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Developing an ecological consciousness as an international student at Lakehead University: a practical guide

Bhal, Neetu Rani

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Developing an Ecological Consciousness as an International Student at Lakehead University:

A Practical Guide

By Neetu Rani Bhal

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Abstract

The portfolio will focus on the increasing ecological consciousness of teachers and student populations in India and Canada. It will largely focus on my personal journey from India to Canada in terms of my ecological understanding. This study is an attempt to explore the need for ecological literacy and consciousness at the level of educators and learners. This study will also focus on the effects and impact of this practice in every educational sector in their different contexts.

To build the concept and actual application of an ecological conscious learner, I have incorporated major episodes of my related classes of ecological consciousness course in the Fall term of 2018, ecological macro-model activities, as well as some practical activities of home products. In addition to this, I have applied my knowledge acquired from different assignments that went on throughout my course. On this basis, I will critically examine some literature to support my research argument. The chosen literature review ranges from the background knowledge of ecological systems to its connections to human life. To support my argument, I will present four videos related to my personal journey of ecological consciousness. I believe that the videos will support concerned groups to increase their understanding of ecological education.

Keywords: Ecological education, ecological literacy, ecological consciousness, ecological macro-model, and teacher training.

Chapter 1

Introduction

For my portfolio, I have chosen to write about *ecological consciousness* and how I would like to share what I have learned from taking a course in ecological consciousness at Lakehead University. My paper will have three distinct sections. The first section will consist of a personal narrative, explaining how I have become more ecologically conscious. The second section consists of a literature review examining relevant theories related to ecological consciousness. The third section involves four videos that reflect a journey of becoming ecologically aware and how we can change our habits to better suit the natural world. Through this paper, I would like to develop a practical guide that could help others understand the reason why we all need to develop an ecological consciousness and help reduce our ecological footprint to preserve the world for future generations.

Outline of the Portfolio

My portfolio will be comprised of three key chapters:

- Chapter 1: will consist of a personal narrative, explaining how I became more ecologically conscious and set the context for this portfolio.
- Chapter 2: will consist of a literature review examining relevant theories related to ecological consciousness.
- Chapter 3: will involve four distinct videos related to my development of ecological consciousness, these videos will serve as a practical guide to help others in developing their ecological consciousness.

My intent is that the portfolio will result in a “practical guide” towards the societal goal of ecological consciousness (Puk & Stibbard, 2010).

Rationale for Portfolio

The purpose of this portfolio project is to explore the challenges in becoming more ecologically conscious, especially with regard to the experience of international students as identified in my personal narrative. The report will largely focus on the themes of education and curriculum, lifestyle choices such as the use of electrical screens and the use of plastics, teacher training using the techniques of experiential learning and concept development, and human health. This document is intended to serve as a practical guide for domestic and international students, faculty, and the wider public in developing their sense of ecological consciousness and learning to care for their natural surroundings. As a personal reason for completing this portfolio, I would be very proud to contribute to the ecological practices in my home country of India. My hope is that the ideas conveyed through this portfolio might be adopted by students and brought back to India.

Definitions of Terms

Ecological Consciousness: “is an empathic and abiding, connecting- presence with natural processes. The goal of ecological consciousness is to find a sustainable niche for human beings in the earth’s natural order and to preserve ecological integrity” (Puk, 2018, p.118).

Ecological Literacy: According to Puk (2018), ecological literacy is “the capacity to make informed decisions about the future of life based on a comprehensive, gestalt-like understanding of reciprocal relationship among and between natural systems and human systems” (p. 118).

Ecological Education: According to Orr (1994), “Ecological education means changing (a) the substance and process of education content and curriculum, (b) how educational

institutions work, (c) the architecture within which education occurs and most important, (d) the purposes of learning” (p. 33).

Concept Development: “is a process in which old concepts are enhanced, made more sophisticated, through experience, either by adding new criterial attributes to the concepts or by making connections to other existing concepts, to handle newly encountered situations.” (Puk & Stibbards, 2011, p. 193-194).

Overarching Questions and Introduction

The portfolio will comprise three different questions including:

1. How did I develop an ecological consciousness?
2. How might my journey assist other people in developing ecological consciousness?
3. What are the likely roles of the communities of Canada and India in their connection with natural processes?

Personal Narrative (my own journey of ecological consciousness)

Graduate Course Influences

I am Neetu Bhal, an international student at Lakehead University, Ontario, Canada. In the fall of 2018, I took a course at Lakehead called Ecological Consciousness (ED-5414) which focused on our interaction with the natural world around us, some of the negative implications of that interaction, and some solutions for leading a more ecologically conscious lifestyle. I chose to do this course because I felt that it would offer me a means of fulfilling my long-held desire to learn more about protecting our natural world from harm. This desire stems from my coming from a region that has suffered significant ecological degradation. While in the beginning, I had been less mindful of the impacts that my daily life had on my

surroundings, the activities and concepts that were communicated through the course have motivated me to value my natural setting and respect nature. As an outcome of my revaluing of my relationship with the natural world, I have become highly cautious of many of the things that I do that could directly or indirectly affect natural processes. Before taking this course, I did not have an understanding of ecological consciousness but since learning about this concept the way that I approach my way of living has changed considerably. I found that the ecological consciousness course provided me a perfect opportunity to learn new ideologies and concepts relating to sustainable practices and increasing awareness of the importance of natural settings.

Through the different class activities of the ecological consciousness class, I learned that the concepts of becoming aware of the natural world and being conscious about protecting it are really eye-opening for not only myself but for everyone involved. I found that the activities that we participated in during the class were highly relevant and critical to my understanding of the importance of the natural world and our relationship with it. The class instructor presented the learning process in a variety of different dimensions. One of these activities included a hike through a natural area. The primary question posed during the class lesson was, “What is your experience when examining a natural area?” and many students responded to their observations of the area with reference to the way they use it as a pedestrian thoroughfare and how they appreciate this seemingly natural setting for its beauty. The instructor then revealed to us the fact that this area was once the shore of archaic Lake Nipissing, which was filled and used as a building site for residences. We were all surprised and shocked that the natural setting could change so much by human occupation and development. The most striking aspect of this activity for me was the fact that I had not acknowledged that my feet were standing on the former shoreline of Lake Nipissing. Through this realization, I understood that many of the natural spaces within this nation as

well as across the globe have been occupied by state and business interests for what they consider to be innovative projects. This may come at the cost of destroying the natural world.

Homeland

On discussing the subject matter with a colleague, an assistant lecturer in the Department of Environmental Education at MPM SD College, India, I recognized that the education system in Canada was highly practical compared to theoretical practices in India. This contrast between practical application and theory is also present within studies of ecological consciousness. This experience of learning about the natural world experientially, and outside of the classroom was reinforced in a discussion I had with this colleague about the parties who are responsible for the destruction of the natural environment and its ecology in India. My colleague argued that the government has initiated tree planting programs to compensate for the destruction of the forestlands. I believe that if my colleague were offered the opportunity to learn about the destruction of the forests and their intricate ecosystems by actually witnessing that destruction, she would be less inclined to accept tree planting as a solution. In addition to identifying the perpetrators of ecological degradation, it is important to identify who would be responsible for conserving the natural environment and its resources and how these parties might do so in a truly sustainable fashion. To elaborate on this, I realized that in addition to the creation of government policies that can be implemented to protect nature and its resources, everyday people also need to take responsibility for safeguarding the natural processes. This concept is reflected in the Chipko movement, a forest conservation movement that took place in 1973 in Reni village of Uttarakhand state in India. Individual members of this movement embraced trees and prohibited their destruction by using their own bodies as shields. This movement became fundamental in future environmental movements across the globe (Sengar, 2018). Additionally, as a more modern example, I recently learned about a group of Indian villagers who walked towards the Mahan

(great) backwoods in protest of the coal mining activity that took place within the Singrauli region in the year 2014 (Niazi, 2014).

Being an international student from India, I would like to share my knowledge as well as experience relating to ecological consciousness with various individuals both back at home and across the globe. This portfolio, I believe, can be an important resource for various individuals, students, organizations, learning institutions and the state in developing an awareness of in the importance of nature and in working to protect it.

There are a few areas of interest that I would like to mention as I have found them to be important. These areas of interest are as follows: Ecological consciousness in Canada, Ecological macro-models, Plastic reduction, and Homemade cleaning and hygiene products. The first topic I will speak about my experiences will be Learning Ecological Consciousness in Canada.

Ecological Consciousness in Canada

In relation to the topic of ecological consciousness in Canada, I would like to compare my experiences growing up in India with my experiences here in Canada. My experiences in Canada will include the experiences of taking a graduate course about ecological consciousness as well as the experiences of continuing my effort to implement what I learned about developing changes in awareness and lifestyle after the course was completed.

In India, even though Environmental Education is taught, it is not something that is necessarily practiced. Environmental Education is mainly theoretical and not practical in that we talk about what we can do to protect the natural world, however we do not put the theory into practice in the world around us. As an example of this difference, I would like to share my observations of the way in which residential waste is handled in India as compared to the way that it is handled in Canada. In my experience in India, we would use an undeveloped piece of land as an informal area to store our garbage. Garbage trucks would arrive erratically

to pick up the trash anywhere between 15 and 30 days or more at a time. In addition to this unpredictable schedule, this garbage pickup would not be complete as there would be some pieces left over. These leftover pieces of trash would sometimes be lit on fire by the people who maintain the infrastructure, creating smoke and pollution. This pattern of use would continue until the person who owned the land was ready to build their home. This practice could be in use for a particular piece of land for years at a time if it was not owned by anyone. This practice persists despite there being theoretical policies in place that address the handling of residential waste in a more ecologically responsible way.

In contrast to this informal model of dealing with residential waste in India, I have noticed that in Canada municipal governments have set aside certain plots of land that are used for the disposal of garbage. There is a by-law in Thunder Bay that only allows two bags of garbage per household per week to encourage waste reduction by either recycling the materials or reusing them. This stands in sharp contrast to practices in India where such practices related to waste reduction and recycling are just now emerging in the urban areas.

Another example of the contrast between ecological consciousness in India and Canada concerns the use of plastic shopping bags. When shopping at the markets and stores in India, we are given plastic bags for every purchase. These bags are given for free by the stores and are rarely reused for anything once the shopping is done and the consumer returns home. After they are used for shopping they are thrown out with the trash where they are often burned, creating pollution. There are no policies or programs for the recycling of these bags nor are there any public awareness programs to encourage reuse of these bags. While shopping in Canada, I have noticed an example of a more ecologically conscious way of dealing with the waste created by shopping bags where some stores have gone from giving them out for free to charging 0.05\$ a bag. This creates consciousness in consumers as to how many bags they really need and serves to reduce the number of bags that leave the store. This

also incentivizes customers to bring bags that are reusable, which is a practice that is greatly encouraged by a number of stores. This reduction of bags leaving the stores leads to a reduction of bags in the natural world.

Plastic Reduction

The second topic in the graduate course that I found interesting is plastic reduction. During the class, we did a series of activities that educated us about different types of plastic and encouraged us to reduce our use of plastic in our day to day life. In the first activity, the professor presented us with a variety of objects made of plastic and asked us to identify them. We were able to easily identify some of the objects as they were obvious; however, there were a few objects that were more obscure as we did not know that they contained plastic. It was during this exercise that we learned about the eight different classifications of plastics and which ones were recyclable and which were not. We also did an activity outside as an extension of this identification exercise. This part of the activity included the use of eight different types of balls that represented the eight classifications of plastic. According to Puk (2018) the classification of plastics are as follows:

1. Polyethylene terephthalate (PET): This particular type of plastic is used for bottled water, pop and different types of food jars.
2. High Density Polyethylene (HDPE): This type of plastic is used in shopping bags, milk jugs, and shampoo bottles to name a few.
3. Polyvinyl Chloride (PVC): This is used in some types of plumbing material, salad dressing bottles, food packaging, and even baby pacifiers
4. Low-Density Polyethylene (LDPE): This type of plastic is used in squeeze bottles, food wrappers, and food storage containers.
5. Polypropylene (PP): We can find this type of plastic in yogurt containers, bottle caps, drinking straws and toys.

6. Polystyrene (PS): meat and fish trays, foam, take out containers.
7. Other (polycarbonate, nylon, and fiberglass): CDs, DVDs, cosmetic containers, drinking bottles (Nalgene)
8. Various: Gore-Tex, various clothing materials, tires, Kevlar, Computers (p. 291-293).

The activity required us to divide the class into two groups. The class would collect the different colored balls representing different plastics and bring them one at a time to the two knowledge keepers. These knowledge keepers would share the information about the resin indicator code and use of the type of plastic represented by the ball. This information was used to stimulate discussion of plastic reduction.

The plastic reduction discussion led to an assignment where over three weeks the class was expected to reduce their plastic consumption. In the first week class members counted the items made of plastic that they used on a daily basis and recorded this number. At the end of the week, a total was created of all the items that were used during the week. In the second week, we were challenged to reduce the number of plastic items used by 60%, followed in the third week by a further reduction of 80%. In the beginning, this seemed very difficult but by the end of the third week, many of the students found that it was indeed possible. The reduction simply took effort to enact a change in lifestyle. Through participating in these activities as part of the ecological consciousness course I changed my lifestyle and learned about the importance of plastic reduction. I also learned that taking a step toward developing ecological consciousness by one person can have impacts on helping to maintain healthy surroundings. If everyone could take these small steps it would definitely help to create a more ecologically conscious model of human life.

Ecological Macro-Models

The third topic from the class that I have found interesting and useful is that of “ecological macro-models” (Puk, 2018). Of all the different types of macro-models that exist

in nature, we spent time with four distinct models. These models were: Water Usage, Sunlight Mood Production, Recycling, and Photosynthesis. Our class often learned through practical participation in activities and this section of the course was no different.

Water usage. To help the class understand the concept of water usage, we used the ecological macro-model of a water barrel that demonstrated water usage. The object of this class exercise was to fill a barrel with water and keep it full for 5 minutes. We found that this was not as easy as it seemed as the barrel had multiple holes. These holes were either small, medium or large which represented different categories of water usage such as residential usage, industrial usage, and agricultural usage respectively. From my participation in this macro-model, I learned that the sector of society that used the most water was that of agriculture. This was different from my thoughts before-hand where I believed that the residential sector was the main culprit in the fresh water crisis. We as a class discussed the need to change the methods of agriculture used globally. As a group, we came up with some alternative methods that would help stem the crisis. I discussed this macro-model with a colleague here in Thunder Bay and how we as a class discussed ways of reducing the need for foreign agricultural products. We discussed that as a country we should rely on more locally produced foods. My colleague mentioned that when she was younger her grandmothers and mother made certain foods from scratch. Her grandmothers would make canned vegetables and fruits, jams and jellies as well as a multiple varieties of pickles. One of her grandmothers still had a cellar that was used to store the preserved foods. This type of locally produced and preserved food has the potential to reduce water use in the agricultural sector as it is smaller in scale and produces less waste.

Sunlight mood production. To help understand how sunlight affects the mood of humans, for this ecological macro-model (Puk, 2018) we went outside and formed a figure 8 which represented the human body. We had one person who represented the sun stand off to

the side of the figure 8 and two people who represented the eyes and brain stood in the top section of the figure 8. We then had one person each represents the concept of human health, the circulatory system, and the skin. These divisions were important because there are two ways that the human body converts sunlight to energy. The first way is through the eyes through which the sun's energy is absorbed in the pineal gland. The pineal gland then converts this energy into both serotonin and melatonin which are important to a human's overall health. Serotonin is a chemical that regulates a person's mood. Melatonin is a chemical produced by the brain the help regulate sleep and the circadian rhythm. Both of the neurotransmitters are necessary for the survival and health of humans.

The second way humans get energy from the sun is through the skin. It is the skin that absorbs many different vitamins and minerals and one such vitamin, vitamin D, is used in the development of endorphins which support a healthy immune system. Vitamin D also aids in metabolizing calcium which, among other benefits, is key to developing strong bones (p. 167). From this exercise, I learned to appreciate the importance of the sun in our lives as it contributes greatly to our well-being. It also helped me to recognize the human connection to natural processes and how these natural processes can go on without humans, but humans cannot exist without natural processes.

Recycling. This was a third ecological macro-model (Puk, 2018) that we touched upon. This macro-model extended the ideas that we had addressed related to plastic reduction. For this macro-model, the class was presented with a variety of different waste products including plastics, glass, metal, cups, plastic bags, and cardboard. The instructor then described the manner in which each of these types of items would be recycled, put in the landfill, or otherwise disposed of. We then had to determine which types of plastics and which other objects were recyclable and which would just end up in landfills. Some of these items would be recycled by shipping them to China, which results in the creation of carbon

emissions through transportation. This exposed for me the reality that not all recycling programs help the planet, but some are designed to serve the interests of business.

Photosynthesis. The macro-model for photosynthesis (Puk,2018) had to do with learning the process of how plants and trees take energy from sunlight and convert it into food. This activity required that one person represent each of the sun, plant, soil, air, and human. The interactions of these students allowed us to see the process of how the plant grows. We learned that to fulfill its growth cycle, the plant needs to combine three components; energy from the sun, water, and carbon dioxide. A plant uses energy that it collects from the sun to create its energy cycle. Water comes from rain and the soil and provides the plant with a necessary component for photosynthesis. Air carries carbon dioxide that the plant needs to grow. This carbon dioxide comes from a number of sources including humans. The students learned from this macro-model that a cycle exists where the plant grows, takes that carbon dioxide from humans, and expels oxygen which humans need to survive. We also learned that plants are consumed by humans and that the nutrition that is contained in the plant material is converted into energy which helps with the overall health of humans. In this way, plants and humans have a type of symbiotic connection.

Home-made Hygiene Products

This class project consisted of learning about the negative aspects of mass-manufactured hygiene products and the benefits of making these products at home. The basis of this project was to teach us the science behind the creation of household products. We learned about the process of mass-producing these items and how financially costly it is. In addition to the cost of manufacturing, another impact is that a lot of products that we use in the home every day have many harmful chemicals. Beyond financial costs, the methods of production for these products are ecologically costly as well as they produce non-recyclable containers and use a lot of electricity. With respect to these drawbacks to mass-produced

hygiene products, our instructor asked the class about some of the items that we would like to make at home. As a class, we voted to find the most popular suggestions. We then split up into different groups, where we made either soap, shampoo, toothpaste or deodorant. All group members were tasked with researching ingredients and where we might obtain locally-sourced materials. After obtaining the raw materials, we combined them to make these products at home in small batches and then tested these products. Once we tested them and were satisfied with the results, we made larger batches. The class created a display at the Agora building as the final part of the project. We made both samples, as well as pamphlets, where we explained the products and provided recipes to other students. For this project, my group was tasked with making shampoo. We found a very simple and inexpensive recipe using just three simple, all-natural ingredients without any foreign chemicals (see Appendix-A). When we presented our shampoo, the students and professors really enjoyed the concept and we ran out of both the samples and pamphlets. I found this project to be an eye-opener as I learned that producing these products for mass consumption is detrimental to our natural surroundings and costly to the consumer. I found that I could make a product that was superior, eco-friendly, and healthy for my hair at a fraction of the cost for all the materials.

Summary of the Chapter

This chapter provides the background of the study. In accordance with this context, it highlights the research portfolio, which incorporates my personal narrative. My personal narrative relates to my participation in an ecological consciousness class as well as my own reflections on how various innovations designed for convenience and comfort have led to increased destruction of nature and its resources. These personal revelations have assisted me in appreciating the increased need for ecological literacy with the aim of protecting our natural surroundings. In addition, the research questions, as well as the rationale for carrying

out this research, are highlighted to help guide the reader in understanding the context of the literature review section.

Chapter: 2

Literature Review

Introduction

The development of ecological consciousness within humans is important for the protection of Earth's resources. To ensure that there are resources for future generations it is imperative that everyone must have an increased ecological consciousness. For this to happen, ecological consciousness should be taught in the school systems starting with elementary and right up to post-secondary. The Ministry of Education in Ontario has ensured that environmental education is included, as appropriate, in all grades and in all subjects or disciplines of the Ontario curriculum. (The Ontario Ministry of Education, 2017). Puk(2018) believes that having an ecological consciousness is so important that it should not only be integrated into all subjects in the Ontario curriculum but it should be its own subject as well.

The purpose of the literature review is to focus on the importance of ecological consciousness and how humans can learn to be aware of their natural surroundings. I intend to demonstrate through the literature the importance of developing an understanding of the natural resources and how those resources are interconnected to a human way of life. It will largely focus on the following:

1. The necessity of educating the population starting at an early age, the importance of having an ecological consciousness, and how to become ecologically aware of their surroundings.
2. Understanding one's natural surrounding by using "ecological macro-models" to explain how human and natural processes are interconnected.

3. The process by which a person can become ecologically aware of their surroundings by practical application, and by doing so can take a look at their lifestyle and evaluate how they can reduce their footprint on the earth.
4. To help people develop the necessary skills to fully attain an ecological consciousness. Students will understand both their perspectives as well as other perspectives to be able to have meaningful communication on how to work together on ways to sustain their natural surroundings for future generations.
5. Looking at the natural processes and ways one can keep their local ecosystems healthy. Discussion about how students will be able to develop problem-solving while having direct experiences in nature.

Literature reviews are bound to contain much information. The topic of ecological consciousness education is a debatable subject and therefore there is much contradictory information concerning it. This literature review will present the viewpoint that supports the importance of having an education in ecological consciousness. My experience of living in India is an example of living with a lack of ecological consciousness. Indian society as a whole does not have an understanding of how their actions affect their natural surroundings and their health as well. My experience of developing a sense of ecological consciousness has been important to me and I view this portfolio as a way that I can share the importance of ecological consciousness with others. As such, this is the reason I am focusing only on literature that supports ecological consciousness.

While researching the topic of ecological consciousness, I have come across seven themes that need to be discussed, namely, Ecological Education, Ecological Literacy, Ecological Consciousness, Teacher Training, Concept Development, Experiential Learning through the use of Ecological Macro-Models, and Outdoor Learning. After reading the articles for this literature review, I learned that incorporating ecological consciousness in

education is challenging. The subject is faced with a mandate from policymakers at high levels that states that ecological education should not be taught as its own proper subject but should be incorporated into other subjects. This leads to the outcome that it is not truly understood by both teachers and students alike. I reviewed the study of Puk and Makin (2006) which was a survey of Ontario Teachers and their understanding of ecological consciousness. I will begin with a discussion of this and the reasons behind it.

Ecological Education:

Ecological education can be described as a practice of continual learning. It is the process of becoming aware of one's natural surroundings and developing and refining a sense of ecological consciousness. According to Orr (1994), we cannot separate our life from our learning. Orr proposes a framework of six principles through which we might rethink education. These principles show various ways in which students are taught or not taught ecological education. The first principle asserts that all education, no matter the subject matter, is environmental education. The second principle borrows from the ancient Greek idea of mastery of one's self as opposed to mastery of subject matter. The third principle concerns the use of knowledge in the world. The awareness of the impacts of our knowledge on people and communities comprises the fourth principle. The fifth principle emphasizes the importance of learning through tangible examples as opposed to simply through words. The sixth and final principle focuses on how the process of learning is just as important as the course content. Related to principles three and four, Biriukova (2005) emphasizes that "the purpose of ecological education in schools is to shape a system of scientific knowledge, views, and convictions that enable school students to form a responsible attitude toward the world around them in all types of activity" (p.39). As an example of a different method of organizing ideas of ecological education, Kamel (2000) proposes that ecological education has four distinct environments, which are the physical, natural, social, and cultural. To begin

to understand ecological education, the student must understand both that all four environments are interrelated and that their personal interactions with their surroundings will shape their ecological education.

When looking at ecological education from a government policy perspective, an examination of Puk and Behm's (2003) article demonstrates to us the state of ecological education in Ontario schools. In their article, they illustrate how in 1998, the Ontario Ministry of Education removed the Environment Science courses from secondary schools and created policies for the purpose of integrating that subject into the content of other subjects. Puk and Behm's (2003) study explores the effectiveness of this approach concerning ecological consciousness by analyzing data collected from both science and geography teachers in Ontario to determine the level of integration of Environmental Science within a variety of topics. Their conclusion was that teachers in Ontario were unable to integrate environmental science with other subjects. They found that a reason for this inability was that the teachers were not prepared and properly trained to enact this integration. Also addressing this lack of preparation and training, Gabriel (1996) indicates that "teachers are not well-prepared to integrate Environmental Education into their classrooms and that inadequate teacher training is the predominant reason K-12 teachers are not teaching Environmental Education". Gabriel, 1996 (as cited in Powers, 2004, p. 3).

The Ontario Ministry of Education reviewed its policies on Environmental Education and its integration into other subjects in the Ontario curriculum and came out with the *Environmental Education* (2017) document. Instead of advocating for Environmental Education to be its own subject, the document reinforced teaching Environmental Education as an integrated part of other subjects and focused on the ways that teachers could integrate Environmental Education into their respective subjects. Contrary to this conclusion by the Ontario government, Puk (2018) asserts that ecological education should be compulsory and

taught in schools starting in elementary schools. He argues that ecological education should be its own subject, taught independently as well as integrated into other subjects. The reason for this argument is to emphasize the importance of ecological education. In Ontario, there is no set curriculum for ecological education and now there is even less emphasis placed on learning this topic. Puk (2018) further observes that the document, “*Shaping Our Schools, Shaping our Future* (Ontario Government 2007) does not go nearly far enough in creating ecologically literate citizens” (p. 440). Knapp’s position in the USA (2000) agrees with Puk (2018) that Environmental Education needs to have a dedicated curriculum and not be integrated into other subjects. Having it integrated only diminishes both the teaching and the learning experiences of the teachers and students. These students are unable to fully understand the depths of the concepts of Ecological Education when it is only integrated within other subjects. Puk and Makin (2006) also state that Ecological Education should be its own subject so students can understand the importance of the natural world.

Without a focused ecological education, students will be unable to develop the capacity for learning ecological literacy, which is a vital component of ecological consciousness. The topic of ecological literacy will be explored in the next section.

Ecological Literacy

Puk and Stibbard (2010) define ecological literacy as “the capacity to make informed decisions about the future of life-based on a comprehensive and gestalt-like understanding of the reciprocal relationships among and between natural and human systems” (p. 115). In a later publication, Puk (2018) defines Ecological Literacy as the “extensive knowledge and insight into the reciprocal relationships between ecological and human systems” (p.12). According to Puk (2018), ecological literacy is but one step along the way to attaining a complete ecological consciousness. This complete ecological consciousness includes a vast

knowledge of the complex interconnections that exist in our natural surroundings and our interactions with these places. St. Clair (2003) argues that environmental literacy translates to developing social practices that are likely to alter the manner in which the society perceives the natural world and its ecology. The importance of recognizing these impacts is mirrored in Balgopal and Wallace's (2009) observation that by developing ecological literacy, students can better understand human impacts on the natural world. Puk (2018) goes on to assert that even with all the knowledge gained with ecological literacy, unless the student is willing to act on the knowledge in a positive manner, then nothing has changed. The student/citizen must have the willingness to reconceptualize their lifestyle to fully gain true ecological consciousness and awareness.

Teachers of ecological literacy are faced with many problems in the Western world. Problems that educators face in promoting ecological literacy include social conditioning that separates humans from their environment, as noted by Puk and Stibbard (2010). Another aspect that presents a problem is in ensuring children are of an appropriate developmental level when educating about ecological literacy. Vygotsky (1978) and Piaget (1973) offer constructivist theories relating to conceptual development which can be applied to the learning of ecological literacy (as cited in Puk & Stibbards, 2010). According to these scholars, children require opportunities to engage with the natural world if they are to develop and realize their potential to obtain knowledge in novel circumstances and apply this knowledge to new issues (Puk & Stibbard, 2010). Despite this, Shayer, in his 2003 study claimed that for this process to occur, the child has to develop beyond Piaget's cognitive assumptions in which learning needs to involve tangible materials. The zone of proximal development, as pointed out by Vygotsky, requires that students interact with a teacher, who is able to provide context for a situation (as cited in Puk & Stibbards, 2010). This process allows the students to construct complex and significant conceptual meaning for themselves.

Puk & Stibbard, 2010 go on to argue that students require personal experience to develop deep understanding and retention of concepts which will then be internalized and be available in novel circumstances.

Orr (1994) presents four challenges to teaching ecological literacy. The first is the division between the materialistic, calculable world and our internal experience that has been socialized into those of us living in the Western world. This division makes it difficult to communicate connectedness of humans to the natural world. The second point that he posits is the implicit understanding in the Western capitalist worldview that destruction of the natural world is a necessary or even desirable activity in expanding human economic and social development. The third idea revolves around the tension between individualism and citizenship. Popular notions of individualism tend to disrespect the connection that exists between humans and one another and humans and the natural world. Last, the idea that has been embedded in our society that continued technological progress is inevitable, desirable, and should be pursued at all costs presents a major problem (p.23-24).

Ecological consciousness

Consciousness, as conceptualized by O'Sullivan and Taylor (2004), is a framework or mental structure which helps us in understanding ourselves, interpreting the world and making meanings. Puk (2018) defines ecological consciousness as “an empathic and abiding, connecting- presence with natural processes. The goal of ecological consciousness is to find a sustainable niche for human beings in the earth’s natural order and to preserve ecological integrity” (p. 118). He generalized ecological consciousness as a worldview or lifestyle stating that “Ecological consciousness fills our whole being and guides us in our daily decision making” (p. 4). From an ecological perspective, Morris (2002) states, “an ecological consciousness thrusts humankind back into the world and down into the earth, and the focus is shifted from human-centered to earth-centered” (p. 580). Similarly, Biriukova (2005)

defines ecological consciousness as a state of “harmonious development” between humans and the natural world, where there is a shift in human behaviors that follow along with a shift in consciousness (p.36).

Aligned with this view of changes in consciousness flowing into changes in behavior, Puk (2012) declares that ecological consciousness can act as an agent to change behaviors in every facet in one’s life, particularly within our educational and societal endeavors.

Moreover, Thomashow (1996) mentions that ecological consciousness involves two aspects, including “a high level of ecological understanding and awareness; and the sense of self as part of a larger system” (p.19). Morris (2002) also describes ecological consciousness as a two-fold process but in the sense that it not only educates individuals but “hopefully will re-integrate us back into the wilderness” (p. 580). Taking this to the next step, Hill, Wilson, and Watson (2004) add that the development of ecological consciousness would result in a flow of self-identified ecologists among the population.

Morris (2002) indicates that ecological consciousness has the ability to reshape not only behaviors but also human perspectives by reminding us what is truly important for the human world. In this conception ecological consciousness interferes with our anthropocentric thinking to involve the entire ecosystem. The benefit of developing an ecological consciousness is that it is not only valuable for the person adopting this awareness but that it could produce a positive ripple effect that could have positive impacts on the natural world.

Agwan (1993) argues that “humanity has now reached the point at which it must change its attitude towards nature, or else nature will continue to thrust ever-harsher catastrophes upon it” (p. 243). This statement emphasizes the importance of ecological consciousness in this anthropogenic era. The irony lies in the argument made by Berry (1988) that “We now control forces that once controlled us, or, more precisely, the earth process that formerly administered the earth directly, is now accomplishing this task in and through the

human as its conscious agent” (p. 42). This statement suggests that the only way to transform the world is to start with the development of ecological consciousness in all individuals. That is why Hill, Wilson, and Watson (2004) encourage educational syllabi, programs, and learning processes to nurture the development of an ecological framework to develop, increase, and raise ecological consciousness. The primary purpose of developing ecological consciousness is to provide individuals with an alternative method to understand the world through an ecological lens. For instance, if a person comes to a decision to buy domestically grown food instead of imported foods and to purchase fruits and vegetables which are in season instead of consuming produce from different international locations, this can be regarded as a conscious ecological action as it would help in reducing carbon emissions.

However, although these steps can be regarded as a move towards ecological consciousness, Puk (2018) reminds us that “[t]here is no perfect state of ecological consciousness” (p. 123). Achieving ecological consciousness is a complex, non-linear undertaking (Puk & Stibbards, 2011). “We may be each starting from different points on the continuum, but where we are headed in our ecological behaviors should be more important than where we have come from” (Puk 2018, p.123).

Teacher Training

Puk and Makin (2006) demonstrated the low level of ecological consciousness in Ontario schools. They suggested a need to build a curriculum in primary grades to enhance student’s ecological consciousness. On the contrary, the Ontario Ministry of Education eliminated the Environmental Science secondary school curriculum guidelines (Ontario Ministry of Education, 1989), and integrated environmental education with other core subjects such as physics, chemistry, and mathematics. According to conceptual development theory, lack of environmental education would lead to low levels of ecological literacy in

Ontario students, some of whom will become the next generation of pre-service teachers (Puk & Stibbards, 2010).

Research carried out by Dove (1996) to determine student teachers' understanding regarding the three environmental issues of the greenhouse effect, ozone layer depletion, and acid rain concluded that student teachers held misconceptions and had low familiarity or little knowledge about each concept. The results of this research emphasize the importance of teaching ecological consciousness at the right stage of student development so that misinterpretations at later stages can be prevented. Similarly, a study conducted by Gedzune and Gedzune (2011) focuses on the urgent need for teacher education programs that would help students in developing their ecological consciousness through exploration and inclusion with nature.

An essential part of developing ecological consciousness is becoming environmentally literate. A study conducted by Swanepoel, Loubser, and Chacko (2002) illustrates the authors' concerns with teacher understanding stating that "[t]eachers can, however, hardly assist learners in becoming environmentally literate if they themselves lack environmental literacy" (p. 282). Similarly, an interrelationship was noticed between teachers' knowledge regarding an issue and limitations to their students' learning opportunities when it was discovered in a study by Karrow and Fazio (2010) that teachers were not able to provide correct answers to students' questions related to the identification of worms. This conclusion seems to verify that knowledge held by a teacher has a direct impact on the learning of their students.

A study carried out by Thompson and Logue (2006) with six participants ranging between 6 and 15 years of age identified various misconceptions these students had concerning science. Their discussion focused on the importance of misconceptions, questioning how students acquire and uphold their misconceptions as they mature. Thompson

and Logue (2006) concluded that teachers should try to eliminate misconceptions by integrating knowledge so that valid concepts are learned and maintained. “By understanding misconceptions in their own understandings, educators can improve instructional practices by reducing confusion, thus increasing comprehension” (Chi, 2005; Chi, Slotta, & de Leeuw, 1994). It is the responsibility of the educational system to provide ample education for both teachers and students in this regard.

Teacher education is strongly emphasized since teachers are considered as significant agents of change in implementing education for a more sustainable, inclusive and ecocentric world (Ilisko, 2007). Therefore, Puk and Stibbards (2010) conclude that “teacher education is the nexus for ecological integrity. How can we discuss solutions for ecological degradation if we are primarily passing around ‘opaque empty shells?’” (p. 472).

Experiential Learning and Ecological Macro-Models

An ecological macro model is a method of practical learning and involves the person becoming immersed in their learning. The learner does not focus on the reading of the text but uses their own body and mind as a mode of learning. One of the best parts of macro model learning is that the activity of performing macro models has a long-lasting effect on the human brain (Puk & Stibbards, 2011). This type of learning is done by removing oneself from technology and focusing mostly on experiences in the natural world. The process is completed outside in nature to engage the senses in action, attach oneself to nature, and to get in touch with one’s emotional response to nature.

According to Puk (2018), “Ecological macro models are analogous representations of natural processes and human systems (or components) in which the learner actively plays a role in order to better understand and internalize how these systems work” (p.134). A study done by Stibbards and Puk (2011) revealed ecological macro models to be a transformative, embodied, and emergent learning approach. These macro-models revolve around these main

facts, further supported by Calvo and Gomila (2008) who suggest that during the learning process the interaction among body, mind, and one's natural surroundings gives birth to a new enlightenment. However, Kauffman (2010) understands that learning from new insights is very much a disorderly interaction among the learners and the instructor does not have much control over learning outcomes.

Academic learning can only teach us the basics of developing an ecological consciousness. We as a society need to see the full impact of our actions on the natural surroundings. The emotional and conceptual processing that is a prerequisite for developing this awareness requires learning through embodied experience, for example, through modality-specific systems (Niedenthal, Barsalou, Winkleman, Krauth-Gruber & Ric, 2005). Embodied experiences provide "multiple levels of brain and body appear to continually interact in cognition" (Stephen, Dixon & Isenhower, 2009, p.1811). Within the experience of a macro-model, the learner is involved in learning through physical participation, much as with experiential learning. This physical activity allows the learner to connect with their surroundings and results in long-lasting outcomes in their understanding. Hoover and Whitehead (1975) support this assertion by describing experiential learning as being a very powerful way of teaching and learning. These scholars assert that experiential activities involve the senses of the learner directly through action rather than simply learning passively. They advocate for this method as a very powerful tool for any educator and describe the advantages of experiential learning as (1) Experiential learning cultivates a very deep understanding of how one's senses are being used maximally during learning. This prepares the learner for the use of the senses when placed in a difficult situation; (2) As an extension of the unique sensory experience for each student, a greater personal significance is attached to the learning as sensations and emotions are later reflected upon; (3) Experiential learning also results in enhanced skills and competence development. Through engaging physically in

an activity, one becomes open to novel approaches that can refine their mental model and create the opportunity for more efficiency; (4) A final advantage of experiential learning is that it embraces the idea of learning taking time and an acknowledgment is made that effort and active sensory experience merge to create a new concept of reality over this period of time. (p. 25)

Experiential learning helps us develop an in-depth understanding and creates long lasting images in our minds of the natural surroundings. With these images in mind, we can start to develop these concepts into concrete ways of how one understands the natural world and their place in it.

Concept Development

Concept Development begins at an early age. We develop concepts to help us in understanding the world around us and how to relate to others and the natural world. Knowing that we are always developing and growing our concepts, we can start to learn ecological consciousness at an early age as well.

Piaget (1964) believed that there are four stages of cognitive development in people that increase in complexity as the person matures. He defined the first stage as sensory-motor, a pre-verbal state in which children between the ages of newborn to 18 months exhibit. The second stage is that of pre-operational representation which builds upon the sensory-motor stage. The third stage is concrete operations. Finally, the fourth stage is what Piaget calls the formal or hypothetic-deductive operations (p.177).

Studying Vygotsky's (1987) work has also helped me to define what concept development means. Vygotsky believes that there are two kinds of concepts: spontaneous everyday concepts and non-spontaneous scientific concepts (as cited in Puk & Stibbards, 2012). Vygotsky (1986) coined the term cognitive zone of proximal development which

states that children require the guidance of those more knowledgeable of the subject matter to help them to form concepts. Regarding scientific concepts, of which the interconnected elements of the natural world could be considered to be, Lourenco (2012) discusses Vygotsky's emphasis on this need for the guidance of a more knowledgeable individual in developing concepts. The author acknowledges that this view is contrary to that of Piaget, who asserted that knowledge is individually constructed.

Puk (2012) builds on the work of both Piaget and Vygotsky and takes the stance that a child's cognitive development is based on the influence of neurobiology. Specifically, Puk is looking at three distinct stages of development that are necessary to attain ecological consciousness. These three stages are (a) pre-puberty which is considered to range from birth to grade 3, (b) the boundary space which includes grades 4-9 and (c) post-puberty comprises individuals from grade 10 through the remainder of the human life cycle. To be able to teach the concept of ecological consciousness, those doing the teaching must first understand that the stages of life and the ability of individuals to understand concepts appropriate to each stage vary. At an early age, the concept can be introduced and as the person gets older, the concept can be built upon adding new ideas to the concept while still reaffirming the original concept. This allows the individual to grow their knowledge of a subject and as they learn they can re-evaluate their understanding. This is especially important with ecological consciousness as not everyone shares the same views and this allows for informative discussions and gaining new knowledge one may have been blind to before. Puk (2018) narrows his research on cognitive development to specifically look at ecological concepts. Puk states that no matter the education a person has, that person may not have a clear and mature definition and understanding of complex ecological concepts. Puk (2018) believes that there are many reasons for this however the most important is that teachers do not have the background knowledge to appropriately teach the concepts of ecological consciousness at

all levels (p. 399). He further explains how the student develops their ecological consciousness by following a sequence of thought. This thought sequence begins with direct experiences, then proceeds to qualia where the student then develops an image of the concept. This stage is followed by a model and finally, the student will come to develop a trial definition based on their understanding of previous stages of learning.

Puk (2018) believes that that to truly understand concepts related to ecological consciousness one must approach learning through direct experiences. An approach to these direct experiences is the usage of what is known as “ecological macro-models”. Puk defines macro-models as representations of natural processes and human systems and the intricate and complex ways in which they interrelate to each other. These representations require that the learner must take an active approach in learning. The purpose of ecological macro-models is to help learners to develop concepts that are long-lasting.

The learner is acquiring an understanding of complex systems from within the representation of that system as s/he observes first hand how the parts interact to make the whole system operate and how this interaction unfolds as it develops. This allows the learner to use multiple senses and develop emotional responses to make meaning for him or herself as the interactions play out all around. (Puk 2018, p 134)

Outdoor Learning

To fully appreciate ecological consciousness, the learner must not solely rely on theoretical learning but must fully participate in active learning. From what I understand, to develop an ecological consciousness, the learner must also learn in their natural surroundings. Outdoor Learning can be defined as going outside of the classroom into either the natural environment or into a constructed environment to build on what is learned in the classroom (Knapp, 1996). Orr (1994) believes that outdoor learning is a broader term than

environmental education as environmental education is instructing the learner on how they can live in harmony with the natural world without destroying it.

According to Puk (2018) ecological education (as taught through the outdoors) can be defined as,

Teaching and learning of the critical relationships between complex natural systems including the sun's energy, entropy, air, water, soil, population and biodiversity; and the interrelationships between these complex systems and all other components of the ecosphere both biotic and abiotic, with the goal of preserving ecological integrity on earth, both short and long term (p. 118).

Connected to outdoor learning, Smith and Williams (1999) describe ecological education as learning that is centered on viewing humans as an interconnected part of the environment. Within ecological education, it is understood that humans can affect the environment either negatively or positively. Smith and Williams describe seven principles of environmental education. Of the seven principles, two are directly related to the topic of outdoor learning. These are "1. Development of personal affinity with the earth through practical experiences out-of-doors and through the practice of an ethic of care" and "2. Grounding learning in the sense of place through the study of knowledge possessed by local elders and the investigation of surrounding natural and human community" (p. 6).

Orr (1994) demonstrates that outdoor learning is important because the learner's concepts are directly correlated on how they are taught. When students are only taught indoors in the classroom, they are not learning to really question ideas. The Ontario Ministry of Education (2017) believes that outdoor learning is crucial for students to develop a strong positive connection to their natural surroundings. The curriculum, however, does not necessarily lean towards this type of education as the curriculum has been changed to include

environmental education in all subjects and therefore there is not enough time or teacher training available for the concepts to be fully explored.

Technology has advanced significantly in the last few decades. This, in turn, has led to a different way of approaching teaching. Instead of learning about the environment by going out and interacting with it, students are now being taught through various computer applications. This has led to a disconnection from the natural surroundings and how humans are related to the environment. Walsh et al. (2018) discuss how science has influence over human life and how nature and natural systems heal human melancholy and stresses. Screen reduction is one of the best epitome of such healing. They also show that limited screen time promotes a healthy life and they have found out that screen time, and sleep are associated with superior global cognition.

Just looking at education in Ontario, we can see the importance of outdoor learning. The standard methods of teaching in the province though take place inside a classroom with walls and a ceiling as Puk and Behm (2003) found in secondary schools and Puk and Makin (2006) found in elementary schools. This is despite the fact that we know that not all students can be productive in this environment. If we can incorporate that way of learning inside and outside the classroom, then students would be more likely to be able to develop a healthy ecological consciousness. According to Fagerstam and Blom (2013), when students are taught a subject in natural surroundings, it helps them to develop a more evolved understanding of that topic instead of just reading about it in textbooks.

Conclusion

The previous chapter studied the challenges of an ecological consciousness Education. It served to highlight the difficulties of understanding ecological consciousness when it has to be incorporated into all subjects in the Ontario curriculum and is not taught as

a separate subject. Puk and Makin (2006), as well as Puk and Stibbards (2010) have advocated for a separate course in ecological consciousness education, as teaching it in all subjects does not do justice to the importance of ecological consciousness.

The above literature review provides an overview of the literature that I have examined which emphasizes the importance of ecological literacy and ecological consciousness as pertaining to education and how students need to be aware from an early age the impact we as humans have on natural processes as well how natural processes impact us as humans. Through these ideas connected to ecological consciousness, students can recognize that all organisms great and small are interconnected and what society chooses to do today has an impact on tomorrow. As Puk (2018) stated,

Without clean air, water and soil, without controls on population, without protection for biodiversity and without ecologically renewable forms of clean energy, there will be no future of life. And along the way, suffering will increase. Thus, in all forms of planning for the future, we must begin with preservation of Ecological Integrity. (p.8)

Chapter 3: Videos

Introduction

This chapter of my portfolio revolves around my journey of learning ecological consciousness. My journey starts in India with not knowing much about ecological consciousness and just going about my life unaware of the impact I was having on the natural surroundings. After coming to Canada and taking an ecological consciousness course at Lakehead University, I became self-aware. I reflected on my lifestyle here and found ways to improve my ecological footprint. Through the medium of video, I have documented my journey from not understanding what ecological consciousness was to having developed an increased ecological consciousness. I believe these videos may help everyone to attain a lifestyle that is consistent with an increased ecological consciousness. There are four videos I created, which are provided on USB.

1. My Journey of ecological consciousness: This video will show my personal understanding and growth pertaining to not having a developed ecological consciousness while in India to how I attain a much more developed ecological consciousness and awareness of my natural surroundings, as well as how my decisions impact those surroundings. This occurred primarily through the ecological consciousness graduate course at Lakehead University, Canada.
2. Sunlight Mood Production: In this video, we recreated the activity that was done during the ecological consciousness class. This video recreates the Sunlight Mood Production macro-model we learned. It highlights how our bodies rely on sunlight for energy and maintaining our health.

3. Plastic Reduction Video: This video will highlight the uses of plastic and which types of plastic can be recycled and reused. I will discuss how to reduce plastic consumption in our lives.
4. Shampoo: In this video, I demonstrate how we can make everyday products at home with minimal effort. This video will help demonstrate that we can reduce unhealthy chemicals from our everyday lives and also reduce pollution and other ecologically unfriendly production methods. (see Appendix A for instructions for how to make the shampoo).

In conclusion, these four videos highlight the journey to having an ecological consciousness. Each of them touched on different steps of the learning process. One has to be aware of their surroundings and to be conscious of how one interacts with the natural world and how we can influence it. Also one must also understand that humans are dependant on the natural world for their development. Once we have fully understood this, we can come up with ways of having a positive impact on the natural world. These videos will also help people in developing an ecological consciousness. Both Canada and India can benefit from teaching people at an early age, what ecological consciousness is as well teach them how to develop it. Once people develop an ecological consciousness, they can monitor their habits and changed them to be beneficial to their natural surroundings.

References:

- Agwan, A. R. (1993). Towards an ecological consciousness. *The American Journal of Islamic Social Sciences*, 10(2), 238-248.
- Balgopal, M. M., & Wallace, A. M. (2009). Decisions and dilemmas: Using writing to learn activities to increase ecological literacy. *The Journal of Environmental Education*, 40(3), 13-26.
- Berry, T. (1988). *The dream of the earth*. San Francisco, CA: Sierra Club Books.
- Biriukova, N. A. (2005). The formation of an ecological consciousness. *Russian Education and Society*, 47(12), 34-45.
- Calvo, P., & Gomila, T. (Eds.). (2008). *Handbook of cognitive science: An embodied approach*. Oxford, UK: Elsevier.
- Chi, M. T. H. (2005). Commonsense conceptions of emergent processes: Why some misconceptions are robust. *The Journal of the Learning Sciences*, 14(2), 161-199.
- Chi, M. T. H., Slotta, J. D., & de Leeuw, N. (1994). From things to processes: A theory of conceptual change for learning science concepts. *Learning and Instruction*, 4, 27-43.
- Clair, R. S. (2003). Words for the world: Creating critical environmental literacy for adults. *New directions for adult and continuing education*, 2003(99), 69-78.
- Dove, J. (1996). Student teacher understanding of the greenhouse effect, ozone layer depletion and acid rain. *Environmental Education Research*, 2(1), 89-99.
- Fägerstam, E., & Blom, J. (2013). Learning biology and mathematics outdoors: Effects and attitudes in a Swedish high school context. *Journal of Adventure Education & Outdoor Learning*, 13(1), 56-75.
- Gedžūne, I., & Gedžūne, G. (2011). Exploring and promoting ecological consciousness in teacher education: The possibilities of educational action research in education for

- sustainable development. *Journal of Teacher Education for Sustainability*, 13(1), 43-61.
- Hill, S. B, Wilson, S., & Watson, K. (2004). Learning toward an ecological consciousness: Selected transformative practices. In E. V. O'Sullivan, & Taylor, M. M. (Eds.), *Learning Ecology: A New Approach to Learning and Transforming ecological consciousness* (pp. 47-64). New York, NY: Paigrave Macmillan.
- Hoover, J. D., & Whitehead, C. (1975). An experiential-cognitive methodology in the first course in management: Some preliminary results. *Simulation Games and Experiential Learning in Action*, 2. Retrieved from <https://journals.tdl.org/absel/index.php/absel/article/view/2787>
- Iliško, D. (2007). Teachers as agents of societal change. *Journal of Teacher Education for Sustainability*, 7, 14-26.
- Kamel, L. I. (2000). Ecological education in the living environment. In J. P. Hautecoeur (Ed.), *Ecological education in everyday life: Alpha 2000*. (pp.21-43). Toronto, Canada: University of Toronto Press.
- Knapp, C. E. (1996). *Just beyond the Classroom: Community adventures for interdisciplinary learning*. Charleston, WV: ERIC/CRESS.
- Knapp, D. (2000). The Thessaloniki declaration: A wake-up call for environmental education? *Journal of Environmental Education*, 31(3), 32-39.
- Karrow, D. D., & Fazio, X. (2010). NatureWatch, schools and environmental education practice. *Canadian Journal of Science, Mathematics and Technology Education*, 10(2), 160-172.
- Kauffman, S. A. (2010). *Reinventing the sacred: A new view of science, reason and religion*. New York, NY: Basic Books.

- Lourenco, O. (2012). Piaget and Vygotsky: Many resemblances, and a crucial difference. *New Ideas in Psychology*, 30, 281-295.
- Morris, M. (2002). Ecological consciousness and curriculum. *Journal of Curriculum Studies*, 34(5), 571-587.
- Niazi, S., (2014, January 17). Protests continue against coal mining in ancient Indian forest. Retrieved from: <https://www.dw.com/en/protests-continue-against-coal-mining-in-ancient-indian-forest/a-17259459>
- Niedenthal, P.M., Barsalou, L.W., Winkelman, P., Krauth-Gruber, S. & Ric, F. (2005). Embodiment in attitudes, social perception and emotion. *Personality and Social Psychology Review*, 9 (3), 184-211.
- Ontario Ministry of Education (2017). *Environmental education*. Toronto: Queen's Printer for Ontario. Retrieved from: <http://www.edu.gov.on.ca/eng/curriculum/secondary/environment.html>
- Ontario Ministry of Education (1989). *Environmental education*. Retrieved from: <http://www.edu.gov.on.ca/extra/eng/ppm/108.html>
- Orr, D. W. (1994). *Earth in mind: On education, environment, and the human prospect*. Washington, DC: Island Press.
- O'Sullivan, E. V., & Taylor, M. M. (2004). *Learning toward and ecological consciousness: Selected transformative practices*. In E. V. O'Sullivan, & M. M. Taylor (Eds.), *Glimpses of an ecological consciousness* (pp. 5-23). New York, NY: Palgrave Macmillan.
- Piaget, J. (1964). Development and learning. In R. E. Ripper & V. N. Rockcastle (Eds.), *Piaget Rediscovered*. (pp. 7-20). (Reprinted from *Readings on the Development of Children*, pp. 19-28, by M. Gauvain & M. Cole, Eds, 1997, New York, NY: W. H. Freeman and Company).

- Powers, A. L. (2004). Teacher preparation for environmental education: Faculty perspectives on the infusion of environmental education into preservice methods course. *The Journal of Environmental Education*, 35(3), 3-11.
- Puk, T. (2012). The Influence of Neurobiology on Lifelong Ecological Literacy and ecological consciousness. *International Journal of Environmental and Science Education*, 7(1), 3-18.
- Puk, T. (2018). *Healing the ecological self: Stop peeing in the drinking water*. Unpublished manuscript, Faculty of Education, Lakehead University, Thunder Bay, ON, Canada.
- Puk, T., & Behm, D. (2003). The diluted curriculum: The role of government developing ecological literacy as the first imperative in Ontario secondary schools. *Canadian Journal of Environmental Education*, 8, 217-232.
- Puk, T., & Makin, D. (2006). Ecological consciousness in Ontario elementary schools: The truant curriculum and the consequences. *Applied Environmental Education and Communication*, 5, 269-276.
- Puk, T., & Stibbards, A. (2010). Ecological concept development of preservice teacher candidates: Opaque empty shells. *International Journal of Environmental & Science Education*, 5(4), 461-476.
- Puk, T., & Stibbards, A. (2011). Growth in ecological concept development and conceptual understanding in teacher education: The discerning teacher. *International Journal of Environment & Science Education*, 6(3), 191-211.
- Sengar, S.(2018, June 25).Chipko andolan was the strongest-movement to conserve forests in India & India needs it again. India Times News. Retrieved from:
<https://www.indiatimes.com/news/india/chipko-andolan-was-the-strongest-movement-to-conserve-forests-india-needs-it-again-342183.html>

- Smith, G. A., & Williams, D. R. (Eds.) (1999). *Ecological education in action: On weaving education, culture, and the environment*. Albany, NY: State University of New York Press.
- Stephen, D. G., Dixon, J. A., & Isenhour, R. W. (2009). Dynamics of representational change: Entropy, action, and cognition. *Journal of Experimental Psychology: Human Perception and Performance*, 35(6), 1811.
- Swanepoel, C. H., Loubser, C. P., & Chacko, C. P. C. (2002). Measuring the environmental literacy of teachers. *South African Journal of Education*, 22(4), 282-285.
- Thomashow, M. (1996). *Ecological identity: Becoming a reflective environmentalist*. M.I.T. Press.
- Thompson, F., & Logue, S. (2006). An exploration of a common student misconceptions in science. *International Education Journal*, 7(4), 553-559
- Vygotsky, L. S. (1986). *Thought and language* (A. Kozulin, Trans. Rev. ed.). Cambridge, MA: MIT Press.
- Vygotsky, L. S. (1987). *Development of scientific concepts*. In R. W. Rieber & A. S. Carton (Eds.), *The collected works of L. S. Vygotsky (pp. 167–241)*. New York, NY: Plenum Press.
- Walsh, J. J., Barnes, J. D., Cameron, J. D., Goldfield, G. S., Chaput, J. P., Gunnell, K. E., ... & Tremblay, M. S. (2018). Associations between 24-hour movement behaviors and global cognition in US children: a cross-sectional observational study. *The Lancet Child & Adolescent Health*, 2(11), 783-791.

Appendix A

Shampoo Recipe

The three ingredients are Coconut milk, Castille soap and Lavender essential oil or you can also add vitamin E for smooth and healthy hair. Coconut milk can be purchased from any super market. Castille Soap and Lavender oil can be found at any drugstore. These three ingredients are not expensive thus are very affordable. We will also need an empty glass jar to pour the oil for future use. An empty glass jar is easily available from any dollar store. Or you can reuse any empty jar of sauces like salsa.

We will be using a mixing bowl to combine all the ingredients in the desired ratio. First, we take about half a cup of coconut milk and put it in the mixing bowl. Coconut milk known for its properties to strengthen the hair and provide good elasticity to the hair. It is loaded with vitamins and minerals.

Second, add about half a cup of castille soap to the coconut milk. Now you can add vitamin e which helps to repair the hair and provides strength. Lastly add about one table spoon of Lavender oil to the mixture and stir everything together. Pour the mixture in the empty bottle and shake well. Shampoo is ready for use. This Shampoo can be stored in a cold and dry place. Just shake well before every use. Each batch can be used for up to one month before having to be discarded.