# CHILDREN AND ENVIRONMENTAL EDUCATION: RECONSTRUCTING ENVIRONMENTAL CONCEPTS THROUGH THE LANDED LEARNING PROJECT ON THE UBC FARM

by

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## Abstract

Nowadays, children are not so aware of the natural environment as they are influenced by the adults around them. As a facilitator, I noted that children become more interactive with the environment at the UBC farm. In this thesis paper, I present the teaching effect of an informal educational project—the *Intergenerational Landed Learning Project* of UBC farm—by using both qualitative interviews and a quantitative questionnaire survey. The focus of this experiment is to discover how participating in this project influenced children's perspective of the natural environment. The findings of this experiment showed a marked difference in attitudes and behavior towards nature as a result of exposure to the environment. These changes indicated that the children's point of view change to become environmental-friendly. Furthermore, the children saw themselves as part of the environment, a major shift in their self-concept. I reviewed articles that dealt with changing attitudes towards the natural environment. One result of this project was the extent that it provided opportunities for personalized learning and self-study. Increasingly, children are being perceived as teachers, empowered to make changes in their families and communities to address environmental issues. Through surveys and interviews collected as part of the hands-on educational Landed Learning Project, I was able to confirm the propositions expressed in the literature.

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## Acknowledgments

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## Chapter 1: Introduction

For those children who grow up in cities, knowledge of food and where it comes from, especially vegetables, is absent from their lives. One branch of environmental education, which aims to improve environmental education in communities, seeks to increase children's understanding of the world and to advocate for environmental issues. Those involved with this effort see children as a vehicle for influencing their parents to change (Ballantyre, Connell, & Fien, 1998/2006; King, 1995; Uzzell, 1999).

Farm field trips are a great way for children to learn outside of the school setting. From the sociocultural and constructivist perspective, learning in informal settings is a social interactive process through which students gain meaningful learning experiences by communicating with group members and facilitators (Anderson, Lucas & Ginns, 2003). DeWitt and Osborne (2007) have extended this argument: "given the ephemeral nature of school visits, it is important to examine ways of increasing their impact as learning experiences" (p.686). Providing 'real' context for visitor learning is the biggest advantage of informal settings compared to formal learning settings. In contrast to formal learning in class, museum-style settings provide 'real' contexts for learners to observe, smell, listen and touch the exhibits and experience the learning process by themselves. The efficiency and the long-term impacts of learning and constructing knowledge in 'real' contexts are much more effective and more retentive than those in formal settings.

Another reason why field trips to informal learning settings have a positive impact for children's learning is that children's positive perspectives of such settings are correlated with

encounters of exhibits with which they could make connections with their pre-existing knowledge and understandings (Piscitelli & Anderson, 2001). For example, plants (in this case, vegetables) are a part of the environment, and children are familiar with these vegetables because they eat them every day. The plan of my research project is to provide them a real and vivid picture of how these vegetables grow before being brought to the kitchen. This can be counted as new knowledge; to some extent it is a complement of their existing knowledge as well. The purpose of this reconstruction of knowledge is to investigate the changes to children's perspective and attitudes about the environment; as well as the changes to their behavior.

Nowadays, most children live in urban settings which give them less chance to access 'real' nature. As a result, their awareness and concern about the environment is less focused or based on natural habitats. Even though they still learn about nature in class, without direct contact, it is less effective. Mayer-Smith and her partners' study called *Teaming children and elders to grow food and environmental consciousness* (2007) shows that, over the course of the project, children's relationship with the environment changed and became more personal. For those children to experience gardening in a real farm, as a school field trip, could not only supplement the school curriculum but also enrich their life experience. Many researchers also thought that children's perspective and attitudes about the environment and their behavior towards it may change through the gardening experience (Mayer-Smith, et. al, 2009; Estrada Alvarez, 2011; & Ostertag, 2009). Furthermore, an environmental self-concept is associated with self-reports of pro-environmental attitudes and behavior (Clayton 2003), and feeling emotionally connected with nature predicts environmental concern. Children's

environmental self-concepts is another element of their ecological identities.

School garden research is a relatively new and developing field, ripe for creative, reflective, and systematic inquiry in order to truly understand the "value and complexity of such spaces" (Gaylie, 2011, p. 13). My purpose is to specifically see how children consider the environment and whether their perspectives and behavior will change after participating in the *Intergenerational Landed Learning Project*, a cooperative project that involved UBC farm and four elementary schools. The project is aimed at illustrating how eco-philosophies could be translated into educational programs that foster environmental consciousness and care, as well as a respect for nature and sustainable living practices. This involves further critical and systematic examination of environmental education initiatives (Mayer-Smith, et al., 2009). As a support of the positive effect of this kind of project on educating and influencing children's behavior through actual research data, I hope my research is enlightening for museum- like programs which will take full advantage of the superiority of 'real' context, to maximize educational value. My goal is to advance the literature of research in this area.

My research is guided by the following questions:

1) What are children's perspectives about the natural environment?
    i. What are children's attitudes about the environment before they participate in the project?
    ii. Do children's attitudes about the environment change by participating in the project?
    iii. How do children's behaviors change towards the environment by participating

in the project?

iv. What are the environmental self-concepts of children before and after participating in the project? Did they change?

2) Whether the project impacts positively children's interaction with the natural environment or not?

# Chapter 2: Literature Review

The focus of my research for the purpose of this paper was primarily to find information about studies concerned with gardening learning, hands-on interaction and constructive knowledge gained through experience as opposed to instruction. My secondary focus was the value of social-interactive learning and the overall changes in the attitudes to the environment.

## 2.1 Learning through gardening

The learning children experienced in the farm is constructed, hands-on, and socially interactive. Exploring the pedagogies and methodologies most appropriate for this study, it is also important to illuminate the type of learning that happens within gardens. Garden-based learning is defined as "an instructional strategy that utilizes a garden as a teaching tool. The pedagogy is based on experiential education applied in the living laboratory of the garden" (Desmond et al., 2004, p. 20).

In a case study by Gaylie (2011), she visited eight elementary and middle schools to interview teachers and students about their perspectives of their school gardens and the ways in which each garden influenced teaching and learning. The teachers considered the first-hand experience of gardening to be potentially transformative for students and acknowledged that the awareness of this potential "must be invited and arrives gradually through experience" (p. 162). The students in Gaylie's (2011) case-studies discussed and wrote about their connections to the land while exhibiting a grounded understanding of

agricultural practices and environmental stewardship. Gaylie interprets the student's responses as demonstrating pride in their garden work as well as finding value in the more-than-human ecosystems with whom they interact. The findings of Gaylie's study showed the power of learning through gardening in the natural environment. And that makes me firmly believe that the *Intergenerational Landed Learning Project* brought the children valuable learning experience at the UBC farm. A study by Skelly and Bradley (2000) also found that although the majority of teachers were using the gardens as a teaching tool less than 10% of the time, 84.3% of teachers who used the school gardens thought that gardens helped their students learn more effectively. Clearly, the findings of Gaylie's study are similar to the intent of my research.

### 2.2 Constructivist learning

Constructivism holds that a student constructs knowledge and experience by interacting with companions and adults, rather than by himself. Dierking and Falk (1997) pointed out that "learning is the process of applying prior knowledge and experience to new experiences. This effort is normally played out within a physical context and is mediated in the actions of other individuals" (p. 216). This definition can also be seen to reflect the constructivist learning that takes place in museum settings. Learning at a farm, can also be considered a constructivist learning environment. Children construct a complex pattern of knowledge and skills about gardening, as well as new concepts about the natural environment.

### 2.3 Hands-on learning

John Dewey (1859-1952), an influential educational and social reformist whose

philosophies remain foundational today, emphasized the learning value of hands-on experience and openly promoted educational gardening as a means of understanding and supporting natural systems (Gaylie, 2011).

Education methods in traditional schools inculcate abstract knowledge to students. In contrast to this, museums offer students a real learning context with a rich collection of resources, which are typically object-based learning. These vivid exhibits inspire a strong curiosity and a desire for exploration into science. Museums also provide opportunities for students to directly observe, experience and practice, which is beneficial to getting direct experience (Leinhardt & Knutson, 2004). That's exactly the kind of teaching and learning the students experienced in the UBC Farm. Falk and Dierking (2000) held the view that, knowledge exists in the 'real' context, and learning occurs in a series of 'real' contexts. There is a wealth of stimulation in the 'real' context, which generates strong curiosity and a desire for exploration among the audience. Meanwhile, the audience's cognition, affect and motor skills will be changed and improved when operating exhibits in a real environment. Wellington (1990) suggested that: hands-on exhibits are of benefit to visitors' deep-exploration and embodied understanding. At the same time, it stimulated their initiative and enthusiasm for learning; and it promoted the development of manipulative skill, manual dexterity, hand-to-eye coordination and many other abilities.

For children involved in the *Intergenerational Landed Learning Project* learning through practice fully embodies the advantage of hands-on learning. "The majority of children shifted from seeing the environment as an object or a place, to a view characterized by the interconnectedness of humans and the environment" (Mayer-Smith, et al., 2007, p. 82).

These concepts related to the environment appeared to grow with their increased experience with nurturing plants. Over time the children's views of the environment assumed a more eco-centric character (Ballantyre & Packer, 1996; Palmberg & Kuru, 2000), which suggests that the students were developing a notion of themselves as part of the environment.

### 2.4 Social-interactive learning

A main characteristic of museum learning is social interaction-centered. Falk and Dierking (2000) and Packer (2006) argue that, except for knowledge learning and relaxation, social bonding and social learning also cannot be neglected in museum learning. During visiting, visitors will also interact with others or through social contact, consciously or unconsciously. There are basically two kinds of people they interact with. The first kind is the ones who visit with them, maybe other family members, teachers, classmates or friends. The second kind is the people other than their companions, such as the interpreters of the museum and other visitors, and so on. According to a study of the relationship between the number of adult social interactions (adult–adult and adult–child)and the cognitive change (Falk & Storksdieck, 2005, p. 763), the researchers found a significant correlation that group social interaction strongly affected visitor learning; in other words, the more social interactions among visitors, the more knowledge they gain.

### 2.5 Environmental education

"Environmental education is a way of understanding environments, and how humans are part of, and influence, environments." (Hart et al., 1999) Findings of a case study (Ostertag, 2009) of five children's experiences at the *Intergenerational Landed Learning on the Farm*

*for the Environment Project* indicated that "children's identities were shifting, and that, increasingly, children are being perceived as teachers empowered to make changes in their families and communities to address environmental issues" (p. ii). The findings also suggested that "the *Intergenerational Landed Learning on the Farm for the Environment Project* provides a model of community-based environmental education that supports children's exploration and expansion of their ecological identities" (p. ii).

Environmental education has been contributing to making the public more environmentally conscious and aware for nearly 40 years by developing people's knowledge, skills, attitudes, and behavior toward investigating issues, solving problems, and protecting and improving the environment (UNESCO, 1977; Uzzell, 1999). In the study by Estrada Alvarez (2011) about ecological identities and environmental consciousness, findings suggested that the students' experiences with the landed learning project deepened their understandings about nature, and informed their attitudes about environmental sustainability. The study provides evidence that engaging the child in a local, place-based educational setting enables him/her to develop a stronger sense of place and nourish a strong connection to nature.

# Chapter 3: Methodology for the Study

## 3.1 Design

The study was based on a controlled experiment design that included pre- and post-activity questionnaire surveys, interviews with closed and open-ended questions, and self-reporting items within the course; as well as observational measures obtained through unobtrusive tracking of all respondents throughout the duration of their gardening experience. This study was conducted in the process of the landed learning project.

*The Intergenerational Landed Learning Project (ILLP)*

*The Intergenerational Landed Learning Project* is both an educational program and a research project in the Faculty of Education at UBC. It is a project where elementary school children and community elders work as partners to raise food crops on an urban organic farm. The goal was to illustrate how eco-philosophies could be translated into educational programs that foster environmental consciousness and care, respect for nature, and sustainable living practices, and to further the critical and systematic examination of environmental education initiatives (Mayer-Smith, et al., 2009). This project strives to provide young people with the knowledge and experiences to make informed choices about food consumption, and explore the connections between land, food, environment and health. Participating in the Intergenerational Landed Learning Project provides the students a chance to access the natural environment. In the context of environmental education, students construct gardening knowledge through hands-on activities and social-interaction with “farm friends” (facilitators).

### 3.2 Setting and content

The research was conducted in the Children's Garden in UBC Farm, where there are many separate small soil beds (see fig. 1). These beds are the places for children in small groups to seed, harvest, and save seeds for next year all by themselves.

**Figure 1. The soil bed of our small group in Children's Garden**

### 3.3 Participants

During the 2012-2013 school year, a sample of 28 students visiting the UBC Farm as a school group participated in the study. The grade 7 children come from the Lord Roberts Elementary School. The whole class participated in our program and the students were divided into several small groups. There were three to four children in each small group with

two facilitators who are called “Farm Friends”. All the students were randomly divided into those small groups. Five children from this class were interviewed by the researcher (see Appendix A). The purpose of this in-depth interview was to investigate children’s attitudes and behavior towards the natural environment, and whether their perspectives changed after participating in the *Intergenerational Landed Learning Project* or not.

Furthermore, pre/post survey data of 102 students in total from the previous school year who participated in the same project were analyzed to see if there was a significant difference, showing that the children’s perspectives changed positively by joining the *Intergenerational Landed Learning Project*.

Having abandoned the inconsistent data collected either only pre-survey or post-survey, the data from 82 effective participants was analyzed. These participants were in the age range of 8-13. See Table 1 below the demographic information of participants.

**Table 1. Distribution of variables of the participants**

| variable | Category | frequency | Percent |
|---|---|---|---|
| **Gender** | Boy | 37 | 45.1 |
| | Girl | 45 | 54.9 |
| **School/teacher** | GB/P | 22 | 26.8 |
| | EC/B | 20 | 24.4 |
| | TYEE/A | 22 | 26.8 |
| | LR/D | 18 | 22.0 |
| **Language** | English only | 35 | 42.7 |
| | Other language(s) except for English | 10 | 12.2 |
| | English ＆Other language(s) | 37 | 45.1 |
| | Total | 82 | 100 |

*Note:* GB/P=Graham Bruce Elementary/ Mr. P, EC=Edith Cavell Elementary/ Mr. B, TYEE/A= TYEE Elementary/ Miss A, LR=Lord Roberts Elementary/ Miss D.

### 3.4 Methods

A mixed research approach was used in this research project, but mainly a qualitative method. The data was collected by both quantitative and qualitative. The in-depth interview satisfies the principles of qualitative research by describing, understanding and explaining (Yin, 1994). Qualitative research is all about exploring issues, understanding phenomena, and answering questions. Focus groups, in-depth interviews, content analysis, and evaluation are among the many approaches that are used, but qualitative research in its most basic form involves the analysis of any unstructured data, including open-ended survey responses, audio recordings, and pictures and so on. An additional defining characteristic of qualitative research is its focus on garnering the meaning held by participants about the topic being

researched. Creswell (2009) reveals that qualitative research focuses "…on learning the meaning that the participants hold about the problem or issue, not the meaning that the researchers bring to the research or writers express in the literature" (p. 175). Through qualitative study, we could not only discover whether the children learned about the natural environment, but also what they learned and how they learned. Also available were notes about their emotions within the process of learning. The open-ended questions of the in-depth interview allowed me to deeply explore how the farm experience affected my students, and evaluated those impacts. Because the questionnaire was simple and general, it might not be strong enough to reveal a significant result of students' change and growth.

A quantitative approach was also applied to this study. This approach is one in which "the investigatory primarily uses postpositive claims for developing knowledge (i.e., cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, etc.), employs strategies of inquiry such as experiments and surveys, and collect data on predetermined instruments that yield statistics data." (Creswell, 2009, p. 21) This method was applied to the surveys in my research.

In a mixed methods approach the researcher "tends to base knowledge claims on pragmatic grounds (e.g., consequence-oriented, problem-centered, and pluralistic)." This method uses "strategies of inquiry that involve collecting data either simultaneously or sequentially" to better understand aspects of the research problem. Collecting the data also involves numeric information (e.g., from instruments) as well as text information in the form of interviews. In this way, the final database reflects both quantitative and qualitative information (Creswell, 2009, p. 21).

The researcher is an active agent in the research process in qualitative research (Creswell, 2009), gathering data using interviews, questionnaires and observations. The researcher's role in my research is also to observe children's behaviors and their interaction with plants and "farm friends"; and to interview them with several brief questions before, during, and after the activity. Semi-structured interviews were used to gain insight into the children's motivations for participating, the challenges they experienced during their participation, and the extent of their learning. My intention was to investigate the changes in self-concept, attitudes, and behavior towards the environment of the children participating in my research. Furthermore, my study sought to explore whether this gardening project really had some positive effects on the children's formation of environmental concepts and their behavior change. The self-concept, attitudes, and behavior towards the environment of participants were readily accessed using qualitative research methods. In addition, my statistical data provided a ratio of how many children report their attitude and behavior change by participating in the project and to what extend the change happen quantitatively.

**3.5 Data analysis**

To embrace my involvement and role l attempted to make use of hermeneutic phenomenology to describe and explain the research process (Anfara, Brown & Mangione, 2002). As Silverman (2007) astutely observes, no data is "untouched by the researchers' hands" (p.54). Hermeneutic phenomenology focuses on the interpretation of each individual's personal experience (Ajjawi & Higgs, 2007) in reference to a specific context (Van Manen, 1997). In this case, I used observations and in-depth interviews connected to the experience

the students had at the farm in 11 visits in total to explore how this project impacts children's attitudes and behaviors towards the natural environment. My perspective as a museum educator/student assured that I would pay attention to engagement and insights generated by the hands-on activities students participated in during the gardening experience, and also the agenda (both the facilitator's and the students'). By using a qualitative research approach I was hoping to observe my subjects derive meaning and construct knowledge during field trip experiences "through the eyes of the people being studied" (Silverman, 2007, p.134).

During the research project I was interested to discover to what extent gardening activities enhanced meaning-making and learning in the natural environment. Learning activities during the field trip experience can take the form of "looking, thinking, and wondering" (Duke, 2010, p.277). When visitors to informal learning spaces assimilate events and observations into mental categories, learning has occurred (Falk & Dierking, 2000). Another factor that I took into account was that learning can be seen simultaneously as "a process and a product" (Falk & Dierking, 2000, p.13). In my experiment, the students planted, watered and harvested vegetables; thus, they went through the process and produced products in the farm.

Items in the survey (see Appendix B) measured behaviors that children had towards the natural environment in their daily life, as well as their attitudes about the natural environment. The purpose of analyzing the pre survey and the post survey data was to investigate whether there were some good behaviors towards the environment that the children did after participating in the project which they had never done before or those they already had done but did more frequently after the project. Also, whether their attitudes towards the

environment changed after being involved with the project by comparing the pre and post data. Section A of this survey questionnaire (see Appendix B) was used to get the demographic data of the participants; and only the part D of the survey was relevant to this study which measured children's perspectives about the natural environment. That is why A & D are the only two sections included in the appendix.

The quantitative data was analyzed by using SPSS (Statistic Package for Social Science) Version 17.0. Through SPSS, statistical approaches were used to analyze the data. Descriptive Statistics was used to see the general situation about the data; pair-sample T-test was used to analyze the difference between the pre and the post data. By using SPSS analysis I was able to show the result of the comparison between children's pre and post attitudes and behaviors and if they had changed by participating in the *Intergenerational Landed Learning Project*.

# Chapter 4: Findings

## 4.1 Findings of in-depth interviews

Genuine conversations can be had based on the equal and mutual trusted relationship I have built with the five interviewees.

I evaluated the meaning made by my students based on the following criteria:

***Children's experience and reflection in the ILLP at the UBC farm***

1. ***Increase in knowledge and understanding & evidence of enjoyment, engagement and creativity***

Children enjoy the experience at the UBC farm, and they appreciate the knowledge they learned there. All the children I interviewed gave me positive responses for the Landed Learning Project. They all think they really learned a lot within this project, even though most of the interviewees had varying degrees of gardening experience before with their families. They really enjoyed learning here. For instance, after a month's wait for the seeds to sprout, the children rushed into the garden and one of the girls in my group said "Oh my god, I'm so excited to come back here". All of them were actively participating in the activities on every visit. They were interested in what the schedule was each day and how their plants grew during the previous two weeks. They asked questions of their "farm friends" and volunteered to do different tasks during the farm day such as work with the compost bins (see fig. 2) .

**Figure 2. Compost**

During the interview, the children would even repeat specific details of what they learned from the facilitators.

> Researcher: Do you think you learned many things from the Landed Learning Project? What kind of things?
>
> M: Yeah. For example when I plant something, you can't just leave the seed over there, you have to dig a hole like that big (with gesture), and you have to bury it; and you have to water a lot or a little. So it helps me realize the difference between things, what I have to do differently. For example, you

have to space different plants differently like nasturtium flower, you can't plant it very close to other plants, because it'll grow up and push and will block up the sun. Something like that, it's like a little details make a big difference. Or like for beans, you can't just put them in the middle of your garden let it grow up or something. When we're at the farm, we had to build a trellis or sticks so the blooms can grow on to it.

***2. Increase in knowledge and understanding***

After their visit, all the children thought healthy food was related to the natural environment. When the natural environment was mentioned to the children, they always thought of plants. Healthy food in their minds is mostly fruits and vegetables which are exactly the plants in the farm related to the natural environment. All the vegetables they planted at the UBC farm are organic and natural. The children planted the seeds and harvested them later to make salads. They made the connection between healthy food and the natural environment through their experience at the UBC farm.

The following are excerpts from the interviews:

R: Where do you think the healthy food comes from?

M (boy): The healthy food comes from where (they're) not using chemicals.

R: Do you think healthy food is related to the natural environment?

M (boy): Yeah, I think when the environment is completely natural, the foods are healthier.

R: What kind of food do you think is healthy?

K: Well, I think like fruits and vegetables and anything that's like none of fats and salts.

R: Do you think that can make a connection with the natural environment?

K: Yeah, because like I said the fruits and vegetables are really healthy, and like the natural environment grows these foods.

R: Do you know why it is healthy from the natural environment?

K: Well, it gives you a lot of nutrients, and I know that some fruits give you a certain type of vitamin, like vitamin C and so on, I think it's healthy.

R: What kind of food do you think are healthy?

Z: Fruits, vegetables, fish most, rice, potatoes, green products.

R: So do you think the healthy food is related to the natural environment?

Z: Yes, because I think they all have something to do with it. Like the green products, some fruits and vegetables, they're all from the earth, from the soil. And then the animals like the meat, they feed off of the plants, if they are not … and then the bigger animals feed off the little animals, and we feed on them. So it all is like a big life cycle (see Fig. 3).

**Figure 3. Life cycle (children put them in order as a life cycle)**

R: What kind of food do you think is healthy?

M: I think like greens, vegetables and fruits, nuts, and stuffs that grows naturally from there.

R: Do you think this kind of food is related to the natural environment?

M: Yeah, I think so.

R: What kind of food do you think is healthy?

T: Well, like vegetables and fruits. Because they're sweet and they're nutritious, but I think maybe we shouldn't eat too many fruits because that'll be super healthy. (the student laughed)

R: Well, do you think this kind of healthy food is related to the natural environment?

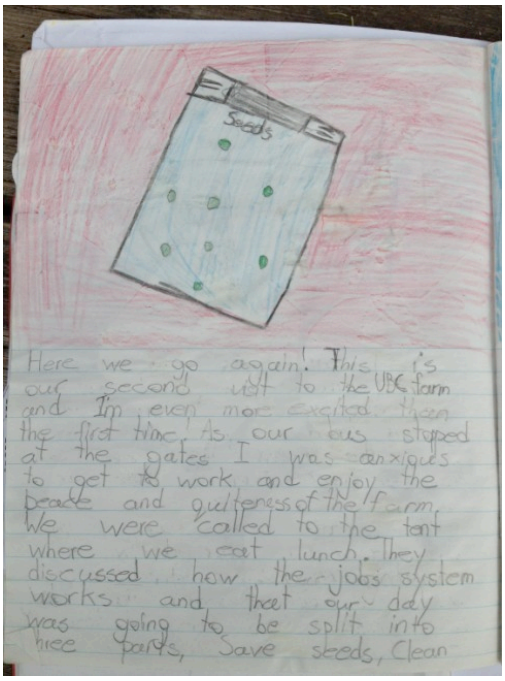
T: Yes.

### *3. Evidence of long-term impact*

On returning to the project children reported that they had talked to their families and friends about their experience at the UBC farm. According to Ostertag (2009), children are increasingly being perceived as teachers empowered to make changes in their families and communities to address environmental issues. This proved to be true for the children who experienced visits to the UBC farm as part of this study. When be asked whether they talked about the natural environment after a visit with their friends and family members, they said:

> Z: Almost every day at home my parents, my brother and I have discussions about like the natural environment, and where everything comes from, and like the cycle of life. And we usually have a lot of class discussion with my classmates about nature too.

> R: After every visit, did you talk and share your experience or some feels with your friends and family?
>
> K: Well, when we come back we write the landed learning log about what we've done at the farm from the beginning of the day to the end; and like what experience we've had and what we've learned from them. Like a diary. A lot of time I come home, I share my diary with them like what I planted, (see figs. 4 a 7 b). what I've done, what I've built, I do share a lot things about the farm and the natural environment.

a. 

b. 


**Figure 4a. & 4b. Children's Landed Learning Log**

T: Well, I always like nature. At home I do have a garden, so I learn stuff at the farm and then I bring it home and I use it in my garden too. For example, like how you have to plant things, like how much space between each other, and like how deep to plant seeds—twice the size of how big the seed is. That really helped me, because I plant things before I was in this program, my tomatoes they never work, I think I planted them too deep. They never come up.

***4. Evidence of changing in attitudes and perceptions towards the natural environment.***

Children's attitudes about the natural environment are changed for good by participating in *the Intergenerational Landed Learning Project*. Their viewpoints towards the natural environment become more related to themselves after participating in this project. And children's self-identification with the natural environment has been built (Estrada Alvarez, 2011). This project helps students relate the knowledge, understanding and wisdom of

humanity to the world in which we all live. In other words, they acted as more caring about the natural environment.

Z: Yes, because before I wasn't really aware of as much as like I was just "oh well, look, a forest", but now I realize more details like the tree, and their roots and the stems of like what's in the forests. If you know what I mean, like, as an example. And like, I think I become more aware of the environment than before, and where my food comes from, and how it grows, and like what insects feed on.

K: Yes, of course. Because now I learn how important, like before I see a bug and I just think it's a kind of gross, but now I learn how the bugs effect the environment, now I know they are not so ugly and they are actually really beneficial to the environment as other things like trees and other plants.

K: Yeah, before wouldn't really think about the environment as much, and just in general when I went to the Landed Learning Project, I've learned a lot more about the environment which has made me be good with the environment and have more knowledge of it.

***5. Evidence of children's behavior change.***

The children do protect the natural environment more than before.

Z: There's a lot of garbage been like throw into the oceans, and pollution from oil spills, but also like garbage been throw into streams and all around.

But I think we shouldn't just throw them into garbage can instead, because then it pollutes the air and then, like for example in the streams, if the streams be polluted of oil spills the fish will start to die. And then if the fish will die maybe like a part of animal wouldn't be able to eat the fish, so then they would have nothing else to eat, so then they will start to die, then the whole cycle will get damaged.

K: Yes, when we have bottles and cans, I always go to the store, if possible, and return them and recycle them. And I always take my garbage and floor stuff to garbage, or recycle it depending on what product it is.

### *6. Participant Evaluation of the Intergenerational Landed Learning Project*

Both the activities and "farm friends" helped the children learn a lot in the Landed Learning Project but in different aspects.

Question: Which aspect of the farm project is the most helpful to your interaction with the natural environment?

Z: I like our activities, because usually what we do throughout the day when you show us how to plant and how many centimeters are the seeds ask to be from below the surface so it has, so it can grow. How you show us, how it grows and takes care of the plants.

M: I think the farm is perfect in my opinion.

R: You mean the physical environment, right?

M: Yes, the physical environment, how people get treated, like the farm friends for example like if I do something by accident, we never get yelled at anything, they just say "woops, you did that wrong, so we are going to help you do it right", and then maybe they even explain it a second time, which is good because sometimes I need to hear things more than once before I get the hinge of them. And the overall environment is fabulous in my opinion.

R: Did you learn these from our activities and farm friends?

K: Yes. They tell us how this bug or plant or tree is beneficial. And now I know that, because before I didn't really have very big knowledge of the plants and the other things.

R: Except for this, what other aspects do you think is really helpful of this Landed Learning Project?

K: We have our garden buddy (farm friend); he teaches us a lot of like how to measure temperature how to even read the temperature. He tells us a lot of basic knowledge that we need to know or we should know.

## 4.2 Findings of Survey

### *Descriptive statistics*

Table 2 shows the descriptive statistics for the participants' aggregate scores on pre- and post- survey, from the table we can clearly see that the aggregate score of the pre-survey

(*M*=18.598) is a little bit higher than the score of the post-survey (*M*=18.421). However, whether there is a significant difference between the pre-survey and post-survey statistically still needs to be analyzed further by pair-sample T-test (see Table 3).

**Table 2. Aggregate scores of pre-survey and post-survey of all the participants**

| | ***N*** | ***M*** | ***S.D*** | ***Min*** | ***Max*** |
|---|---|---|---|---|---|
| **Pre-survey** | 82 | 18.598 | 2.5621 | 13 | 24 |
| **Post-survey** | 82 | 18.421 | 2.5331 | 12 | 24 |

*Note: N*-number, *M*-mean value, *S.D*-standard deviation, *Min*-minimum value, *Max*-maximum value.

***Compare means***

**Table 3. Pair-sample T-test**

| | ***N*** | ***correlation*** | ***Sig.*** | ***t*** | ***Sig.(2-tailed)*** |
|---|---|---|---|---|---|
| **Pre score & post score** | 82 | .549 | .000*** | .661 | .510 |

*Note: N*-number, *Sig.*- significance of correlation, *t*- t-test coefficient, *Sig.(2-tailed)*- significance of difference.

*** p< .001

The result of Pair-sample T-test illustrate that there is no significant difference between participants' pre-survey score and post-survey score. Which means it cannot tell whether the project changed participants' perspectives of the natural environment or not from the analysis of questionnaire survey.

## Chapter 5: Discussion

Significant correlation (correlation coefficient=0.549, P<0.001) was found between pre-survey data and post-survey data, which illustrates that it was the same participants taking the same questionnaire before and after participating in the Landed Learning Project. However, the difference in the test shows there is no significant difference between previous and posterior data. As far as the result of questionnaire analysis is concerned, inquiring into the reasons, the impact of the activities of this project for the participants might not be as strong as we thought. Otherwise, in terms of the items of the questionnaire, what lead to the asymmetry of factors (e.g. attitude, behavior) are the low number of items related to the natural environment; furthermore, three quarters (item 1, 2, 3, 4, 5, &7) of them are investigating participants' behavior. This is probably another reason why there is no significant difference between the pre-experiment survey and post-experiment survey.

Statistical analysis also shows that the Cronbach's Alpha Coefficient of this questionnaire is 0.64, Guttman Split-Half Coefficient is 0.456. Statistically, a questionnaire with the reliability is 0.6~0.7, the items of which need to be amended (Nunnally, 1978). Additionally, the Pearson Correlation Sig. (2-tailed) is 0.549, which is under 0.8, reveals that there are some defects in the questionnaire design, which may be the factor which reduced the result. My suggestion is re-designing the questionnaire to be more structured, organized and better factored.

Even though quantitative analysis shows an unexpected result, the qualitative analysis excitingly presents positive consequence of the impacts of the project. Authentic insights and

learning can occur based on this level of interaction. Alexander, North and Hendren (1995) who studied the effects of a gardening program on inner city students in the San Antonio Independent School District noted: “Is there a way to introduce positive values, and expose students to role models? What might enhance their self-esteem and help them develop a regard for life and nature? One part of the answer may be as simple as a hands-on learning experience: gardening at school” (p. 124). Through hands-on experience at the farm, what the children gained was not merely the knowledge of the natural environment and gardening skill. Their greater achievement is a strong deep connection that has been built between them and the natural environment that fosters a sense of empathy, care, and informed responsibility (Hungerford and Volk, 1990; Payne, 2005; Sobel, 2004). As Estrada Alvarez (2011) pointed out, children develop a sense of respect and responsibility through their awareness of the environment that results in an attitude of stewardship.

Most items of the questionnaire were used to investigate the whether the behavior of participants changed by taking part in the project after 9 months. The insignificance of the statistical analysis results reveals that there is no difference in their behavior before and after they participated in the project. However, the information from in-depth interviews show that the students acted in a more environment-friendly way, which is an apparent shift in behavior. The difference between these two results, I conjecture, was reflected in two aspects. One is the heterogeneity of participants lead to the difference. The 5 interviewees come from Lord Roberts Elementary School of 2012-2013 school-year program, but those participants who did the survey were from 2011-2012 school-year program of all the 4 elementary schools. Even if the whole project, the main activities and the facilitators were all the same, we still

cannot ensure the impacts were the same on the two groups of students. On the other hand, as there are some defects in the questionnaire design—low number of items and the asymmetry of factories—which is not enough to obtain a significant result statistically. The advantage of semi-structured interviews lies in acquiring relatively rich, multi-dimensional and comprehensive information in the form of statement and opinion (Longhofer, Floersch & Hoy, 2013), which enlarged the difference and gap between the data collected by these two methods.

The elements of the success of the *Intergenerational Landed Learning Project* will be discussed from two dimensionalities. A) The project itself. Not only the main idea and the purpose of this project but also the design and implement of relevant activities is an innovative but not completely unfamiliar approach for the students, which can engage children's positive interests (Piscitelli & Anderson, 2001). By learning about the knowledge of the natural environment, the students related the natural environment to themselves more than before. Besides, they can use the knowledge they learned in their life, such as being able to recognize healthy fruits and vegetables, to help gardening their garden with family members, and to become an environmentalist, and so on. Additionally, at the farm they can learn while having fun, where positive feedback of learning comes from. B) The facilitator of the program. The facilitator of the program, called "the farm friend", is a crucial element of this project. Even though they are just volunteers who come from different sectors of the community and different ages instead of professional museum educators, they all have a number of characteristic need for becoming museum educators—having the expertise, being good at communicating, super patient, and knowing how to teach the knowledge and guide

students to experience. In addition, the different age composition of our facilitators provides an intergenerational interactive learning environment, which is a surprise for my research but one part of the research of the whole *Intergenerational Landed Learning Project* of the faculty that "an intergenerational learning experience that involves working with the land can be powerful in promoting environmental concern" (Mayer-Smith, Bartosh, ＆Peterat, 2007, p. 77). In view of the rich combination of factors that are part of this project, I think this project is a successful example of museum education practice.

## Chapter 6: Suggestion

If I still want to consider this endeavor as a quantitative research, the questionnaire needs to be re-designed; more specific items need to be designed; and factors need to be classified clearly.

As museum educators, we need to make greater efforts to include families and more diverse communities in environmental education in order to validate the knowledge.

## Chapter 7: Application and Popularization in the Future

In order to build stronger intergenerational and intercultural relationships there is a need to better facilitate this kind of environmental education, and to distribute the challenges of enacting environmental change to arouse public's awareness and action to retard the extent and the speed of current environmental degradation.

The *Intergenerational Landed Learning Project* helps students relate the knowledge, understanding and wisdom of humanity to the world in which we all live. Similar project not

only should be popularized within and outside of our community, but also, I think it could be popularized in China and other countries. As a museum educator who comes from China, I am eager to take this project back to China, because I know it has a real potential to influence the future of museum education in China.

## Chapter 8: Limitations to the Study

The quantitative data and qualitative data could not be combined very well because the survey data is from the previous school year, but the students I observed and interviewed were from this school year. The fact that the collection of data was not coordinated to match interviewed students with surveys, lead to the difference in results between qualitative and quantitative findings. Most significant was the fact I was unable to do the post-survey with the children I worked with this year.

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# Appendix

Appendix A: Semi-Structured Interview Questions

Does children's perspective of the natural environment change by participating in the landed learning project?

1. What kind of food do you think is healthy? Do you think healthy food is related to the natural environment?
2. Do you talk about the natural environment with your friends and family? If so what do you talk about?
3. What do you think of when I say "natural environment"? Can you define it?
4. Has your attitude about the natural environment changed by participating in this landed learning project?
5. Do you do anything to protect the natural environment? Why do you think doing this helps protect the natural environment?
6. Have you done something good for the natural environment that you didn't do before joining the Landed Learning project, and if so give me some examples.
7. What kind of things do you think should be done that help the natural environment?
8. Have you made any changes in how you interact with the natural environment after participating in the Landed Learning project?
9. What are some of the ways you like to interact with the natural environment?

10. Which aspect of the farm project is the most helpful to your interaction with the natural environment? (For instance, the physical context of the farm; the activities that were designed for you at the farm; the farm friends, etc.?)

Appendix B: Landed Learning Start-of-Year Student Survey 2011-1012

**For Student To Fill in**

Your First and Last Name

Your Teacher's Name

Your School Name

**Part A: WHO AM I?**

1. Are you a boy a girl
2. How old are you?
3. What language or languages do you speak at home?
4. I participate in the Landed Learning Project this year. (Check either Yes or No)

**Part D: ENVIRONMENTAL CARE**

Please check the box under either "never" or "sometimes" or "often"

| | Never | Sometimes | Often |
|---|---|---|---|
| 1. I pick up garbage when I see it lying around. | | | |
| 2. I recycle bottles, plastics and paper. | | | |
| 3. I compost at home. | | | |
| 4. I try not to waste food. | | | |
| 5. I try not to waste water. | | | |
| 6. I am concerned about how to take care of the environment. | | | |
| 7. I talk with my family or friends about the environment. | | | |
| 8. I am interested in learning how to care for the environment. | | | |