of the Selkirk Mountains; the Valhalla Range to the west and the Slocan Range to the east. It is about 39 km long with a maximum depth of 300 m. Towns and villages found along its shores include New Denver, Rosebury, Village of Slocan, and Silverton.

Kootenay Lake
Kootenay Lake follows mostly a North-South valley with many small and large bays, as well as 35 km larger arm sticking out towards the west (called the west arm). The lake is surrounded by the Selkirk mountains to the west and the Purcell ranges to the east. It is fed by many creeks and streams with the largest being the Kootenay River. The Kootenay River enters the lake at its southern point and drains out the western am. It is approximately 104 km long and has a maximum depth of 152 m. The water level was once 150 meters higher than is currently is, this was mostly likely due to glacial ice blocking its main drainage system. Towns and villages along its shores include Creston, Kaslo, Ainsworth, Crawford Bay, Riondel, Balfour, and Nelson.

Arrow Lakes
Just like the lakes above, the Arrow Lakes follow a North-South route along valley bottoms, with some twists and turns and a large(ish) eastern arm. The lakes are surrounded by the Selkirk Mountains to the East and the Monashees to the west. The Arrow Lakes are called Lakes rather than Lake because they used to be two separate lakes. The Keenleyside Dam, found towards the south, caused water levels to rise allowing the two lakes to join together. We still call them Upper and Lower Arrow Lakes. The lakes are mainly fed by the Columbia River near Revelstoke and after a 230 km journey they drain just north of Castlegar back into the Columbia River. Towns and villages found along the shores of the lakes include Renata, Fauquier, Nakusp, Galena Bay, and Revelstoke.

**Did You Know?**
- Kootenay Lake is home to the world's longest FREE ferry. It takes approximately 35 minutes to travel on the ferry which acts as part of Highway 3A between Balfour and Kootenay Bay (near Crawford Bay)
- When the water levels are low enough you can easily tell where Upper Arrow Lake and Lower Arrow Lake used to be separated. This area is commonly referred to as The Narrows.

**DISCOVERY CHALLENGE:**

Throughout all the lessons the movement of glaciers, glacier deposits, and ice damming has come up a lot. Glaciers have eroded our mountains tops and have aided our rivers in deepening and widening our valleys. They have left behind deposits and ice dams that have re-routed our rivers. Your job is to discover three things:
1. How long ago was the most recent major glacial episode that sculpted this region?
2. What was the name of the major ice sheet that covered this area?
3. What evidence (other than what has been listed above) still remains of glacial events in this region?
Lesson: Our Local Treasures

As we have explored the Mountains, Valleys, Rivers, and Lakes of the West Kootenay Region I hope you have come to see that we live in a region with a very diverse landscape. One of these best parts about living here are all the secret (or not so secret) little places that allow us to call this region home. The locals of the region are always taking in the beaches and rapids of Slocan River, riding the ski lift to paradise on Granite Mountain, exploring the forest around Wilson Falls, sliding the natural slides at Tulip Creek, hiking Idaho Peak for the amazing views, or sitting on benches up Dove Hill to take in the view of the Kootenay and Columbia Rivers merging. Wherever or whatever it might be, these places are all part of landscape. Millions of years of geological processes have given us these treasures, but what do we really know about them? This leads us to our final DISCOVERY CHALLENGE:

What are some of our local geological treasures?

Is there a particular spot that is important to you? Somewhere you explore with family and friends, or a spot on the mountains you watch from the car window every time you drive past? Perhaps it is a steam, a waterfall, a gigantic rock, or a beach. Pick somewhere, anywhere (local)!

Whatever it might be try to see if you can find out more about it. How was it made? What processes have shaped it? What is it made of? Why is it important to the community? If you struggle to find anything about it, try to take what you have learned and make a hypothesis!