

CULTIVATING YOUNG MINDS AND A SENSE OF PLACE THROUGH TEACHER
PROFESSIONAL DEVELOPMENT

by

Emily Vercoe

A professional paper submitted in partial fulfillment
of the requirement for the degree

of

Masters of Science

in

Science Education

MONTANA STATE UNIVERSITY
Bozeman, Montana

July 2016

©COPYRIGHT

by

Emily Vercoe

2016

All Rights Reserved

TABLE OF CONTENTS

1. INTRODUCTION AND BACKGROUND1

2. CONCEPTUAL FRAMEWORK6

3. METHODOLOGY12

4. DATA AND ANALYSIS22

5. INTERPRETATION AND CONCLUSION32

6. VALUE36

REFERENCES CITED38

APPENDICIES42

 APPENDIX A Fieldtrip Concepts and Discussion Ideas43

 APPENDIX B Workshop Agendas45

 APPENDIX C Pre- Treatment Educator Survey and Data57

 APPENDIX D Student Post Activity Evaluation and Data61

 APPENDIX E Post-treatment Educator Survey and Data67

 APPENDIX F IRB Exemption71

LIST OF TABLES

1. Data Collection, Timeline, and Triangulation Matrix	19
2. Educator Demographics.....	22

LIST OF FIGURES

1. Map of Chiloé Region of Northern Patagonia, Chile	2
2. Colegio Monte Verde Teachers and Don Luis Gallardo	3
3. Example Pre-Treatment Map.....	17

ABSTRACT

This project is a professional development experience for educators at Colegio Monte Verde, a primary school serving students from ages three to twelve in Castro Chile. It addresses integrating agroecology, a form of place-based education, into the school curriculum for the 2016 school year, beginning in March. It consisted of four phases: educator curriculum and content development onsite at Centro de Educación y Tecnología Chiloé's experimental farm, summer on and off-site professional development for educators, modeling teaching strategies and content with students, and a presentation of learning in which teachers shared their own place-based lessons. The study is designed to explore how agroecology can be used as a teaching tool to help students better understand the world around them and look at their community as a living laboratory.

INTRODUCTION AND BACKGROUND

“Every farm is a textbook on animal ecology; woodsmanship is the translation of the book” (Leopold, 1989, p. 81).

This classroom research project addressed transferring of traditional knowledge of agroecology and agriculture through a place-based pedagogy into a formal science learning experience for teachers and their students. Teachers and administrators from the Colegio Monte Verde (CMV) participated in workshops, field trips, and planning sessions with the goal of integrating a sense of place and the important agroecological heritage of their island into the school curriculum. Planting the seed of agroecology into the school ethos that will last long beyond the 2016 school year, which will help establish connections between classroom content and the place students call home was our collective goal. The place students call home is the island of Chiloé in southern Chile, the country’s largest island and home of unique agroecological practices, endemic species, and a primary center of origin for potatoes, strawberries, and Chilote garlic (Figure 1).



Figure 1: Chiloé Region of Northern Patagonia, Chile.

It is an ecologically unique location where traditional practices and diverse food systems can and should be celebrated by its inhabitants and the world at large. Chiloé is also one of the pilot sites for the United Nations’ Globally Important Agricultural Heritage Systems (GIAHS) program, which began in 2002 as a way to, “safeguard and support the world’s agri-cultural heritage food systems” and acknowledge the importance of indigenous, or traditional knowledge, on food systems (FAO, n.d para 2.). Surprisingly, teachers at this environmental school did not know Chiloé had such designation and when they learned of the island’s global importance they became quite proud that they were a part of something so big.

This project applied traditional knowledge of land and ecosystems as teaching tools for science education in a real-world classroom where the nature of science occurs

on a daily basis. Figure 2 depicts teachers learning from farmers how their practices align with classroom instruction, specifically aging a sheep based on dentation.



Figure 2: Colegio Monte Verde Teachers and Don Luis Gallardo.

Dalgaard, Huchings, and Porter refer to agroecology as the study of the interactions between plants, animals, humans and the environment within agricultural systems (2003). By looking at these relationships one can begin to explore and notice patterns, cause and effect, systems, and structure and function. They are the relationships that were formed throughout human history, as our species was more dependent on and coexisted with its surrounding ecosystem (Mitchel & Mueller, 2010). As a society, we are loosing this connection as we become disassociated from the geographic source of our raw materials. In addition, there are many young people around the globe who do not know where their food comes from or about the energy it takes to produce it. While these big picture issues cannot be solved with a capstone project, learning about and taking responsibility for our place in the system is a start.

This project allowed for the integration of hands-on, location specific, learning

tools through systems thinking, which provided both students and teachers a rich learning environment and way to make science content “sticky.” Through causal chains we explored how Chiloé’s drought over the summer impacted Earth’s four spheres (atmosphere, lithosphere, biosphere, and hydrosphere) as well as humans, and vice versa, thus demonstrating to teachers and students relevant connections between themselves and scientific phenomena. According to Cachelin, Rose, and Rumore, research on community-based initiatives suggests that,

students gain richer and more nuanced understandings of socio-ecological dynamics when immersed in particular places, and critical scholarship argues that sustainability education is more grounded and more deeply understood when students are removed from traditional classroom settings, when they are more immersed in place (2016, p 8).

The organization, Centro de Education y Tecnologia Chiloé (CET) has a thirty-year history of working with farmers to demonstrate the systemic nature of farming and the numerous moving parts, including farmer and soil, which make up a diverse system. Their experimental farm is a patchwork of forest, cultivated land, livestock grazing areas, fallow pasture, greenhouses, and office space. It is a living demonstration of an ecosystem that supports humans and non-humans and serves as the island’s most robust seed bank for native potatoes. In addition to agriculture, the culture and people are considered inputs to the system. CET’s work and philosophy served as this project’s content backbone and were applied in a school setting through teacher professional development. CET viewed the benefit of this partnership and project as a way to support the sustainability of agroecology on the island so CMV’s students are the next generation leaders and decision-makers on the island; therefore they are also inputs in a successful

and dynamic agri-cultural system. The following questions motivated this study: Can we build agroecology programs that resonate with the youth who will grow up with an environmental or ecological ethos and appreciate traditional practices? How do we help students, who see in black and white, understand the concept of value of place? I do not suggest we create a new movement of farmers, only informed citizens who can use this perspective when making decisions about land, food, and place within their territory. Based on these questions and the approach CET applies to its work on the island of Chiloé, a series of lessons were created for educators and young people at CMV, a nine-year old charter school in Alto Castro whose vision is to emphasize meaningful learning experiences for students in harmony with the natural, social, and cultural environment. Before students returned for the 2016 school year, teachers and administrators participated in a series of place-based fieldtrips and curriculum planning meetings along with me. These field experiences and planning were designed to provide teachers with a deeper understanding of how agroecology and its principles could be applied to school content, increase confidence in integrating science into every day activities at school, and as a way to help them build a philosophical frame for cultivating young thinkers as agroecologists cultivate soil. The school administration's overall goal for this project was to establish a plan for integrating more natural sciences into classroom instruction throughout the 2016 school year therefore the partnership was mutually beneficial. In addition to the summer workshops, teachers participated in a series of classes in agroecology and natural science during the school year as a way to begin fostering a sense of place in their school community. An example of this was the creation of lessons

about soils, traditional content for fifth and sixth grade students, which we then modeled with students by digging into different areas on the school's property and collecting samples rather than using a traditional text. The goal for this experience was to help educators incorporate a dynamic agricultural ecosystem into their content and to help cultivate a wonder and appreciation in their students, thereby promoting growth within the agroecology ecosystem and perhaps contributing to its long term conservation.

Focus Question

In order to better understand this system and explore the above questions in detail, this project investigated, "how to use the concepts of agroecology, as a form of place-based education, to inform and educate young people?" Furthermore, I am interested in, "what makes place-based learning effective and how can it be applied to agroecology?" The answers will help frame the project's context. I am also interested in learning, "how educators and students can see their community as a living laboratory." More specifically, can educators breakdown the walls that separate classrooms from the surrounding school grounds and begin to use nature as a teaching tool, not just a location?

CONCEPTUAL FRAMEWORK

Ecology as a discipline and gardening as a hobby have long been interests of mine. In addition I have over ten years of teacher professional development experience in using inquiry and hands-on resources to teach science content. This project encouraged the blending of personal and professional interests to offer a compelling mechanism to teach science. I was able to expose teachers to ecology content in an agricultural setting and work with them to make connections and explicit lesson plans that wove the two

together in a relevant manner. This section builds the foundation for my project and specific methodology.

Place-Based Education

The systemic approach of agroecology is an appealing way to help farmers manage people, land, and animals. In addition to the outputs of food, fiber, and fuel inputs such as place, culture, history, and community are critical to a successful system. It is also an approach to science education espoused by John Dewey in his psychology courses as early as 1892. Although the name is different, he called for students to learn science through activities such as raising animals and gardening. He called for using locally relevant knowledge gained from experience (Dewey, 1922, & Buxton and Provenzo, 2012). Because of his approach to teaching in this manner, Dewey is one of the foundational supporters of what is now known as place-based education, which provides a vehicle to better understand these relationships and is a pedagogy that can be used to explore their dynamic nature. The work of Jean Piaget is also foundational in place-based learning, his psychological theory identifies four developmental stages of education and the processes by which children progress through them and then they are applied to how they interact with their environment (Buxton and Provenzo, 2012). This important connection between community and student is as important in contemporary place-based education pedagogy.

In today's schools, as Robert Yager of the University of Iowa explains, "by integrating place into the school curriculum, learning can be seen as important for daily living... Place-based education provides a real world context that is missing from a

prescribed curriculum.” (Yager, 2010 para 2). This connection to relevance and integrating the world beyond the classroom walls continues for proponents of place-based learning. Sobel promotes the importance of local examples as a way to make learning relevant to students and their teachers, by using their backyards or local geographies as a point of reference for scientific phenomena rather than a “pretty picture” of a far away place that has no meaning for students, learners can better grasp concepts (Sobel, 2007 p.7). These connections between location and learning also provide students with roots and a foundation from which to grow.

In an analysis of rural place-based education written by Bartholomaeus for the International Education Journal, the work of Gruenwald is cited as a justification for the power of place-based learning, especially in rural education settings. She quotes his statement, “place-based learning is rooted in what is local – the unique history, environment, culture, economy, literature and art of a particular place” (2006, p. 480). The context for learning is much broader than the classroom walls and serves to engage students in their geography. Place-based education provides grounding and understanding of the world in which students operate and learn, therefore relevance to their lives through agriculture, a vocation that is inherently place specific. In Chile, along with other indigenous populations, culture and identity provide powerful teaching tools. According to CET Program Director Barbara Gonzales, the strength of Chiloé’s culture would serve as a good connection for learners. A study of place-based science lessons for indigenous Timorese students articulated their finding that the richness of science and mathematics content in familiar everyday phenomena and artifacts created in the learner, “something

like an evangelistic desire to show others what they had found in front of their noses” (Gabrielson & Hsi, 2012 p. 208). Beyond the cultural connections, this type of science education also allows students to appreciate the place from where they come in a new way. In addition to connecting with the location the “sense of place” will also be woven into the project by connecting with the ethical and social implications of agriculture (Smith & Sobel, 2010; Smith & Gruenewald, 2007). Agnew advocates that “place” is three fold: place as a *location* of an object or event; place as *locale* for a setting; and *sense of place*, referring to the identification with and belonging to a particular place (1987). This notion of sense of place allows an opportunity to develop ecologically conscious citizens who can connect the local to the global and vice versa and is the type of place-based learning I address through this project. According to Gruenewald’s acclaimed work *Critical Pedagogy of Place*, knowing your place, where you come from is intertwined with who you are. Dentzau would corroborate this sense of place and its impact on who we are as learners and how we perceive the world around us (Gruenewald, 2003; Dentzau, 2014). This sense of place is a growing area of pedagogy and practice among science educators and research therefore it is woven into the content as a way of connecting to learners locally and beyond Chile’s borders. For example, baking bread is a platform for students to learn about chemistry and their culture’s history and this is a way to look at science in a practical and approachable manner that is tied to familiar everyday experiences that go beyond the lab and into the family structure. There is not a lot of research linking agriculture, or agroecology, and science education for K-12 students (Mercier, 2015); and this is an opportunity to make new connections locally and globally.

Place plays an important role in agroecology and is a larger foundation for this research project (Gautreau & Binns, 2012). Indigenous and rural communities around the globe offer powerful connections between education and location. Using examples that are local and culturally familiar can help make lessons more place-based (Smith, 2002; Gautreau & Binns, 2012). In communities such as Castro, Chile can serve as a place to explore new techniques that will benefit global learners and offer local students relevant science instruction that is sticky (Gabrielson & Hsi, 2012). While examples of and research about agroecology programs for K-12 students are lacking there are a few university programs that inform this study's design. In the *Journal of Agricultural Education and Extension*, Lieblein, Breland, Francis, and Østergaard explain that their agroecology program is designed to challenge students to become "effective agents of change in the dynamic context of current global problems in agriculture and food systems" (2012, p. 28). This article and its research provides strong insight into how to build an agroecology program for younger learners such as using location and community as a teaching tool, which provides relevance and real-world experience. In addition to relevance, learning experiences and workshops need to contain a hands-on and inquiry-based component so that students are actively involved in the learning. Passive intake of information does not lead to long-term behavior change (Lieblein et al., 2012; Minner et al., 2009).

One example of how place-based education benefits students is in The Beebe School in Malden, Massachusetts. Over a four -year evaluation period, Beebe students outperformed their peers on the Massachusetts math and science portion of the MCAS

suggesting benefits of this approach to learning (PEEC Collaborative 2010). Schools like the Beebe School use their community to teach lessons in science, literature, history and social studies on a regular basis. Their environment is a laboratory rather than a destination rarely visited. These findings are corroborated by a nationwide study by the State Education and Environment Roundtable, undertaken in 1998. This study analyzed 40 schools and specifically addressed the, “effects of learning and instruction of using the environment as an integrating context in K-12 schools” (Lieberman, 1998, p. 11). Positive correlations between the environment, or place, and learning were found among all content areas; specifically in science it found that standardized test scores increased for elementary, middle, and remained equal to those of their non-place based education schools (Ibid, p. 22 & 47). In addition to the standardized test advantages, the study found that students were better able to establish connections between their learning and the real world application than their non-place-based learning peers (Ibid, p. 45).

Agroecology

Agricultural education has long been an interdisciplinary endeavor with many elements of contemporary education practices woven in. As far back as 1929, proponents of agricultural education claimed that, “Agriculture is a meeting ground of the sciences. Physics and chemistry lie at its base. To these elements biology adds its conception of organism. Mathematics is their common instrument” (Parr & Edwards, 2004, p. 107). Parr and Edwards demonstrate that hands-on learning and agricultural education are complementary and often overlap (2004). Both are more learner centered than traditional lecture and provide students with a more meaningful learning experience than traditional

lecture (Parr & Edwards, 2004; Minner et al. 2009). Agroecology lends itself well to the new standards design of crosscutting concepts across disciplines because as a science it also spans the content areas and is focused on similar principles. Patterns, cause and effect, and systems are all taught within the content and then applied through active learning, which align well with the trends found in the contemporary science education of the United States, and other countries.

METHODOLOGY

Treatment

This project is a professional development experience for educators at CMV, a primary school serving students from ages three to twelve. It focused on integrating agroecology, a form of place-based education, into the school curriculum for the school year, beginning in March 2016. It consisted of four phases: One, my own practicum at CET where I participated in a growing season, taking fieldnotes and making observations to inform teacher professional development; Two, summer professional development with teachers where two offsite field trips occurred with planning based on those experiences that created a frame for the integration of place-based education into their daily curriculum; three, in school professional development during planning meetings with teachers and administrators; and four, educators presenting lessons grounded in place-based learning to one another and to me as celebration of their learning. The four phases can be seen as individual development, teacher development, curriculum development, and lesson plan development that fits the curriculum.

Fieldnotes and Observations

CET's year round agroecology workshops hosted on their experimental farm in Chonchi, Chile was a foundation for my own work. They blend theory and application into their programs for adult farmers, beginning with lecture in the classroom and then moving out into the fields, greenhouse and seed lab. The field component is hands-on; participants create fertilizers and biocontrols for crops and learn pest identification, animal care, and seed saving. Between October and December, fall in the northern hemisphere, I participated in workshops and volunteered on the farm, where extensive fieldnotes were created on how CET staff delivered content, the content itself, and reflection on how those experiences would be best modified for classroom settings with teachers and students at CMV. On the farm, we actively engaged in chemistry: making fertilizer out of algae and aged manure, addressing the location's geology and geography by building a meter trench to analyze soil horizons, and lessons in biology came daily while we worked through a growing season from planting to harvest of both animals and vegetables. These fieldnotes, which capture the rich life of an experimental farm, served as the catalyst for this project. They allowed me to understand the systemic nature of agroecology, the importance of "place" and culture in a growing system, and how these co-exist to make producing food a way of life not just a commodity for market. This understanding addresses sub questions relating to the power of "place" in education as well as creating motivation within the learner. Each of these aspects is key to understanding the research questions developed for this capstone.

Summer Teacher Professional Development

The week before school started in February 2016, 16 teachers participated in a multiple day teacher professional development on topics related to agroecology and integrating a sense of place into their classroom content for the upcoming year. The above trends became unifying themes for additional lessons. Through guided instruction, tours of two working farms, and strategic team planning we developed a sense of place within the teaching community that was encouraged to grow beyond this project. Prior to each field trip, educators received a list of prompts to encourage their thinking about integrating these experiences into their lessons, in and out of science time. Copies of the Fieldtrip Concepts and Discussion Ideas document can be found in Appendix A. On these fieldtrips, we walked through the farms and talked with the owners about how they applied scientific concepts on a daily basis. Teachers harvested vegetables from the gardens and picked apples in orchards. They learned how to age a sheep based on their dentation or number of teeth and weave yarn from the sheep's fleece. We hiked in native forests and discussed their specific ecology, in a location where the temperate and tropical ecosystems come together. In addition to experiencing the island's rich scientific possibilities teachers had the opportunity to then discuss how concepts unique to Chiloé might be integrated into any of their classroom curriculum. Field experiences were designed to provide a frame for the in-school learning experiences that were developed afterwards. Workshop agendas for all professional development activities can be found in Appendix B. Experience and content gleaned on field trips led to a larger discussion about integrating place-based education into the classroom. Those teacher experiences

helped them understand their unique island and its integration for a real-world laboratory in science classes, and beyond.

School Year Support

My own experience at CET between October 2015 and February 2016 guided the creation of criteria for educator workshops that were delivered during the school year. CET's focus on principles of soil health, forestry, animals, and fruits and vegetables framed the activities and lessons that became teacher workshops. Workshops integrated natural curiosity and wonder for the content through hands-on activities and guided facilitation. My intention for this exercise was not to create additional work for the educators, but help them see how the island's summer drought or unique soil profile could serve as a relevant way to connect with students and provide rich opportunities for doing science. They were designed and delivered with action learning integrated throughout. Students who learn through active engagement and investigation are more likely to, "have increased conceptual understanding and strategies than those who experience more passive techniques" (Minner et al., 2009 p.1). Teachers benefitted from this modeling as a reminder of how it looks in their own classrooms. David Sobel's work on local examples as teaching tools also drove workshop design. He advocates for students using local examples and phenomena that occur in their backyard as a way of making learning relevant. He cautions that students relate much easier to these kinds of learning experiences than in homogenized lessons designed for students regardless of geography (Sobel, 2007). As students relate to what they see and know learning becomes more sticky, and the community becomes a living laboratory or classroom waiting to be

discovered. With repeated opportunities to use the island's rich resources as a teaching tool, teachers began to value it as a way to connect with their students and develop their own appreciation of Chiloé.

Agroecology is place-based and location specific. Therefore, in order to begin the agroecology program teachers familiarized themselves with the geography of their school grounds. One activity in the Pre-treatment Educator Survey, which can be found in Appendix C, was to go out and make a landscape map, participants were to observe and incorporate sites, smells, sounds, sun location, and animals, educators were asked to draw the location where learning takes place on the school grounds. This mapping activity was revisited at the end of the workshops as a way to analyze how educators looked at their learning space over the treatment phase and served as a reflection on the understanding of the agroecological system in which they participated. Below is an example of one pre-treatment map created by an educator (Figure 3).



Figure 3. Pre-Treatment Map, (N=6).

During the treatment phase, educators engaged in approximately fifteen hours of professional development over the span of six weeks and students had four hours of agroecology education. Throughout the treatment period, we used Chile's national education curriculum, developed by the Ministerio de Educación de Chile, as a frame on which local resources or sense of place could be applied to paint a more full picture of learning on the island. Science content required for each grade included biology, chemistry, physical science, botany, geology. Each addresses a variety of natural

phenomena: living beings, matter, energy and its transformations, the solar system, and Earth. Similar to the United States, schools have control over how the curriculum is taught and in what order. On average, each grade had three or four science units per year and students receive approximately 150 hours of instruction as mandated by the Ministerio de Educación. Educators worked through both science content and the change process this new shift required to make it successful and imbedded into school culture as well as aligning this shift with the school's mission and vision. The experience offered teachers examples and lesson plans, modeling on how integrating a sense of place looked when combined with a national education curriculum, small group planning sessions, and finally a chance to demonstrate the work they did together with their own place-based lessons.

Celebration of Learning

The culmination of this project came in early May when teachers from each grade level presented their own place-based lesson to be used with students sometime during the school year. This was at the request of the administration and not an original part of the project design. The change was a strong vote of confidence in this way of teaching and learning as well as the leadership's commitment to linking curriculum and place.

Instrumentation

Evaluation for the four phases of this project consisted of: workshop observation and fieldnotes, which brought to light CET's pedagogy and impact on a regional scale; pre- and post-surveys and interviews with educators during multiple day professional development on place-based education, which established a foundation from which the

school year’s curriculum was built; project design and implementation, where students engaged in agroecology workshops onsite at CMV; and finally a presentation of lesson plans. Table 1- Data Collection, Timeline, and Triangulation Matrix lays out each activity and appropriate data collection instrument as well as timeline and triangulation.

Table 1
Data Collection, Timeline, and Triangulation Matrix

DATA COLLECTION MATRIX	FIELDNOTES AND OBSERVATIONS (CET) NOV '15-JAN '16	SURVEY & MAP PRE TEACHER PD (CMV) FEB '16	INTERVIEW & OBSERVATION (CMV) MARCH '16	MODELING LESSONS WITH STUDENTS (CMV) APRIL '16	SURVEY & MAP POST-TREATMENT (CMV) APRIL '16	TEACHER PRESENTATION PBE PLANS (CMV) APRIL '16
RESEARCH QUESTIONS						
Main Topic How can we diversify agroecological principles to inform and educate a new generation?	√	√	√	√	√	√
Sub-question #1 What makes place-based learning effective and how can it be applied to agroecology?	√	√	√	√	√	√
Sub-question #2 How can educators and students see their community as a living laboratory?	√	√		√	√	√

The fieldnotes and observations built context and content for this classroom research project. Over time, I participated and observed workshops throughout October and November 2015 by CET staff that taught the principles of agroecology, the importance on a global and local scale of its practice for territorial identity and regional

development, and how to apply it in farmscapes across the island of Chiloé. The experience provided a chance for me to learn about the topic in classroom and farm settings and to think about how it might be woven into classroom curriculum for teachers and their students. The experience provided insight into how CET designs and delivers their courses, how adult learners responded, and how that might be modified for youths as well as key content to incorporate in a pilot program. The fieldnotes and observations established a strong foundation from which the project grew.

The CET content along with my background in teacher professional development came together in the next phase of the project, as a series of teacher professional development workshops. Before school began in February, teachers participated in fieldtrips to farms across the island and from those onsite experiences and constructive conversations about curriculum planning we built a plan for them to create and present their own grade-level-appropriate place-based lesson. Teachers were given pre- and post-surveys to measure change in understanding how to integrate place into their curriculum and confidence in using local resources. They were also interviewed along the way, which helped corroborate the survey findings and build some anecdotal evidence, or stories, to back up the data.

In partnership with educators, I modeled lessons with students. This was an opportunity to demonstrate how connections between the geographic location and content could be constructed and implemented. These sessions provided an opportunity to observe students, the school curriculum and environment, and support teachers in shifting towards the use of more local examples and resources for teaching tools. These sessions

were evaluated in a Student Post Activity Evaluation (Appendix D). Recordings and photos were also captured as tools for triangulation and verification of teacher survey data.

A final data collection tool and activity was the presentation of teacher's place-based education lesson plans. We created a space to celebrate their learning and growth over the two and a half months of learning. They shared their lessons and we supported each other in a discussion about how to continue integrating the island into science, and other curriculum, over time, as they completed a Post-Treatment Educator Survey (Appendix E). My intention with the whole project was to demonstrate the systemic nature of agroecology and how it can be used as a tool to teach place-based science.

The research methodology for this project received an exemption by Montana State University's Institutional Review Board and compliance for working with human subjects was maintained. Appendix F lists the IRB exemption. Project validity was insured through observation and notes over the treatment period, interviews with teachers and administrators to corroborate trends seen during observation, and peer reviewed evaluation tools.

Demographics

Colegio Monte Verde is a charter school in Alto Castro, on the island of Chiloé Chile. Twenty teachers are employed to teach pre-kinder through sixth grade. There are approximately 20 students per grade or about 120 students total. All students are from the general Castro region; many youth live in the city of Castro, which has a population of approximately 20,000 inhabitants [Map 1]. Other students live in the surrounding

countryside. The school employs 16 teachers and four support staff; of those two-thirds are from Chiloé and the others are from the mainland with the majority coming from Santiago, the nation’s capital. Only about 25 percent of the teachers are from rural backgrounds, the majority come from urban environments and are learning along with the students about the agroecology of their home, table 2 describes their demographics. Traditional agriculture, industrial fishing, shell fishing, marine algae collecting, and tourism are the primary economic activities on Chiloé.

Table 2
Educator Demographics

	ORIGINATE IN CITY	ORIGINATE IN COUNTRY	FROM CHILOÉ	OTHER ORIGINS
EDUCATORS				
Staff population (<i>n=20</i>) All female staff in pre-kinder – 6 básica	15	5	14	6

DATA AND ANALYSIS

Throughout the teacher professional development workshops the metaphor of “cultivating young minds as an agroecologist would cultivate soils” was used. Provide diverse inputs and focus on growth and fertility, and young minds will blossom. In agroecology cultivation of soil is key. Healthy, biologically diverse, earthy smelling soil is a prime growing medium for fruits, vegetables, and feedstock. Agroecologists put the majority of their time into optimizing soil conditions just as teachers might put their time into cultivating curious, thoughtful, critical minds each hoping to establish fertile ground

for future growth. For a school whose supplies list include a trowel, it was a fitting metaphor and also helped me explain some of the data I uncovered throughout this process. Many of the inputs for creating a strong and diverse place-based learning community were present but needed to be better and further nurtured to reach their full potential, namely the teachers and their understanding of how to use local resources as teaching tools for their lessons. In order to begin cultivating curious minds in this project I had to work with the teachers to foster their own sense of curiosity and interest in agroecology, science, and using place as a teaching tool. This metaphor also helped focus my action research questions, how can we use these concepts to inform and educate students? What makes place-based learning effective? Can we begin breaking down the barriers between classroom and community so students are encouraged to learn beyond the school walls? Our goal as educators is to offer students diverse learning opportunities and foster their critical thinking just as we nurture the soil. Teachers need additional resources and time in order to nurture the school community as one would the soils. Analyzing this trend from the data is laid out in the following progression; cultivating thinking among the educators, using nature as a setting for learning, making personal connections between the teachers and their roots, moving this notion forward together, and finally how the experience addresses my action research question.

Cultivation of Soil = Cultivation of Thinkers

In order for this to happen in a meaningful way, a process was necessary. Part of that process was acknowledging the change from how things were to how they could be. Over the six weeks, it became clear that the administration was eager to go along with the

opportunity I presented to create a stronger commitment to integrating the natural world, the environment, and their island into their science curriculum. Teachers did not have the same passion or vision. Administration did not sell this shift to the teachers; it was imposed on them. Teachers were comfortable with the status quo, using lessons that were developed by the Ministry of Education and resisted the additional work that change brought. This was echoed in interviews with the school's director, who explained to me,

I come from a background of change in Santiago, I have worked with teachers my whole life and I am passionate about creating a strong learning environment where minds can grow. I have seen it happen, these teachers have a mentality that they cannot change, that they would not even consider changing the system. They teach how they were told and it is hard for them to shift that thinking.

Rather than focusing on the content and building local resources into school curriculum from the beginning, this project became focused on moving the staff through a change process in a positive and inclusive way, in an environment that felt safe, and brought everyone together as a stronger team as much as it was on the content. The director later shared that one teacher explained, "aside from the excuses her colleagues made for not being engaged in the work at the beginning this was a hard shift to have to make."

As a group, the teachers thinking evolved from being closed off and disinterested in the integration of a sense of place into the curriculum to curious. Teachers became animated and engaged on our fieldtrips to working farms where we discussed how the farmer's lives and vocations could be woven throughout the school's curriculum as well as how farmers daily manage their environment through science. As the school year unfurled and weeks passed, teachers slowly bought into the process and how it might

look in their classrooms. Lessons were modeled and the group worked together on their lesson designs. About half way through the six weeks, I asked teachers to sign a large piece of paper along with a commitment they were willing to make in order to implement this change successfully and meet the school's current mission and vision. One of the more vocal teachers in the school, who often speaks for others, stated that she would, "be open to the possibility of change." This allowed me to finally focus on the content and program, thus this project grew into two stages, first to get teachers to change their curriculum and second to develop lesson plans that integrated into the new curriculum.

Nature as a Setting

Initial data collection demonstrated that educators liked nature and the natural environment but were intimidated by the deeper connections to scientific phenomena. They felt they lacked ways to explain and explore science beyond the superficial connection to nature, as one teacher acknowledged, "perhaps not knowing about our own area limits our ability to transmit it." This was demonstrated in responses to the Pre-treatment Survey as well as through discussion during fieldtrips and onsite workshops. One respondent to the Pre-treatment survey stated that, "the natural world is important for students to explore." But had no response to probes looking to dig deeper into how that natural world could be investigated through content delivery. The same superficial sentiment was echoed by 80% of the other educators ($N = 12$). Educators knew there was value in giving students experiences in the garden or out in the forest but were not practiced in integrating these places into lessons in a way that results in deeper learning. Interviews with school administrators corroborated these findings, and further brought to

light that teachers took students outside for lessons but the lessons taught were traditional content. This school's walls between indoor and outdoor space were more rigid than I had imagined. A summary of the short answer survey responses is in Appendix C.

Post-treatment Educator Survey data revealed that educators have long had an interest in integrating the natural world with standard curriculum but did not know how or where to start. Over the course of this project, I modeled two lessons, one with teachers and one with students. Lesson plans for each can be found in Appendix B. During the student lesson on soils, fifth and sixth grade teachers observed. Students collected soil samples from around the school property, from which we explored how soils act as filters. Student surveys and data tabulation can be found in Appendix D. The fifth grade teacher responded, "I've always had the idea of integrating nature and knowledge, but to see it in the class you did generated a lot of ideas about how to work with our surroundings." She also remarked about how engaged her students were to participate and relate the activity to their daily lives. Through the Post-treatment Educator Surveys and round-table discussion, I learned that some of the teacher's assumptions about using their school grounds and nature as teaching tools were challenged. The kindergarten teacher shared with the group that based on our teacher workshops and lesson planning challenge, she took her students outside for a nature walk. She was afraid that the kids would get tired and want to be carried home. The opposite was true, they were more engaged with their surroundings and looked at the forest more carefully than she had seen them do prior. She said they were excited and wanted to keep exploring. This anecdote helped me see the perceived barriers to overcoming the outdoors. In order

to manage their resistance, the educators needed to have time and a safe place to nurture that interest.

One goal over the six weeks of professional development was for the teachers to start thinking of how their own environment could be used as teaching tool, which directly addressed my classroom research questions. An example came in modeling a lesson for the teachers during a workshop on earth science using causal chains of different colored construction paper. Each color represented a different sphere, biosphere, hydrosphere, atmosphere, and lithosphere. Humans were also assigned a color in the causal chain activity to demonstrate how our impacts affect the environment. Teachers used these strips to tell the story of this summer's drought. The connections between science content and the local environment, with which students and teachers interact daily, were clear and made the science feel more approachable than reading about spheres and their interaction from a book. The teachers were animated, involving diverse staff members from the physical education teacher to the school's librarian. Others that do not consider themselves science teachers had straightforward interactive chains that told a story of how the drought had, or could, impact the island. It was a simple way to demonstrate a science concept in a way that connected to a critical part of this island and helped me justify the importance of breaking down the lines between in and out of classroom learning. This activity also met Chile's National Curriculum Learning Objectives OA 3 and OA 2 for elementary science:

OA - 2 - Represent, through modeling, the transfer of energy and matter from photosynthetic organisms other living beings through food chains and networks in different ecosystems.

OA - 3 - Describe the characteristics of the layers of the Earth (atmosphere, hydrosphere and lithosphere) that enable the development of life and provide resources for human being, and propose measures to protect these layers (Currículum Nacional, n.d.)

The drought activity and others that were implemented during treatment demonstrated that teachers, just like their students, need to practice in order to feel comfortable using the surroundings to be successful. Given the right conditions, this was a change they could see benefitting the school culture. Over the six weeks, we modeled for each other and practiced these activities in order to give those educators the confidence and practice they needed to begin shifting their mindset. It will be an important concept to continue practicing in the future if integrating nature into the curriculum is truly a goal of the administration.

Personal Connections

Educators have deep and positive connections to life in the campo, whether they directly consider themselves campesinos or urban. Many related emotionally to the smells, sounds, and actions of the farmscapes. These connections opened the door to ‘I wonders’ and teachable moments that facilitated a transition to content. This experience represented an opportunity over time to explore developing lessons and create deeper connections to the natural world in a positive and constructive environment. Educators noted strong and positive personal connections to campesino life, whether it was because of a grandmother who was a campesino or a desire for a cleaner, simple life, many responded well to time in the fields and discussing the possibility of integrating agriculture and a sense of place into their classrooms. These sentimental connections

served as a strong starting place for planning the school year's lessons and activities. One teacher explained her field experience and how she connected it to her past in this way,

The colors of the garden, of the farm, the smells and textures and wildflowers are beautiful. I haven't had an experience like this to just explore.... Maybe when I was kid because my grandmother lived in the countryside. But not like this. Where we visited, gardens and forest (pause) and it reminds you of your childhood. It made each memory very beautiful... I am enthusiastic to share this with my students. I want them to see how it takes me back to when I was a kid.

Teachers wanted their students to understand the positive relationships they maintained or created through this process with the campo. At the end of a fieldtrip to Don Luis Gallardo's sheep farm in late February, the group debriefed the experience and how they could apply it to their school design and lessons together, "It is important to make testimony to our contact with nature. We can't just talk to them [students] about nature nor can we teach them something they don't know themselves. It needs to be something we experience together." Another teacher suggested capturing her own enthusiasm via photos or videos for her students. She wanted her students to see how surprised she was by what she learned in a forest walk. She suggested that, "Through this energy we can transmit the knowledge." Appealing to educators emotions was a strong way to begin making a shift in school curriculum and getting them to start thinking in a new way. Over time this initial enthusiasm waned and the connection to our summer fieldtrips was less strong. Once the school year began, it was back to a traditional manner of working with students as referenced in the above section. Although, these positive personal connections the educators had to campesino life became leverage for committing to change. It is my

hope over time that personal connections will continue to drive educators to think differently about designing and delivering content.

Working collectively, Si se Puede!

Throughout the treatment, educators worked collectively on creating lessons and lesson plans for their students that integrate agroecology or a sense of place. Each educator was expected to present a lesson plan that integrated a local resource into their classroom content, therefore not all lessons were science based. I modeled ways to do this through simple science activities, because that is my area of expertise, and made connections between these activities and Chile's national standards. Over time the educators became engaged and interested in thinking about how local resources could be used as teaching tools. They also realized the benefit of working together, across disciplines on a concept like this. An example of this budding teaching and learning community came during a two-hour planning session in which the teachers sat together and each presented their initial lesson ideas. Overlaps emerged; the English teacher's plan was to create a dictionary of local plants as well as the garden plants that are cultivated onsite. She wanted students to collect and identify specimens found onsite from which they would build this resource. The fourth grade teacher was interested in a very similar idea and the two decided to start working together on this dictionary integrating the English, Spanish, Latin, and native names of the plants onto each page. As these two educators were talking to one another about this notion, the librarian started to understand how she could get involved by helping students understand what a dictionary

is and how it is used. There were great moments of synergy and support. One of the educators commented in a reflection on the whole process up to that point,

A metaphor that came to me in the hike and at school thinking about diversity, we saw a lot of diversity in the forest plants/trees all working together in order to create the forest itself. And the greater the diversity you find the more stable in the forest. (*sounds of agreement*). Because the network of roots themselves support and help each other. We're working towards an education based on an ecological model – seeking the greatest diversity, but to feel comfortable in designing with great diversity, looking for help in one another – relying on each other. If you have an area where you are weak, another can help and knowing the other will help you.

It had taken multiple engagements over four weeks, but once educators started working and thinking together the workshops took on a different tone and I began to feel like this action project might actually be relevant to the teachers at CMV and that they were starting to understand how to work together. To cite the school's director,

What one person is able to provide, another provides something else. The whole is more rich together. Working in a team at this school with the diversity of each one of us just as with the diversity of kids, provides us with a diverse community. This diverse community has more nutrients, and if we take full advantage of this we will have a better product, more capable of confronting the real world, more tools.

The discussion about each of the teachers contributing to the school's whole led to follow up discussions and observations of the strength diversity can provide a forest and the importance of mimicking said ecosystem in the school. In addition to the notion of cultivating minds like cultivating soils, this notion of diversity of skills became important throughout the treatment phase of this project. Educators admitted that in order for change to stick, they needed time like this to plan together and this will be a recommendation going forward. I learned from the sixth grade science educator that,

based on the time we spent planning together the whole staff has put in a proposal to administration for additional unstructured group planning and learning sessions.

INTERPRETATION AND CONCLUSION

This project sought to explore how local concepts like agroecology could be used to inform and educate learners about the island they call home. The data may not demonstrate a change in how children view their community, because the project shifted to working with teachers on planting seeds of empathy and support within their students for Chiloé. Through the treatment this project grew beyond understanding agroecology as a way to teach science, which became the means rather than the ends. And now at the end this project demonstrates to a local school how to incorporate local natural and cultural resources into state mandated curriculum in a relevant way. It gave educators language to understand and explore scientific phenomena with their students in a more problem-based manner. From that perspective I do believe that agroecology and local science topics can be used to create an informed citizenry. Teachers have built lessons using local tools to help students better understand the island where they are growing up. Over the course of this project, teachers developed a more vivid and clear perspective on teaching using their environment. In Pre-treatment surveys, an educator explained that, “discovering new things” is what excites her about teaching science. The same question on the Post-treatment survey was met with, “we discover our surroundings, our origins and where we come from, also we relate ourselves with other living beings, we have something as concrete as our surroundings to investigate, compare and contrast and to learn from.” This demonstrates that educators began to see their world in a more intimate and

appreciative way and that vision could be used as a catalyst for a bigger pedagogical change. Data revealed that the school had a strong foundation on which to build a culture and curriculum steeped in environmental learning. They have a beautiful physical environment, an administration that supports learning through nature, and students that are eager to go outside with their shovels and bucket no matter the weather. The next step was to take the state mandated curriculum and integrate local examples and teaching tools into it as a way to build on the foundation and create a school in which the inside and outside spaces are a living laboratory for learning. It was the project's intention. Through the treatment phase, educators saw how a substantive program could be built. It is my hope and intention that this classroom research project planted the seeds in the school's collective thinking.

What makes place-based learning effective and how can it be applied to agroecology became clear. As well as, how educators and students can further see their community as a living laboratory. To be successful, work with the teachers was critical. Without their buy in, it would be difficult to change student attitudes and behavior. Therefore, in retrospect the time creating buy in with educators was time well spent and necessary. It allowed me to encourage change in a positive long-term, supportive manner and help dispel resistance. Workshops and content lessons were presented in an approachable way to encourage educator buy in that I hope over time results in small changes, which may allow for the administration's vision of an environmental school.

Student Reflections

Creating effective place-based science education programs as well as helping students view their world as a living laboratory takes time. A two-month engagement with educators cannot demonstrate a change in behavior or empathy for a location. At this age, fifth and sixth grade students, may just be focused on learning, using local resources as teaching tools may not make an impact on them now so the impact of this work may not reveal itself for years with them. But the power of the experience is greater on the teachers who can actively cultivate that sense. This realization was compounded by reflection on how I came to love the place I called home. It was through a teacher whose impact still resonates in the way I relate to the world around me. In the fourth grade, my fellow classmates and I undertook a study of monarch butterflies along a small lake near the school, which was an ideal environment for milkweed plants to grow, and indeed they did. Monarch caterpillars would flock to our wetland and we would observe the Lepidoptera feeding hungrily for a few weeks in the spring and studied their behavior until hatch. Those days are etched in my memory and mark a point in time when I found something I cared about deeply. It is only after many years that I can look back and see that moment as the one that encouraged me to appreciate the world beyond my classroom walls.

From observations and discussions with young people, students at CMV assume their world is the same as the one off the island. Only over time as they mature developmentally can students begin to see their place as unique. I asked students, “do you like learning about Chiloé?” some wrinkled their noses at the question, as though it were learning about a subject – say history. But that was not what I intended in the question, I

wanted to know whether they liked using Chiloé as a teaching and learning tool. They like experimenting and going outside to learn, but do not necessarily equate these experiences with learning about the island. My hope that over time students start to see Chiloé as a tool rather than the topic and that it does enhance their curiosity and interest.

According to Sobel's work, *Beyond Ecophobia*:

“what's important is that children have an opportunity to bond with the natural world, to learn to love it and feel comfortable in it, before being asked to heal its wounds...First, children need to develop emotional empathy for the creatures of the natural world. Next they need safe opportunities to explore their urban and rural landscapes, and finally, they need to have opportunities to work on problems in their local communities” (1996 para 19).

Therefore CMV is at a good place to teach students empathy for the natural world. Using science as a way to demonstrate how that world works will help students see their space as familiar and worth caring for. In his phases of development, Sobel writes that for the younger learners this is an appropriate place to be working. And creating this empathy is placed on teacher's shoulders.

Overall Reflections

The goal for this project evolved into planting seeds of agroecology and place-based learning in the ethos of CMV. Those seeds need the right environment to sprout and it may take more than a season for this to happen. But this is the right place and time to support this growth. CET has offered to do a landscape analysis at CMV. They would create a blueprint for building out the garden and pasture, for integrating forests into the curriculum, and for domestic animals to be more appropriately integrated into the landscape. This blueprint would come with a soil analysis and other tools to help the

school create a living and breathing environment for students and teachers. The intention behind this offer is that it would prepare the school to secure grants or future funding for these projects as they grow, thereby further supporting the teachers in their own development as well. I hope that it will grow and become a reality and that students become more interested in the science around them through this partnership, as I did when I was young. I did not know that my learning process was special, it was just learning. And I conclude that the students here in Chiloé are undergoing the same learning process. This reflection has reinforced my commitment to working with teachers who can make a difference with their students and will continue to influence young people.

VALUE

This project's value serves as a potential model for other schools or places of learning to see how integrating the natural environment into their curriculum can be done. It demonstrates that small change over time may lead to a more rich learning environment for teachers and their students. I found that educators who participated found a renewed curiosity and interest in the place they call home. According to a second grade teacher, "Since we began these activities, I have begun to value much more the richness that is Chiloé and at the same time take care of it." It is now incumbent upon the school as a learning community to continue to learn and plan together with the idea of integrating a sense of place into their curriculum. As noted by the administration early on, "The teachers think they get it [what teaching using the environment looks like] but at the end of the day, they use what is comfortable." If this is to be a change in the school's ethos,

more collective planning needs to happen. For me, the most impactful time I had with the educators was one afternoon during a planning workshop. They had never taken the time to think together about how their lessons and ideas overlapped or could support other content or coursework. If this change is to happen, the administration needs to prioritize the planning, visioning, and support of educators to “get it” and do it together.

This approach to teaching and learning also comes at a time when understanding the complexities of this island is urgently needed. Chiloé is experiencing an unprecedented algal bloom that is a result of increased sea-surface temperatures, which came about from this summer’s drought as well as intensive fish farming just off the shore. Millions of fish have died, and on an island where 60% of the population’s livelihood is from the sea the problem is amplified. At the time of this writing, school has been cancelled because those in the fishing industry and artisan shellfish collectors have blockaded the island; there is currently no way on or off. A more important value of this project is to help educators facilitate the learning about this issue and scientific phenomena behind the crisis with their students when school resumes. To help students think critically about the environment and better understand the complexities of the ecosystem in which they live adds greatly to the value of this work.

REFERENCES CITED

- Agnew, J. (1987). *The United States in the world economy*. Cambridge, UK: Cambridge University Press.
- Bartholomaeus, P. (2006). Some Rural Examples of Place-Based Education. *International Education Journal*. 7(4), 480-489.
- Buxton, C. & Provenzo, E. (2012). *Place-Based Science Teaching and Learning: 40 Activities for K-8 Classrooms*. SAGE Publications Inc., Thousand Oaks, CA.
- Cachelin, A., Rose, J., & Rumore, D. (2016). Leveraging Place for Critical Sustainability Education, the Promise of Participatory Action Research. *Journal of Sustainability Education*. 11.
- Daalgard: Dalgaard, T., Huchings, N., & Porter, J. (2003). *Agroecology, scaling and interdisciplinarity*. Danish Institute of Agricultural Sciences.
- Dentzau, M. (2014). The Value of Place. *Cultural Studies of Science Education*. 9. 165 – 171.
- Dewey, J. (1922), *Human Nature and Conduct: An Introduction to Social Psychology*. Henry Holt and Company, New York, NY.
- FAO – Globally Important Agricultural Heritage Systems (GIAHS) Homepage: <http://www.fao.org/giahs/giahs-home/tr/>.
- Gabrielson, C. & Hsi, S. (2012). Design Principles for Creating Locally-Rooted National Science and Mathematics Curricula in Timor – Leste. *Science Education International*. 23(3) 205-220.
- Gautreau, B. & Binns, I. (2012). Investigating Student Attitudes and Achievements in an Environmental Place-Based Inquiry in Secondary Classrooms. *International Journal of Environmental and Science Education*. 7(2) 167-195.
- Greenwood, D. A. (2013). A critical theory of place-conscious education. In R. B. Stevenson, M. Brody, J. Dillon, & A. E. J. Wals (Eds.), *International handbook of research in environmental education* (93-100). New York, NY: Routledge.
- Gruenewald (Greenwood), D. A. (2003). The best of both worlds: A critical pedagogy of place. *Educational Researcher*. 32(4), 3-12.
- Leopold, A., (1949). *A Sand County Almanac*. New York: Oxford University Press.
- Lieberman, G., & Hoody, L. (1998). *Closing the Achievement Gap: Using The Environment as an Integrating Context for Learning. Results of a Nationwide Study*. Washington DC: Council of Chief State School Officers.

- Lieblein, G., Breland, T.A., Francis, C., & Østergaard, E. (2012). Agroecology Education: Action-oriented Learning and Research, *The Journal of Agricultural Education and Extension*, 18:1, 27-40. Accessed 13 Sept. 2015.
- Mercier, S. 2015. Food and Agricultural Education in the United States. *AGree publication*.
- Ministero de Educación de Chile, Currículum Nacional. (n.d.). 5th and 6th Grade Science Standards: <http://www.curriculumenlineamineduc.cl/605/w3-propertyvalue-49434.html>
- Minner, D., Jurist Levy, A., & Century, J. (2009). Inquiry-Based Science Instruction – What is it and Does it Matter? Results from a Research Synthesis Years 1984 – 1992. *Journal of Research in Science Teaching*.
- Mitchell, D. & Mueller, M. (2011). A philosophical Analysis of David Orr’s Theory of Ecological Literacy: Biophilia, Ecojustice, and Moral Education in School Learning Communities. *Cultural Studies of Science Education* 6: 193 – 221.
- Parr, B. & Edwards, M. C. (2004). Inquiry-Based Instruction in Secondary Agricultural Education: Problem Solving – An Old Friend Revisited. *Journal of Agricultural Education*. 45 (4) 106 – 117.
- Place-Based Education Evaluation Collaborative, (2010). The Benefits of Place-Based Education: A Report from the Place-Based Education Evaluation Collaborative (Second Edition).
- Smith, G. (2002). Place-Based Education: Learning to be Where We Are. *Phi Delta Kappan*, 83(8), 584-594.
- Smith, G. & Sobel, D. (2010). Bring it on Home: The abstract and faraway don’t always sustain the interest of the young. Place and community-based education makes learning relevant. *Educational Leadership*. 9/2010. 38-43.
- Smith, G. A., & Sobel, D. (2010a). Place and community-based education in schools. New York, NY: Routledge.
- Smith, G.A., & D. A. Gruenewald. (2007). Place-based education in the global age: Local diversity. NY: Routledge.
- Sobel, D. (1995). Beyond Ecophobia: Reclaiming the Heart in Nature Education. *Orion Magazine*.

Sobel, D. (2007). *Place-Based Education: Connecting Classrooms to Community*.
Antioch University Press.

Yager, R. (2010). *Place-Based Education: What Rural Schools Need to Stimulate Real Learning*. *Perspectives, Place Based Education*.

Zeidler, D., & Sadler, T. (2008). Social and ethical issues in science education: A prelude to action. *Science & Education*, 17, 799–803.

APPENDICIES

APPENDIX A
FIELDTRIP CONCEPTS AND DISCUSSION IDEAS
FEBRUARY 29, 2016

Fieltrip Concepts and Discussion Ideas February 29, 2016

As we prepare for site visits to different locations on the island both natural and cultivated, please consider the following elements and how they might be integrated into your curriculum back at school.

1. At the farm, how do you see science reflected in the farmer's daily practices? What scientific principles are at work? Do you see any concepts or methods you have to teach being played out?
2. Record any examples of science you see as you tour the forests and farms.
3. What are the positive and or negative impacts farmers make to their environment? How are they impacting land (for example)?
4. How do you see ideas of culture and identity playing out in the way these farms and forests are managed? How could this knowledge be translated to students?
5. Where do you see science and technology playing a role on the landscape? How are they forming the terrain?
6. How could you use what you saw today as teaching methods for basic math, history, understanding of the environment, technology, art, music, physical education, etc.?
7. Do you see patterns in the farm work and could those be applied to school?
8. Culture is an important part of agroecology in Chiloé. Where and how do you see it on this landscape?
9. How could the traditional knowledge and practices you see today help better connect with your students?
10. How could you incorporate these concepts, and with what tools, into activities at your school?
11. How do you see the role of education in the development of Chiloé today and in the future?

APPENDIX B
WORKSHOP AGENDAS

Introduction to PBE and Agroecology Workshop 2.26.16

Goals

- Participants understand the idea of integrating place into the school year curriculum
- Participants are open to using the island as a teaching tool and they see how it might look
- Participants begin to think of their community as a living laboratory.

Time	Activity	Resources
15:00 – 15:10 Feb. 24 Colegio Monte Verde	Brief introduction – who are we and what are we doing here? <ul style="list-style-type: none"> • Background on Richard and me. • What do we hope to accomplish through this activity? 	
15:10 – 15:25	Survey Discuss place and sense of place, how they inform learning and what they can mean to students	Copies of survey - 20
15:25 – 15:40	Intro to Agroecology and <ul style="list-style-type: none"> • SIPAM and how it can be used as a learning tool – place based education • System of agroecology and supporting a healthy inputs and outputs • Importance of traditional knowledge • Discuss place and sense of place and what they can mean to students. 	
15:40 – 16:20	Mapmaking: have participants make their own landscape maps <i>Where do you see learning and teaching happen?</i> Think, pair, share – key insights and a ha’s Popcorn out the commonalities and begin a discussion about why and how they perceive the current state of the school. <i>To be revisited after the farm visit on Feb 29.</i>	Blank paper for mapping – 20 Crayons Record this part Collect maps as artifacts
16:20 – 16:30	Quick debrief on why we did that: <i>Way to start making sense of the world – this is a science. Serves as a bridge between real world and abstract world – kids enjoy the visual representation. Simple way to make models that can teach us about our students.</i>	
16:30 – 16:45	Introduce 4 lessons I’ve developed, discuss intention to co-teach and model for others that are interested. <ul style="list-style-type: none"> • Content • Design with crosscutting concepts of 	Flip chart

	<ul style="list-style-type: none"> ○ patterns (when and how kids start to see the world, sort for meaning and make sense of their environment), ○ cause and effect (after patterns cause and effect is a higher order skill that if they act on something – a change will occur). Get them starting to think as a scientist, how they can manipulate something to get a different result. ○ Systems, (thinking about how all things are integrated and how our actions of cause and effect impact more than just us). Starting to think as a scientist. Why are these important and how do they align with agroecology. <p>These are my ideas, but what tools can I provide to help YOU build agroecology into your classrooms? What might you like? Popcorn out some of the learning outcomes you have and that you'd like to start thinking about infusing agroecology into – could be science, or any other topic.</p>	Copy or record this session – how can we help?
16:45 – 17:00	Discuss fieldtrip and what to expect, what to bring etc... Introduce fieldtrip handout	Fieldtrip observation handout – 20 copies
17:00	Fin	

Make/Do/Buy:

Fieldtrip eval handout

Evaluations for teachers on place and PBE

Poster board for maps

- Markers/crayons
- Flip charts?? If available. Can also use chalkboard

Agenda Fieldtrip Day 2.29.16

Goals:

- Teachers develop a deeper understanding of how agroecology and agroecological principles can be applied to their classes
- Teachers are more comfortable finding the science in everyday activities on a farm or in the forest
- We all start thinking of cultivating a ag-ecosystem as a similar process to cultivating young minds – with diverse inputs and management practices

Time	Activity	Resources
9:30 Feb. 29 Colegio Monte Verde	<ul style="list-style-type: none"> • brief opening to day and drive to CET • Small group discussion to start gears turning: <ul style="list-style-type: none"> ○ Has Chiloe or your place influenced your classroom practice? ○ What tools do you find useful and why? ○ What were some unexpected or unanticipated experiences, consequences of incorporating place into your teaching? 	
9:30 – 10:00 Travel	Drive to CET	
10:00 – 11:30 CET Barbara	<p>Tour farm and talk about CET's philosophy, history, and background and how they teach.</p> <p>Address importance of culture and science, the connection to people and land...</p> <p>In the classroom, reflect on how the CET philosophy aligns with CMV's teaching style and goals</p> <p>Prep for visit and tour with Don Luis</p>	Notebooks Pens Boots or clothes for walking on the farm
11:30 – 12:00 Travel	Drive to Estancia El Esfuerzo – home of Don Luis	
12:00 – 15:30 Estancia El Esfureso	<p>Tour by Don Luis</p> <ul style="list-style-type: none"> • Welcome in the fogon, led by Luis • Sheep herding demonstration • Hike in native forest • Farm visit and native potato field visit 	Fieldtrip observation form
15:30 – 16:30 Estancia El Esfureso	Assada or some type of comida	
16:30 – 18:00 Estancia El Esfureso	<p>Wrap up Content discussion and reflection on day, surveys? Think about dividing into smaller groups, content foci or grade bands.</p> <ul style="list-style-type: none"> • What themes emerged: science, technology, arts, history and culture? Let them discuss together what does this mean for them, if anything? • How do they see what is happening around them as a tool for working with youth? Think pair share? 	Any school planning resources Chart paper Notebooks

	<ul style="list-style-type: none"> How might you apply what you learned today to your school year? <p>What tools would you find helpful?</p> <p>One sentence summary – what was your key learning from the day?</p>	Pens and markers
18:00	Return home	

Follow Up 3.1.16

What do I do with all this information? Making meaning of my learning:

Time	Activity	Resources
10:00 – 12:00 Mar 1 Colegio Monte Verde	<p>LOOK vs. SEE</p> <p>Give everyone a piece of paper, have them fold it in half, quickly list on the left side and in three minutes do a brain dump, everything I have learned, key insights, learnings, tools...</p> <p>Now, look at the left hand side, what do you see? Put that on the right side. Look for patterns, repetition. Difference between looking and seeing. Organize the information you have on the left. <i>Seeing begins to make sense of the looking. Patterns?</i></p> <p>Then have them get with a pair and ask your pair what they see. They look at both sides, explore and reflect. Compare and contrast notes. Discuss, each share pair: what stands out to you? What is missing? Take 10 minutes to share, encourage people to add to their lists as they see fit.</p> <p>Then, do a big fat harvest of ideas on a flip chart. Do a popcorn out. Ask people, now you've seen others and thought about others, what are things that you have in common? What excites you? What was something really important that you forgot?</p> <p>Give people a feel of what happened in the collective. If there is enthusiasm for it: Then ask them quickly, if there are common themes, let the group talk about it for a bit. Does anyone have observations that they've seen? What does this information tell us? All of this is making meaning of what is happening – reflecting on our learning and prioritizing it. Remind them of that! And that they have the tools to make sense of it all based on their reality back home.</p> <p>Quick Next piece of paper, what does it mean for my 'role' in work?</p> <p>TRANSITION TO WHAT HAPPENS ON MONDAY SLIDES: Based on this activity, (new map/page with visual) what are the things that you really want to try? What really made you curious, excited? What gave you energy?</p>	<p>Plain white paper</p> <p>Flip chart</p> <p>Look/see planning map</p> <p>What happens Monday slides</p>

	<p>Look at the system in which I operate, what is around me? How is it constructed?</p> <p>See: What patterns emerge in the system in which I work, related to changing/preparing for the new frameworks?</p> <p>Imagine: What is most important in the system and what can I impact? What can I change? What can I design to move the discussion forward? What gaps can I fill that exist?</p> <p>Show: Are you seeing what you set out to see? Socialize your ideas or plan. Chances are people will help you remember things, share with group.</p> <p>OK so you have all this information contained in these pieces of paper, what is ONE thing you can do and why? How is this going to make a difference to you your district, your kids, and what can you apply back home.</p> <p>How are you going to do it? Create plan, what resources do you need?</p> <p>Who in this room can you call on for help? That was why people started crying. Reflect back your key learnings, what you want to do with it going forward? Develop trust and a team.</p> <p>They have what they need, they need someone to invoke it. The key to this, I have to remind people they have what they need to be SUCCESSFUL!!</p>	
12:00- 13:00	Walk about at the school, discuss ways to apply learnings from the farm visits	

To make/to do:

- Sticky notes
- Print think/see/do notes
- Slides – translate to Spanish

Introduction to PBE in the Classroom 3.8.16

Goals

- Participants understand the idea of integrating place into the school year curriculum
- Participants begin to see how sense of place can be woven into lessons
- Participants see how to apply place-based lessons using Bloom’s taxonomy

Time	Activity	Resources
16:00 – 16:10 3.8.16 Colegio Monte Verde	<p>Brief introduction – Last week we created the frame, now it is time to fill in the picture. How do we build lessons thinking about place and sense of place?</p> <p>Discuss long-term goals <i>Each grade will make a lesson using agroecology/ sense of place to be shared at the end of April. We will work together over the next two months to build our skillsets and tool in order for everyone to be successful.</i></p>	Timeline of activities Mar/Apr
16:10 – 16:20	<p>Reminder on agroecology and bioregional or place-based learning Briefly describe Piaget’s developmental stages and how they apply to Colegio Monte Verde.</p> <p>Discuss: <i>based on your grade level, how do your students perceive the world around them?</i></p> <p>Introduce the 5E model of lesson planning and structure Pull up a lesson plan from CMV and talk through how I built the two together</p>	<p>Sample lesson plan</p> <p>5E handouts?! CMV lesson plan</p>
16:20 - 16:40	<ul style="list-style-type: none"> • Engage - bring out soil trays for groups to explore and begin ‘playing’ with. Give 5 min to engage without direction. • Explore - what do you see? What do you wonder? Some direction and discussion around what we’re looking at. • Explain – what is this activity and why are we doing it (<i>bulk of time here</i>) • Elaborate – how could we build on this with various ages? • Evaluate – what did you learn? 	<p>4 cartons of soil</p> <p>Spoons any other digging utensils</p> <p>Blank paper for note taking</p>
16:40 – 16:45	Discussion: <i>How does this relate to our island?</i>	
16:50 – 17:00	<p>Blooms taxonomy, what are the levels we explored in this quick lesson?</p> <p>How might we elevate this activity on the pyramid?</p> <p>What tools would you need to start building your own lessons?</p>	
17:00	Fin – homework, bring a lesson next week to work on together and make more place-based	

Make/do/buy:

- Collect soil samples
- Copies of lesson plan, 5E overview
- PPT – blooms taxonomy, 5E steps etc...

Using PBE and Agroecology in the Classroom 3.16.16

Goals:

- Begin to apply the use of ‘place’ to traditional lessons
- Continue to grow familiarity with place as tool for teaching
- Teachers leave with at least one lesson plan that integrates place
- Teachers commit to making small changes in their lessons on a regular basis

Time	Activity	Resources
16:30– 16:50 3.15.16 Colegio Monte Verde	<p>Discussion – write the school’s vision on the board: what is it in your words? How does what we are doing now align to this vision?</p> <p>Change process and how to adopt and integrate change into the day’s lessons. What are we feeling and how can we manage this?</p> <ul style="list-style-type: none"> • School’s vision and mission – how are we living it • How can we empower ourselves and each other to make this change? <p>Any other ideas about motivation, learning, vulnerability etc... create a safe space to do this together and move forward with the vision we imagined on the fieldtrips.</p>	
17:10 – 17:25	<p>take no more than 10 minutes to go outside and find something you could use in whatever you teach. Bring back and prepare to share with your peers. <i>Whole group round table.</i></p>	PPT
16:50 – 17:10	<p>Sample activity –causal chains. Have teachers make paper chains describing the drought and how it impacts the island; designate one color for each sphere, bio, hydro, atmo, litho, and add humans. Describe the chains as they relate to Chiloe. <i>How does this meet your standards 6 unit 1 (OA_3). What happens when one of these is removed? Again, where does it align with the standards? (OA_2).</i></p>	<p>Strips of colored paper Stapler or glue Markers/pens</p>
17:25 – 17:30	<p>Planning for the future – introduce working world cafe, as we are WISER together than we are alone. In groups of 4 that are mixed grade levels discuss the lessons and ask each other the following questions:</p> <ul style="list-style-type: none"> • <i>What activity did you choose and why?</i> • <i>Take notes and give each person in the group a suggestion</i> • <i>Discussion – what similarities do you see? Differences?</i> 	Paper for note taking
17:30 – 18:15	<p>Work in small groups; world café style for 2 rounds – explain rules and mix up groups. <i>Diva, Em, and Richard circulate and support.</i></p> <p>Report out:</p> <ul style="list-style-type: none"> • what lesson do you have? • what did you learn from your colleagues? . 	

	<ul style="list-style-type: none"> • What resources might you need to be successful? 	
18:15 – 18:30	<p>Report out and big picture discussion about how to start changing mentality</p> <p><i>Take ownership of what you're committing do doing from here moving forward</i></p> <p>April 4.26 report and presentations FIN!</p>	<p>Big chart paper report on people's commitments in writing somewhere</p>

Mission and Vision of Monte Verde – for reference.

Nuestro proyecto educativo se identifica con la formación de la conciencia ecológica, incorporando en el curriculum objetivos y actividades que operacionalizan esta línea. La dinámica escolar se desarrolla en un entorno de extensas areas verdes y espacios educativos intramuros tradicionales.

Fortalecemos la formación ecológica a través de la asignatura transversal de Huerto y Reciclaje, donde los alumnos vivencian el contacto con la naturaleza integrando el concepto de autosustentabilidad, respeto y cuidado del medio ambiente. Además destacamos actividades de celebración en este ámbito durante todo el año que fortalecen la línea verde del colegio.

Visión

Ser un colegio vanguardista, abierto al cambio que responda a las exigencias de los tiempos modernos dando énfasis a los aprendizaje significativos para los alumnos, vivenciados preferentemente en contacto con la naturaleza, que amplíen su visión de mundo, en armonía con el equilibrio natural y su entorno social y cultural.

Misión

Formar integralmente a los alumnos, desarrollando en ellos conciencia ecológica, valores- actitudes, competencias habilidades y destrezas.

Dotarlos de herramientas para la creación de una sociedad más democrática, autosustentable y respetuosa con el medioambiente.

The Scoop on Soils – Earth DAY

Goals

- Students will discover that soils physically and chemically filter impurities out of water.
- Students will discover the role of soil in having good drinking water.

Time	Activity	Resources
5 min	Brief opening who are we and why are we here? <ul style="list-style-type: none"> • What is agroecology and why is it important here in Chiloé? <ul style="list-style-type: none"> ○ Why is soil important in general and in agroecology ○ Address soils as filters – what do you know about soils? 	Take notes, capture ideas.
10 min	Explore Ask students – what is a filter and what can it do? Prompt students to start thinking about soil as a filter – ask how that might be? What can they do to filter out bad stuff from water? Can make connections to our island and water? Explain activity/experiment and have students make predictions: <ul style="list-style-type: none"> • What color do you think will come out the bottom? 	Write down predictions on whiteboard or chalkboard, have students record their own predictions on paper
45 min	Go collect samples from school ground with students Activity – (one set per group) <ol style="list-style-type: none"> 1. Put five different soil media (2 soils, a sand, a sand top soil mix, and soil from the school yard) into 5 different 5 oz paper cups, about half full. Poke small holes with a toothpick in each of the 5 oz cups. 2. Set 5 oz cups into smaller 3 oz cups (put a toothpick in between so air can escape). 3. Pour dirty water into the top cups <ol style="list-style-type: none"> a. Observe what happens to the soils b. What happens to the floaties? 4. Pour out dirty water in the bottom cup 5. Repeat with colored water <ol style="list-style-type: none"> a. Observe what happens with the colored water, what color goes into each cup? What color collects at the bottom of the cup? b. Does the water come out the same color at the bottom of each cup? Why why not? 	Recording paper for note taking See materials list below for sets
10 min	Discussion and reflection: <ul style="list-style-type: none"> • What do you like about learning outside? 	
5 min	Complete post activity survey	Copies of survey

Total 75 min

List of materials

- Shovels for collecting local soil sample – get from greenhouse and from outside somewhere
- Buckets for saving soil
- trays for sorting soils and containing mess
- water vessels for solution (gatoraide)
- 5 cups – large per group d
- 5 cups – small per group
- various media – 5 types: sand, soil, sand soil mix, 2 other local collections
- Gatoraide mix – orange and blue
- "floaties" – leaves, organic material

Discussion:

Soils – what are they? A mix of sand, silt, and clay, organic matter, air, and water – they are important medium for growing anything. Living systems depend on soils, and they perform pretty amazing functions in our ecosystem including:

Culminating Activity and Celebration of Learning 4.26.16

Goals:

- Demonstrate understanding of how place and agroecology can be used as a teaching tool
- Continue developing the learning community and commit to future practice
- Celebrate the learning we have undertaken and debrief the process to help inform the future
- Get Surveys and Interviews

Time	Activity	Resources
16:30– 16:50 4.26.16 Colegio Monte Verde	Open discussion: review commitment to change chart, what has been done? What if anything looks different this year? Why? Fill out post treatment surveys	Copies of survey
16:50 – 18:00	Teachers present their PBE lessons to each other: <ul style="list-style-type: none"> • give overview of the lesson, • when it will be used in class, • how it aligns to national standards. Discuss as a group and share constructive feedback – what do you like about this lesson? Do you see yourself supporting this lesson (if you're support staff), how?	
18:00 – 18:10	How can we continue to support each other in breaking down the classroom walls and moving out into the community/nature with our lessons?	
18:10 – 18:30	Celebration of learning – 'certificates' in place based learning and agroecology from CET and me.	certificates
18:30	FIN	

APPENDIX C

PRE- TREATMENT EDUCATOR SURVEY AND DATA

Appendix C
PRE-TREATMENT QUESTIONNAIRE

GRADE TAUGHT _____

How many years have you taught? _____

Please respond honestly to these questions and brief statements:

1. Do you ever use Chiloé and specifically the island's agriculture as a part of your lessons? If so please provide a brief example.
2. What is your experience in teaching science?
3. What excites you about science?
4. What, if anything, gives you fear about teaching science?
5. What do you like about hands-on learning?
6. Have you every thought about or used agroecology as a way to teach science? If so provide an example.
7. Have you ever used traditional practices in your teaching? If so provide an example.
8. Do you see your community as a living lab, if so how?
9. Do your students see themselves as scientists?
10. Do your students see the community as a living lab?

Survey Pre-treatment response summary, N=11.

1 - do you ever use agriculture of Chiloe as a part of your lessons? If so, provide a brief example

Each grade somehow uses the greenhouse or garden through workshops. They sound like separate activities rather than integrated into the daily routine of school. It does not necessarily rely on local agriculture mostly just gardening without the integration of other animals, crops, or forest. The use of the greenhouse is interesting but not connected to the island; it's historical crops, or value in traditional agriculture. One respondent noted, "yes, we use the garden and in the recycling - we don't know our own traditions and our own agriculture." This teacher engaged with students in 1-6 curso.

2 - What is your experience in teaching science?

There are connections between the environment and teaching about nature with students. One respondent mentioned a connection between the place and science on Chiloé. Nine of the eleven mentioned liking science and having an interest in teaching it. Either because they enjoy learning about it themselves or feel it is important for students to have grounding in it.

3 - what excites you about science?

Most respondents mentioned nature and the connection to the natural world, though no other connections to scientific disciplines are noted. "To be in touch with nature" was a common response.

4 - what if anything gives you fear about teaching science?

Most fears lie in lack of knowledge or tools, or making science interesting to kids. Three people neglected to answer this question.

5 - what do you like about hands-on learning?

A number of respondents mentioned the fulfilling nature of hands-on learning for both the teachers and students. One mentioned contact with nature (though I was more interested in the pedagogical responses), and another stated, "we go out side to see what it can teach us and we learn more in the process." *I am curious whether they responded in this manner because they thought that is what I wanted.*

6 - have you every thought about or used agroecology as a way to teach science? If so provide an example.

Of those that responded yes, they referenced local garlic and the history of apple pressing in the fall. Survey responses read as though there are a variety of ways food and culture are referred to in school, but the content is superficial. Five of the eleven stated that, "no" they had not ever thought about or used agroecology as a teaching tool.

7 - have you ever used traditional practices in your teaching? If so provide an example.

Three of the eleven answered no or left this prompt blank. Of those that chose to answer this question, the vast majority referenced the unique flora and fauna of the island as an example. A

representative response was, “yes in the way in which the children see their cultural heritage flora and fauna Chilota for example.”

8 - do you see your community as a living lab, if so how

Respondents gave a range of answers, from no to yes. A representative no answer was, “no not specifically like a living lab more like a space that we use sometimes like the greenhouse.” Yes responses mentioned the flora and fauna on the island.

9 - do your students see themselves as scientists

All of the upper school teachers responded yes, the pre-school teachers did not think their kids saw themselves as scientists. One responded that they see their students as motivated thus like scientists, while others mentioned the students curiosity and ability to see how scientific instruments are used. One mentioned a concern with a lack of resources for the students to see how science is used or taught. *This gives me hope that we can start allowing teachers to see that being a scientist or having a scientific mind does not require stuff, more a way of looking at the world.*

10 - do your students see the community as a living lab

Mixed response demonstrate a connection to the ‘stuff’ of science rather than to cultivating curiosity around the kids. *I would have thought there were more yes answers due to the school's ethos. Flag for me, probe deeper in the interviews.*

APPENDIX D

STUDENT POST ACTIVITY EVALUATION AND DATA

STUDENT EVALUATIONS

Grade

Do you live in the city or the country?

Using one sentence, what was your key learning from this exercise or experience?

Using one sentence, what do you like about learning?

Think about how much you agree or disagree with the following statements:

I like to be outdoors during the school day.

Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

I remember what I learn when I am outside.

Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

I think of my time outside as learning time.

Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

I like learning things about Chiloé.

Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

Curso	Ciudad / campo	I like to be outdoors during the school day	I remember what I learn when I am outside	I think of my time outside as learning time	I like to learn things about Chiloé?	What did you learn in this activity?	What do you like about learning?
6	ciudad	5	3	5	5	there are distinct soil types	experimenting
6	ciudad	3	4	3	4	different soils	experimenting
6	campo	5	4	5	3	that the lower bar filters water and leaves clean water in the end	that there are always new things and I can tell my friends later
6	campo	4	3	3	4	the way water is absorbed in soil	yes I like it
6	campo	4	3	2	4	that there are different types of soils	when we learn with movement
6	ciudad	4	3	4	2	I learned that each soil is different	when it entertains me
6	ciudad	4	3	4	5	different types of soils filter the water	I have more experiences
6	ciudad	5	4	5	4	some absorb and others do not	experimenting and going outside

6	ciudad	3	4	5	3	that there are different soils and they can filter different things, some better than others	
6	ciudad	4	5	4	5	that not all soils filter water the same	because each time I learn more
5	ciudad	3	5	4	4	we experimented with soils and colored water	that the experiment that we did with soil and colors of different kinds of soil
5	no, in the city	5	3	5	5	when there is no soil there are no plants, and when there are no plants there is no life	learning things
5	ciudad	5	4	5	5	depending on the type of earth soil different things happen to the water	to know about things using natural things

5	ciudad	4	3	5	5	because the soil that has sand in it allows water to fall fast.	yes, because I can learn more
5	ciudad	5	4	4	5	it's what it does for the water	that I learn things
5	ciudad	5	4	5	5	that there are different soils in all of Chiloe	yes because I learn. I love learning. Its fun!
5	ciudad	4	5	3	5	that If you put water on soil the soil becomes more dense or more soft	Learning more about the things of nature
5	ciudad	2	3	5	5	that water can change color when it goes through sand, soil, and more	that I am entertained by doing it
5	campo	5	5	5	5	what we put juice in the soil or sand it changes color	going to look for soils and learning to do an experiment
5	ciudad	5	3	3	5	that the sand passes water through it quickly and the soil	to learn new things

						passes slowly	
5	ciudad	3	5	3	5	that the sand with juice is much more clear that the soil with juice, which is liquid with sediment	that I learn a lot and it makes me want to be a great person when I get big.
5	ciudad	5	2	3	5	I learned that soils are really important for living and that it is part of nature	I like when I learn new things and era me gusta
5	ciudad	4	5	5	4	that depending on the kind of soil, water acts in different ways. In addition to being essential for life	things that are interesting and help me in the future
5	ciudad	1	3	1	2	that soil can change the color of things	that I learn a lot more things

APPENDIX E
POST TREATMENT EDUCATOR SURVEY

POST TREATMENT EDUCATOR SURVEY

1. What excites you about teaching science?
2. In what ways has your thinking changed over the course of this activity about how you view Chiloé's resources?
3. After our visits to the farms, there was a lot of enthusiasm about the experience. One teacher said, "it is important to make testimony to our contact with nature. We can't just talk to them students about nature nor can we teach them something they don't know themselves. It needs to be something we experience together." How have you used this energy and enthusiasm in your teaching since?
4. After this experience, has your thinking about integrating nature or agroecology changed? In what ways?
5. Are you more likely to use local examples when teaching concepts after this experience? Please provide an example.
6. What challenges do you face in implementing more agroecology or local content into your curriculum?
7. Is there anything you would like to share about your experience that I did not ask about? If so, please provide your insights on this paper.

Finally, please take a moment to make (again) a map of places where learning takes place on the school grounds. Write one sentence about why you chose the location you did.

Post-treatment Survey N=13

1 - What excites you about teaching science?

Detail in each response is much greater than the pre-treatment survey. Each teacher gave a response that used science and the application in a way that shows a more intimate understanding of Chiloé, an example comes from a 5 curso teacher, "the importance of nature in our lives and the power to make known its importance and relevance is what motivates me."

2 - In what ways has your thinking changed over the course of this activity about how you view the community?

Each respondent mentioned the 'wonderful resource' Chiloé can be for teaching and that it should be taken advantage of. Some mentioned seeing the island with new eyes. A powerful response came from a second grade teacher, "since we began these activities I have begun to value much more the richness that is Chiloé and at the same time take care of it." This is the first step in developing a sense of place, knowing it so that there is something to care for.

3 - After our visits to the farms, there was a lot of enthusiasm about the experience. One teacher said, "it is important to make testimony to our contact with nature. We can't just talk to them students about nature nor can we teach them something they don't know themselves. It needs to be something we experience together." How have you used this energy and enthusiasm in your teaching since?

Each respondent indicated that, yes they have started integrating a more active approach to using Chiloé in the classroom, whether it is through science or other content areas. One teacher explained that the whole school field trips this year were planned with the 'pedagogical qualities' we discussed and practiced on the farm visits. One respondent explained, "we're motivated to find new information and look for new experiences in order to initiate new activities and continue our own learning along with the students."

4 - After working together, has your thinking about integrating nature or agroecology changed? In what ways?

The quality of responses varied in this question, from "we go outside more often" from the English teacher to "we've always had the idea of integrating nature and knowledge but to see the class you did generated a lot of ideas about how to work with our surroundings." Educators also considered the multidisciplinary of agroecology four of the respondents mentioned something about applying this notion to other content areas, "yes before I had the idea that nature could only be integrated in the sciences. After our work started, I began to understand that this can be integrated into all of the areas and I have in fact applied it."

5- Are you more likely to use local examples when teaching concepts after this experience? Please provide an example

Each educator responded with some local example of place, whether it was related to the island's UNESCO churches, or traditional dance. Some respondents mentioned using the island in a

general way. The second grade teacher described a science practice she intends to do with her students, “absolutely, when we saw the horizons of soil. We are going to go now and visit a big road cut that exists close to school.” This practical example of something onsite that can be used as a teaching tool gets at the heart of this project and why I see place as a valuable asset.

6 - What challenges do you face in implementing more agroecology or local content into your curriculum?

Three of the respondents chose not to answer this question. Of those that responded half mentioned a lack of time and planning to make these integrations. One mentioned student motivation outweighing their content knowledge. A powerful introspective response that helps me understand the need for further professional development or teacher learning came from the fifth grade teacher, “perhaps not knowing about our own area is what limits our ability to transmit it. Furthermore you have to have a good strategy so that the focus of the work outdoors is not lost”

APPENDIX F
IRB EXEMPTION



INSTITUTIONAL REVIEW BOARD
For the Protection of Human Subjects
FWA 00000165

960 Technology Blvd. Room 127
 c/o Immunology & Infectious Diseases
 Montana State University
 Bozeman, MT 59718
 Telephone: 406-994-6783
 FAX: 406-994-4303
 E-mail: cherylj@montana.edu

Chair: Mark Quinn
 406-994-5721
 mquinn@montana.edu
Administrator:
 Cheryl Johnson
 406-994-6783
 cherylj@montana.edu

MEMORANDUM

TO: Emily Vercoe and Walter Woolbaugh

FROM: Mark Quinn, Chair *Mark Quinn*

DATE: December 1, 2015

RE: "Sustaining Agroecology Education for the Next Generation Through Youth Programming in Collaboration with the Centro de Educacion y Tecnologia Chiloé (CET) in Chiloé, Chile" [EV120115-EX]

The above research, described in your submission of December 1, 2015, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

- (b) (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
- (b) (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.
- (b) (3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
- (b) (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.
- (b) (5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.
- (b) (6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.