

YOUTH AND ENVIRONMENTAL ART: THE EFFECTS OF THE ISLAND SCHOOL
ON ECOLOGICAL LITERACY

By

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Abstract

Ecological literacy levels were researched in 16 youth attending The Cape Eleuthera Island School in The Bahamas over a three-month semester. Their experiences were enriched by the location of The Cape Eleuthera Island School, a place encouraging creativity and ecological connectedness. This research explored how environmental education affects a youth's artistic expression and understanding of ecological literacy. Using a newly developed ecological literacy matrix, an ethnographic observation and case study approach described the experience of the participants in this project. Fifteen of the 16 students were found to have increased their understanding and expression of ecological literacy. Immersion, integration, and reflection were found to be key components for the success of the students developing their ecological literacy. This case study provides insight into the relationships among art, environmental education, and ecological literacy and contributes to understanding of creative expression as an essential component of environmental education.

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Chapter 1: Introduction

Environmental art and artistic expression of ecological literacy are innate activities of human interaction within ecological communities (Anati, 1999; Rosenthal, 2003). Humans deepen their understanding of natural systems that surround them through the expression of ecological literacy. Rosenthal uses the term ‘Eco-Art’ to describe this discipline: “Eco-art offers a vehicle to cultivate systems thinking, interdisciplinary problem solving, collaboration, and social and environmental responsibility” (p. 154). To this end, eco-art within an environmental education matrix enhances an individual’s sense of place, creativity, and their role within the community (Kellman, 1998).

Ecological literacy within environmental education is the narrative in which we embed our sets of beliefs, values, and knowledge of the environment (Cutter-MacKenzie & Smith, 2003; Fisher, 2005; Prakash, 1995). “All forms of communication essential to sustaining cultural patterns are part of the process of environmental education” (Bowers, 1996). Thus, the rich narrative and communicative quality of environmental education resides within the creative reflection of bio-complexity and provides a robust pedagogical platform on which to build environmental art curriculum (Savva, Trimis, & Zachariou, 2004). The current lack of formal and non-formal environmental education within the western education system is limiting progress towards an eco-literate society (Cutter-MacKenzie & Smith, 2003; Fisher, 2005). Indeed, Orr (1990) believes the deficiency of environmental integration is the root cause of our current ecological crises.

Place-Based Learning at The Cape Eleuthera Island School

Despite the scarcity of environmental education in the formal educational systems of the western world, one institution has been exemplary in its formation and leadership of ecological literacy curriculum for youth. The Cape Eleuthera Island School of Eleuthera Island, located in The Bahamas, hereon “The Island School”, is an experiential semester school that enrolls students from across North America and The Bahamas. This school meets the curriculum outcomes of a typical North American high-school as well as provides outdoor and interdisciplinary opportunities in community outreach, research, mathematics, humanities, and the arts (Maxey, 2006a). As a result of attending The Island School, the students are well-exposed to a diversity of worldviews that are both scientific and culturally relevant (Maxey, pers. comm. February 17, 2007). This school facilitates experiences that encourage place-based social responsibility in a transformational setting. In particular, the environmental art program within The Island School framework acts as an integrating course allowing for reflection and expression of understanding about the other courses at The Island School. The art course further develops the student’s interdisciplinary artistic expression.

The Island School is located on the south end of Eleuthera Island in The Bahamas Archipelago (24°50’06” N; 76°19’32”). Its curriculum is infused with place-based education as described within its vision (Maxey, 2006b):

- Connecting students to place through continuous interaction with local culture and environments;
- Developing citizens who maintain responsibility for themselves, larger communities and the biosphere;

- Creating authentic learning opportunities where students are producers of information that has lasting value beyond the classroom experience;
- Building an understanding of personal and cultural lens and bias and the roles they play in reaching solutions to problems;
- Empowering students to continue to be active as leaders and educators in their communities after graduation; and
- Modeling sustainable systems that allow us to live with a reverence for the future.

The Island School represents a model for sustainable environmental education and is built to promote the development of responsible, caring global citizens by restoring a sense of wonder and respect for biotic and cultural complexity (Danylchuk, Bachand, & Maxey, 2004). This school's unusual location fosters an exploratory element to the place-based curriculum and engenders a sense of place by imbedding its curricula in the local environment and culture. Many of the alumni of The Island School have described their experience as being transformational and life-changing (Maxey, pers. comm. February 17th, 2007).

This research aims to discover the effects of the environmental education through environmental art on a youth's development of ecological literacy. Data collection was framed as a case study that examined grade ten and eleven students' learning experiences through the creation of art projects during the Spring 2007 semester of school.

Research Question and Objectives

My research focused on the following questions.

1. How does place-based environmental education affect a youth's expression and level of ecological literacy?
2. How does The Island School support the development of ecological understanding and expression?
3. What is the connection between environmental art, place-based learning, and ecological literacy?

A major objective of this research is to explore the effects of The Island School environmental art curriculum on the expression of ecological literacy of grade ten and eleven students within one semester. The research aims to examine the elements of The Island School that lead to positive change in the student's ecological understanding and expression during the course.

Below, I help guide the reader through the five main chapters by giving a brief summary of each of the chapters.

Chapter one provides an outline of the research along with its questions, framework, limitations, and delimitations.

Chapter two contains the literature review and is separated into three sections. The first section highlights the link between my research and the research of developmental psychologists. The second section provides a review of ecological literacy literature as it relates to the development of worldviews, especially in youth. The third section explores the research on art as a tool for teaching environmental concepts with youth.

Chapter three outlines the methodology of the inquiry. This section describes a new matrix for measuring ecological literacy, as well as the qualitative ethnographic observation and interview research methods I used to measure the development of ecological literacy in the 16 participating youth. It describes the research as a phased-approach. The chapter concludes with the style of data analysis used and a justification for the use of a case-study approach to this research.

Chapter four presents the results of the study. This chapter sets the stage for the findings and conclusions in Chapter five and much of the art that is found in Appendix F. Chapter four provides a phase-by-phase report of the various art pieces and interviews. The three phases of research are summarized which include the analysis of the pre-semester project, the Land and Environmental Art course unit projects, and the interviews with specific statements highlighted.

Chapter five represents the conclusions and recommendations based on the analysis of the major themes found in the results. This section highlights the three elements of The Island School experience that affected the students the most: immersion, integration, and reflection. It also discusses the usefulness of an environmental art course as a binding agent for trans-disciplinary curricula. Finally it sets out recommendations for educators about integrated environmental education curricula.

Delimitations and Researcher's Perspective

For this study, I restricted the analysis to the experience of willing participants that were attending the Spring 2007 semester at The Island School. This decision enabled a more thorough analysis of one school's contribution to environmental education through a case study approach. It also allowed for a longer-term and more in-depth analysis with the participants, of which 16 volunteered to contribute to the study.

The participating students had a relatively narrow background in terms of cultural diversity, all hailing from across the United States of America. The rigor and robustness of this study is enhanced through its longevity in comparison to other art and environmental education research. Although case studies tend to be limited in their ability to be generalized, this study can be used by schools or learning communities that strive for integration among their teaching disciplines.

In addition to being an investigator into their experience, I was the student's teacher in art and research classes. This dual-rolled situation could be seen as a conflict of interest. However, I mitigated this through using an ethical review process, where volunteering students and their guardians were informed of the potential conflict and assured that their participation had no bearing on grades.

My bias to the study included the following beliefs: I expected that the participants' ecological literacy levels would increase due to the art curriculum and the semester experience. The participants' understanding and ability to express this understanding would also increase, which would give them tools to analyze and reflect upon their own development. I was biased towards an outcome that showed a marked development within the participants' behaviours due to my personal interest and belief in environmental education as a tool towards sustainability.

Significance of this study

The limited research on experiential schools and their role in the development of a student's ecological literacy warrants studies such as this to help fill the gap in our knowledge. It is troubling to me that the academic world continuously states that education will contribute to solving the environmental problems of the world (such as at

the Earth Summit, North American Environmental Education Conference, Canadian Network of Environmental Education and Communication Conference, and World Environmental Education Congress to name a few), and still there is a dearth of research concerning its impact on students. The research in environmental education is still in its infancy (Hart & Nolan, 1999; Rickinson, 2001). Therefore, research such as this can contribute a great deal to both the environmental educational and standard educational community, exploring the validity of integrating disciplines that have traditionally been disparate such as the arts, sciences, and humanities (Boldt & Brooks, 2006; Bower, 2006; Kellman, 1998; Rosenthal, 2003; Russell-Bowie, 2005; Savva, Trimis, & Zachariou, 2004).

The underlying objective of this research is to understand how young people develop their understanding and expression relative to their surroundings. I am formally addressing the calls for action from books such as Louv's (2005) *Last Child in The Woods*, and Sobel's (1999) *Beyond Ecophobia*. It is imperative that we continue to search for deeper understanding of environmental education and its effects on youth, especially from their perspective.

Chapter 2: Literature Review

Case study research on experiential, place-based schools is both relevant and extremely useful to the environmental education academic community and beyond to the broader community of educators, academics, and policy makers. The World Environmental Education Congress, an offshoot of the Tbilisi Intergovernmental Conference on Environmental Education (UNESCO, 1977), strongly encourages continued research into innovative and integrated environmental education (WEEC, 2005, 2007). This continued call for more environmental education research is an echo from the Tbilisi report's original recommendation No 21 that research on education must continue to be conducted in order to discover:

1. the goals and objectives of environmental education;
2. the epistemological and institutional structures that affect consideration of environment demands; and
3. the knowledge and attitudes of individuals, in order to identify more precisely the most effective educational conditions, types of action by teachers and processes of assimilation of knowledge by pupils, as well as obstacles to the modification of concepts, values and attitudes which are held by individuals and are involved in environmental behaviour. (p. 38)

It is the third point that this research is looking to address. Embedded within my methodology and analysis are a diversity of academic disciplines that requires further explanation and acknowledgement to past literature. This review is divided into three

subject areas. First, developmental psychology and worldview research gives a framework for the analysis of the students' development through The Island School experience. Second, understanding the role of ecological literacy research provides definitions, context, and comparative guidelines for the data analysis component of this research. In addition to ecological literacy, this section also tackles worldview research and its relation to ecological literacy and consciousness. Third, the limited discipline of art and environmental education provides parallel research for contrasting and comparing the findings of this project.

Developmental Psychology

It would be remiss of me to not acknowledge Piaget and Vygotsky's influence on developmental psychology and its relevance to this study. Vygotsky's work provided a litany of deep understanding to the educational psychology world. Most useful to this study is the literature that discusses dialectic and the concept of growth in a subjective world (Vygotsky, 1962). Dialectical theory points to the use of language as the central method for young people to develop consciousness. Thoughts and language reflect reality and therefore are key to the nature and timbre of human consciousness. His phased view of childhood development is relevant to youth learning in an environmental setting as well (from Blunden, 1997, ¶ 5):

- **First phase - syncretism;** objects are united only by subjective bonds and not by anything pertaining to the objects themselves.
- **Second Phase - complexes;** objects are united not only by subjective bonds but also by facts. Any factually present connection may lead to

the inclusion of a given element into a complex, but not one consistent attribute.

- **Third Phase - concepts:** a single attribute is abstracted to form the basis of a collective, the child has begun to operate with concepts, to practice conceptual thinking, before being aware of the nature of these operations. This peculiar genetic situation is not limited to the attainment of concepts; it is the rule rather than an exception in the intellectual development of the child.

Vygotsky's most renowned work was his zone of proximal development (ZPD) theory, which included the concepts around the social aspects of learning (Vygotsky, 1978). Schools such as The Island School provide a support network to increase the amount of development that student's experience due to the scaffolding and immersive nature of the instructional design. Vygotsky's dialectic phases, ZPD outcomes, and constructs are conspicuous within the participant's artworks at The Island School, and indeed their entire experience here.

Piaget acted as a quarrelsome counterpart to Vygotsky's theories. Piaget argued that Vygotsky's work left little to the concept of action-based learning. Piaget's concept was that individuals learn through our personal creative actions rather than through dialectic and social processes (Ayman-Nolley, 1999). Piaget explains personal development as a series of constructs that create a schema, or ways of knowing about objects in the world (Piaget & Inhelder, 1967). His schemata theory is based on a mixture of biological observation and psychology and plays an important role in the environmental education community because he suggests our previous experiences

influence our interaction with the environment (Morgan, 2006). The Island School student's schemata act as prior knowledge in which they can contextualize and relate new knowledge. It is through a basic understanding by an observer or teacher of the student's schemata contributes to the diverse experiences that students have at The Island School.

The idea of a variety of developing schemas relates reasonably well to Gardner's notion of multiple intelligences, that is to say, each of Gardner's 'intelligences' might represent a relatively autonomous 'mental schema' which can undergo development independently (to a greater or lesser extent) of the others. (Morgan, 2006, p. 347)

Gardner (1998) presents a model for learning that points to the multiplicity of learning styles of students. His multiple intelligence theory is helpful for building curricula and understanding the projects that students create. For this research, the participants' works were observed with the diversity of the intelligences presented under Gardner's model in mind. I have reviewed his list of the intelligences with the eye of an environmental art teacher: linguistic (relating to the new language of ecological literacy), logical-mathematical (understanding the economy of ecological systems), musical (expression and creativity in projects), spatial (a key element of art), bodily-kinesthetic (relating to the performance artworks), interpersonal (group work and teaching others), intrapersonal (understanding the relation of myself to the environment), naturalist (understanding and relating to nature) and existential (related to the quadrants of the ecological literacy matrix discussed in the methods and results sections).

Tuckman (1965) proposed a set of stages that small groups evolve through when given a shared task. Tuckman's model explains that as the team develops, relationships are formed and leadership styles evolve:

- Forming – Leader is depended on for guidance and direction. Little agreement on team aims other than received from leader. Individual roles and responsibilities are unclear.
- Storming – Group has difficulty making decisions. Team members vie for position as they attempt to establish themselves in relation to other team members and the leader, who might receive challenges from team members.
- Norming – Agreement and consensus is largely forms among team, who respond well to facilitation by leader. Roles and responsibilities are clear and accepted. Commitment and unity is strong. The team may engage in fun and social activities.
- Performing – The team is strategically aware; the team knows clearly why it is doing what it is doing. There is a focus on over-achieving goals, and the team makes most of the decisions against criteria agreed with the leader. Disagreements occur but now they are resolved within the team positively and necessary changes to processes and structure are made by the team.
- Adjourning – Individuals are proud of having achieved much and glad to have been part of such an enjoyable group.

Tuckman's model is particularly useful to the scope of the Land and Environmental Art course in the building of the curriculum, which acts as part of the methodology (described in the Methods section).

Experiential schools such as The Island School have the potential for creating a positive atmosphere for transformative learning. Mezirow (1991) stated that transformation for an individual is reflected through perspective changes:

Perspective transformation is the process of becoming critically aware of how and why our assumptions have come to constrain the way we perceive, understand, and feel about our world; changing these structures of habitual expectation to make possible a more inclusive, discriminating, and integrating perspective; and, finally, making choices or otherwise acting upon these new understandings. (p. 167)

Taylor (1998) discusses Mezirow's view of what makes an ideal transformative environment as being part of a themed process, which includes centrality of the process, critical reflection, and rational discourse. Through these themes of transformation a learner's personal cognitive development is an inevitable and irreversible outcome.

It is apparent to me that much of cognitive development research relates to how humans construct their own ways of knowing. As shown through Kegan's orders of consciousness, ways of knowing and the understanding of consciousness development relates to the creation of sets of beliefs and morals. Koltko-Rivera's (2004) exploration of the psychology of worldviews is a robust meta-analysis of the concepts behind worldview development. In his analysis, he leads the reader through the complicated world of worldview analysis. This extremely rich subject of how worldviews develop is

still fraught with unknowns. For this research, I am specifically interested in the ecological literacy component of worldviews, which might be a small or large sliver of any given individual's worldview. I have chosen to adopt Koltko-Rivera's definition of worldview.

A worldview is a way of describing the universe and life within it, both in terms of what is and what ought to be. A given worldview is a set of beliefs that includes limiting statements and assumptions regarding what exists and what does not (either in actuality, or in principle), what objects or experiences are good or bad, and what objectives, behaviors, and relationships are desirable or undesirable. A worldview defines what can be known or done in the world, and how it can be known or done.

(Koltko-Rivera, 2004, p.4)

Ecological literacy and the understanding of the environment is integrated into this definition through the inherent beliefs systems that are built around what can and can't be done in the world. Koltko-Rivera's definition of a worldview meshes well with Orr's definition outlined below.

Ecological Literacy and Worldviews

According to UNESCO (1977), ecological (then environmental) literacy and action-based curriculum are the fundamental goals of all environmental education. Originally coined by Roth in 1968, the definition of environmental literacy has since been developed by a multitude of authors (Bueth & Smallwood, 1987; Roth, 1992; St. Clair, 2003; UNESCO, 1977). However, until Orr's (1992) contribution to the definition of ecological literacy, there was no generally-accepted definition (Cutter-MacKenzie &

Smith, 2003). Orr has been known to use both environmental literacy and ecological literacy interchangeably.

For the purposes of this study, I will use Orr's (1992) definition of ecological literacy and also primarily refer to the concept as "ecological literacy". Ecological Literacy is "how people and societies relate to each other and to natural systems, and how they might do so sustainably" (p. 92). Further to this, an ecologically literate person understands ecological systems, and how people and communities impact the systems in which they live (Cutter-MacKenzie & Smith, 2003).

Still more difficult than defining ecological literacy, is the description of a person's level of ecological literacy. Cutter-MacKenzie and Smith present a matrix of ecological literacy levels, based on Roth's work, giving indicators that allow evaluators to gauge the complex array of ecological understanding (Table 1).

Table 1: Ecological literacy levels (from Cutter-MacKenzie & Smith, 2003)

Ecological Literacy	Complex Knowledge	Beliefs	Eco-Philosophy
Ecological Illiteracy	<ul style="list-style-type: none"> • Little understanding of environmental issues and/or the idea of environmental crisis. • Many misconceptions about environmental issues 	<ul style="list-style-type: none"> • Believes that environment is a resource to be used by human beings. • Science and technology will solve/manage any problems. • All economic growth is good. • Suspicion that environmental education and social change are necessary. 	Technocratic (Anthropocentric) Perspective.
Nominal Ecological Literacy	<ul style="list-style-type: none"> • Can recognize some basic terms used in 	<ul style="list-style-type: none"> • Is developing awareness and sensitivity towards 	Accommodation Perspective

	<p>communicating about the environment.</p> <ul style="list-style-type: none"> • May possess misconceptions about and provide naïve explanations of environmental system • Is beginning to identify environmental problems and the issues surrounding proposed solutions. 	<p>the importance of natural systems and the human impacts on them.</p> <ul style="list-style-type: none"> • Reformist belief that economic growth and resource exploitation can continue. • Provision of effective environmental management agencies at national and local levels. • Raising environmental awareness and concern is necessary within society/education. 	
Functional/Operational Ecological Literacy	<ul style="list-style-type: none"> • Regularly uses environmental vocabulary with the correct definitions and in the appropriate context. • Understands the organization and functioning of environmental systems and their interaction with human systems. • Possesses the knowledge and skills to act on local problems and be involved with environmental concerns at the education level. 	<ul style="list-style-type: none"> • Is personally committed to environmental quality. • Belief in the intrinsic importance of nature for defining and sustaining humanity. • Rejection of materialism. • Lack of faith in large-scale technology and continued economic growth. • Personally committed to environmental education and the production of environmentally literate and 	Communalist (Eco-Socialist) Perspective

		committed citizenry.	
Highly Evolved Ecological Literacy	<ul style="list-style-type: none"> • Possesses a thorough understating of how people and societies relate to each other and to natural systems, and how they might do so sustainably. • Possesses a thorough understanding of the dynamics of the environmental crises, which includes a thorough understanding of how people (and societies) have become so destructive. • Possesses an understanding of models of sustainability and associated environmental perspectives. • Is able to synthesize environmental information and act upon that synthesis in ways that leads to environmental sustainability through environmental education. 	<ul style="list-style-type: none"> • Faith in cooperative capabilities of societies to establish self-reliant communities based on sustainable resource use. • Belief in the intrinsic importance and preservation for defining nature and sustaining humanity. • Belief that humanity should live simply, so that other non-human communities can live. • Belief in the production of an ecologically literate, committed and active citizenry. 	Gaia Ecocentric Perspective

In an effort to further the usability and rigour of this analysis tool, I have adapted the Cutter-Mackenzie matrix to include multi-centric ontologies such as Wilber's centricism model (Hochachka, 2005; Wilber, 1998) (Figure 1).

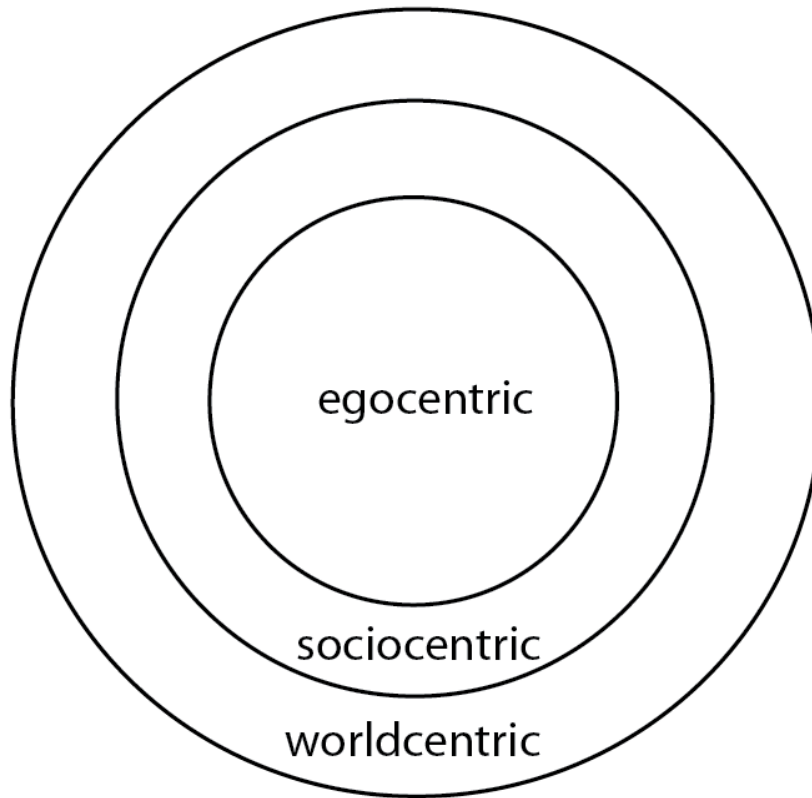


Figure 1. Centricisms adapted from Hochachka (2005)

Wilber's addition to this model contributes to the concept of centric layers. One of the most straightforward descriptions of centric layers is from Gail Hochachka's (2005) *Developing Sustainability, Developing the Self – an Integral Approach to Community and International Development*, a publication based on her Master's work at the University of Victoria:

A simplified sketch of self-development processes explains that as an individual's sphere of consideration and care expands to include others

beyond oneself, and as that person acts in concert with others who also share this expanded worldview, the closer the community or society comes to sustainability. In this way, worldviews move from being self-focused and egocentric, to include others in the social group, or socio-centric, to eventually include other humans, species and ecosystems in a world-centric embrace. Therefore, self-care, care for others, and universal care are all contained within a world-centric perspective. (p. 2).

Overlaid and entwined with the centricisms, I have overlaid Kegan's order of consciousness (Love & Guthrie, 1999) (Figure 2).

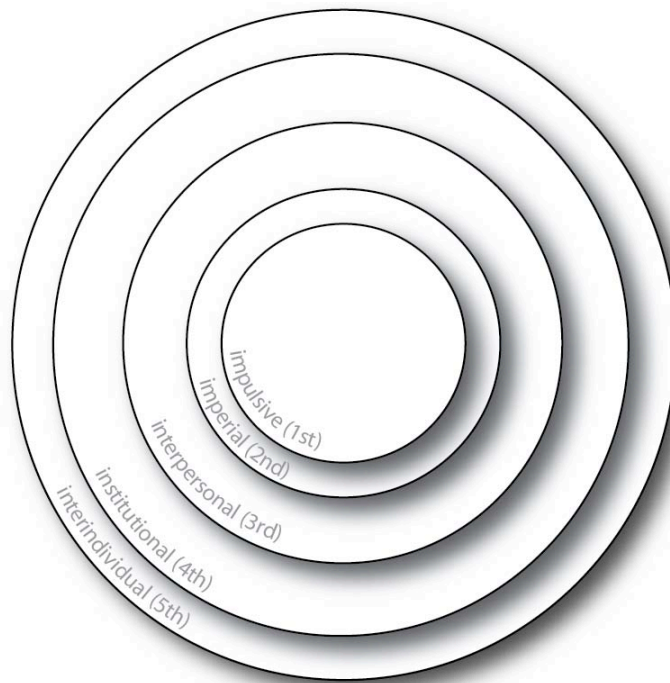


Figure 2. Kegan's Orders of Consciousness (adapted from Love & Guthrie, 1999)

Kegan's work primarily focuses on how humans can transform through various ways of interacting with the world, and acts as a useful model to compare ecological literacy development. He specifically focuses on stages in which human psyches dwell

including *impulsive* (entirely concerned with self), *imperial* (motivated by personal needs but discovering relationships), *interpersonal* (self defined by his/her own social culture), *institutional* (motivated by for self-definition within his/her own culture), *interindividual* (self defined by a mutual inter-dependence) (Kegan, 1982).

Naess's pluralisms also play a role in the design of the matrix assessment tool as they provide a place and explanation for coinciding or conflicting worldviews (Quick, 2006; Weston, 2006) (Figure 3).

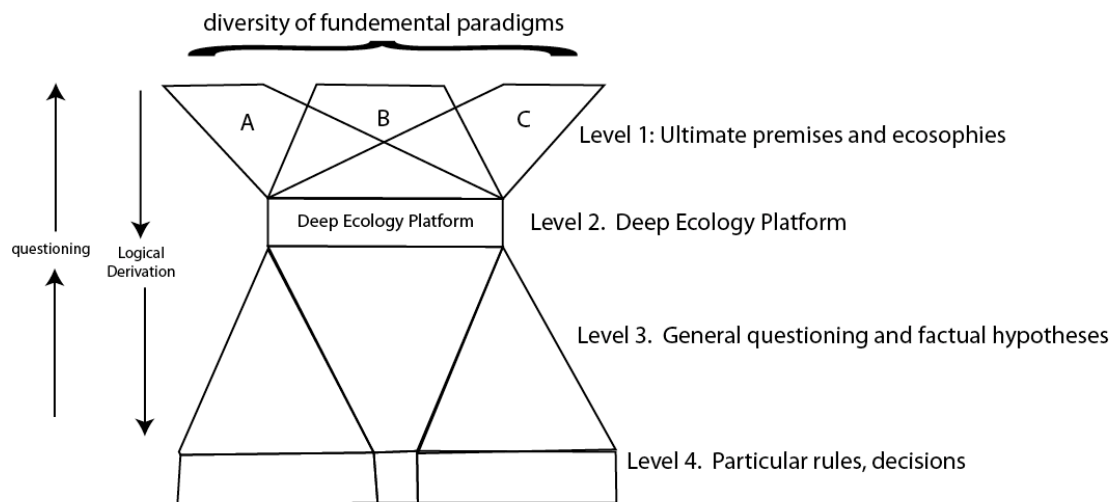


Figure 3. Naess' Pluralisms through Deep Ecology (adapted from Naess, 1992)

Arne Naess' influence on the ecological literacy matrix comes in the form of its dynamism and gestalt theory. Naess approaches analysis of human development with the concept of "total view", something similar to what we know as "worldview". This research project is not attempting to describe the total view of any particular individual. Rather it is attempting to understand the interrelation and expression of one component of an individual's development of a belief system known as ecological literacy. However, it is important to acknowledge the other ways of knowing, which might include religious or

spiritual backgrounds, and that the participants within this study may have complex interactions among their personal epistemologies. At any one time, an individual's beliefs might be confounded by multiple understandings (Weston, 2006). Naess points to pluralism as a form of constant re-evaluation which enhances an individual's conceptual diversity and thus influencing their total world view (Drengson, 1999).

Finally, Koltko-Rivera's (2004) conceptual relationships among beliefs, values, and worldview provides quadrants for the various levels of ecological, self, and centric consciousnesses (Figure 4).

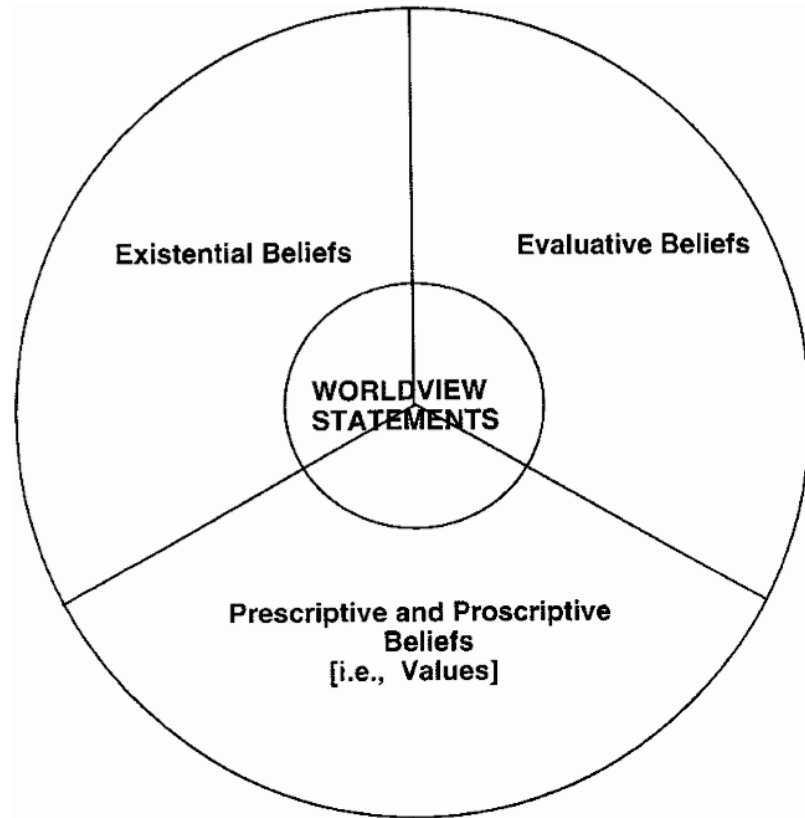


Figure 4. Conceptual relationships among beliefs, values, and worldview statements adapted from Koltko-Rivera (2004).

The ecological literacy matrix, and the adaptations that I have made to it, enriched the descriptive component of this project, as it was used as an evaluation rubric for the assignments and interviews associated with the participant's experience. I discuss the use of the ecological literacy matrix in more detail within the methods section.

Bowers (1996) is persuasive when discussing the role of ecological literacy in moving education towards a more sustainable model. His view is that ecological literacy is much more than just learning about the environment. It includes knowledge on how humans live in and around the environment. He looks to cultures far older than his own to explain the significance of environmental education. Bowers explains that environmental education should focus its

attention to the adverse consequences for the environment of the cultural patterns taught in the nonscience areas of the curriculum. Literature, history, and the arts, as well as all other areas of the curriculum, at both the public school and university level, represent a form of environmental education. (§ 7)

Interestingly, Bower's research points to arts as the potential catalyst to rebind what he claims is a destructive and indifferent attitude to environmental education and ecological literacy in educational institutions.

Barrett (2001) described integrative science, or the evolution of transdisciplinary education, as being an path for how humans see the earth around us. His estimation is that we are closing the circle of ecological and environmental knowledge and understanding by teaching environmentalism. The circle is being closed through what is called the "noosystem", the interaction between the human mind and the ecology

(originally described by Vernadsky and Teilhard de Chardin and well summarized in Smith-Sebasto (2001)). Vernadsky (1945) and Teilhard de Chardin (1966) define a noosystematic approach as an integration of the biosphere and power of global human consciousness. The Island School curricula can be described as using a noosystem or holistic approach by integrating the curriculum and focusing on sustainable living, conservation, and leadership within a global context.

Worldview, environmental education, and ecological literacy literature share a philosophical component that makes for a logical nesting of the disciplines (Clacherty, 1993; Clark, 1998; Hage & Rauckiene, 2004; Koltko-Rivera, 2004). This research considers environmental education to have a high influence on the participants' worldviews. Clacherty and Hage claim that there are positive effects from a holistic environmental education on student's worldviews. This holism can occur through the study of systems thinking, a way of seeing larger interactions among elements. Meadows (2002) has a particularly playful way to develop a better understanding of the earth around us through systems thinking. Her 14 solutions to understand systems of the earth are valuable to this project as they influence the analysis of the results, the framework that the results are based on, and depth of the recommendations found in Chapter five:

1. **Get the Beat.** Discover how the system works; explore its trends.

Focus on the facts, not the theories about the system.

2. **Listen to the wisdom of the system.** Before changing anything in the system, pay attention to the value of what is already there.

3. **Explore your mental models to the open air.** Invite others to challenge the assumptions of our own models and add their own.

4. **Stay Humble. Stay a Learner.** Avoid making assumptions within all facets of your interpretation. Learn from previous mistakes.
5. **Honour and protect information.** Continually look for accurate and complete information to help influence your knowledge. Create an accountable and transparent flow of information.
6. **Locate responsibility in the system.** Look for the intrinsic feedback within the system.
7. **Make feedback policies for feedback systems.** Build and expand on the feedback loops within the system you are studying or experiencing.
8. **Pay attention to what is important, not just what is quantifiable.**
Avoid only relying on statistical indicators but expand values-based judgment within your approach to the system.
9. **Go for the good of the whole.** Assess whether changing one value or item within the system will influence the whole and make the system lopsided.
10. **Expand time horizons.** Envision the system in 1, 5, 15, 50, 100, and 1000 years. Understand how you might impact that system.
11. **Expand thought horizons.** Penetrate the jargons and utilize diverse disciplines to analyze all sides of the system.

12. **Expand the boundary of caring.** Use systems-thinking to back up the moral obligations of you and your community's interaction with the system.
13. **Celebrate complexity.** Reflect the values of the system and its celebration of diversity and complexity within expressions that are created around it. Understand that the world is highly dynamic.
14. **Hold fast the goal of goodness.** Keep the standards of you and your community absolute. Don't weigh the bad news more heavily than the good news.

My participants were encouraged to practice number thirteen, but I found that many of the students would exercise almost all of these 14 points as part of their art projects. The next section explores the literature on the relationship between art and systems thinking.

Youth and the Expression of Ecological Knowledge

Savva, Trimis, & Zachariou (2004) discuss the role of environmental art as a direct way to express one's understanding of the environment, and that it includes creative expression in and about the environment utilizing both old and new media. They suggest that the exploration of natural materials through interactive experiences provides opportunities for participants to enhance their environmental sensitivity.

It is suggested that an important function of visual arts education is to develop empathy (the relationship of the world of objects with the world of the self is continually explored) and thus, it could be argued that in this

case, empathy was found to be an essential component in developing participants' environmental experiences and encouraging environmental awareness. (p. 9)

The difficulty with utilizing this power in educational environments, however, is that youth are under-exposed to the concepts and inspiration that environmental art encourages (Bower, 2006; Rosenthal, 2003; Savva, Trimis, & Zachariou, 2004). Rosenthal states that environmental art can provide a deeper connection with the environment around us:

By its very nature, eco-art is multidisciplinary and pedagogical. Eco-artists draw from diverse disciplines, including art, ecology, landscape architecture, urban planning, and history, to restore damaged ecosystems, interpret environmental and cultural histories, and reveal systems problems and solutions (such as the water systems within a city or bioregion). The intent of such projects is to foster sensitivity to our place within human and non-human nature, and to encourage more informed public discourse and action. (p. 2)

In the twenty-first century, expression of understanding and creative art is a dynamic and complex exchange through an increasingly mediated system of international peers and mentors (Thompson, 1997; UNDESA, 2005). Carrington and Marsh (2005) postulate that with increased exposure to digital technologies, the expression of ecological literacy is being over-run by this fascination with technology. New forms of media literacy are needed to help guide youth in their communicative experiences about ecological knowledge.

Encapsulated within the complexity of new-media creativity and its potential effects on creative expression lies the combination of young people and art that supports individual and community growth (Boldt & Brooks, 2006). Environmental art can be a creative way to express an understanding of ecological systems and provide “real world” experiences that endorse a young person’s sense of being and authenticity.

Environmental art and the space to express understanding through creativity can transform a curriculum of “thinking” to a curriculum of “doing” (Loock, Myburgh, & Poggenpoel, 2003). In turn, youth can be transformed through participating in an active curriculum where they gain understanding in both creative expression and increase their ecological literacy. Place-based learning scenarios, such as The Island School, are particularly useful in fostering creativity and ecological literacy (Kellman, 1998; Knapp, 2006; Sobel, 1998).

Danylchuk *et al.*’s (2004) analysis of the pedagogical approaches to the education of The Island School provides a comparison point for this research. The paper focuses on two curricular activities of The Island School: a) Research class, a hands-on research course that partners with real research projects and b) Community Outreach class that involves Island School students in a teaching atmosphere within a local settlement (small village 7 kms from The Island School). Within these two classes as examples, they state that the place-based education of The Island School is built on four principles: *immersion*, *involvement*, *ownership* and *legacy* (Table 2).

Table 2. Definitions of the four principles of pedagogical design (adapted from Danylchuk, Bachand, & Maxey, 2004).

Principle	Definition
Immersion	Students have daily interactions with their surroundings

Involvement	Student's academic pursuits can be applied outside of the classroom
Ownership	Students take ownership and leadership over their projects
Legacy	Students provide results in their projects that last beyond their three month stay on Eleuthera Island.

Chapter 3: Methods and Data Collection

Research Design and Rationale

An ethnographic case study approach was used to describe the impact of environmental education on ecological literacy expression and understanding in 16 youth attending The Island School during the Spring 2007 semester. Over the course of the three-month semester, the 16 participants and their artworks were evaluated using an ethnographic and thematic analysis as described in (Braun & Clarke, 2006) and (Erikson, 1986). The acknowledgement of the prior relationship with my students is important as it has been shown to enhance the effectiveness of thematic analysis (Kerlin, 1998). All of the analysis was done using an ecological literacy assessment matrix (Figure 5) based on my literature review where I followed four coding streams (or quadrants) for both the students' artwork and interviews. These coding streams were based on Koltko-Rivera's concepts on worldview statements including *existential beliefs*, *evaluative beliefs*, *prescriptive beliefs*, and *proscriptive beliefs*. Using these streams, I then compared my observations and interviews against a predetermined set of themes of the pedagogical value of The Island School as discussed by (Danylchuk, Bachand, & Maxey, 2004). These themes were identified as *immersion*, *involvement*, *ownership*, and *legacy*. The interviews were set up as informal semi-structured discussions (Fereday & Muir-Cochrane, 2006; McClaren & Morton, 2003) allowing the questions to be directed more by the content of the answers to the previous question than by following a strict questioning script. My methodology is grounded in an ethnographic process that allows for a deeper understanding of relative change within small groups.

Ecological literacy matrix as an assessment tool

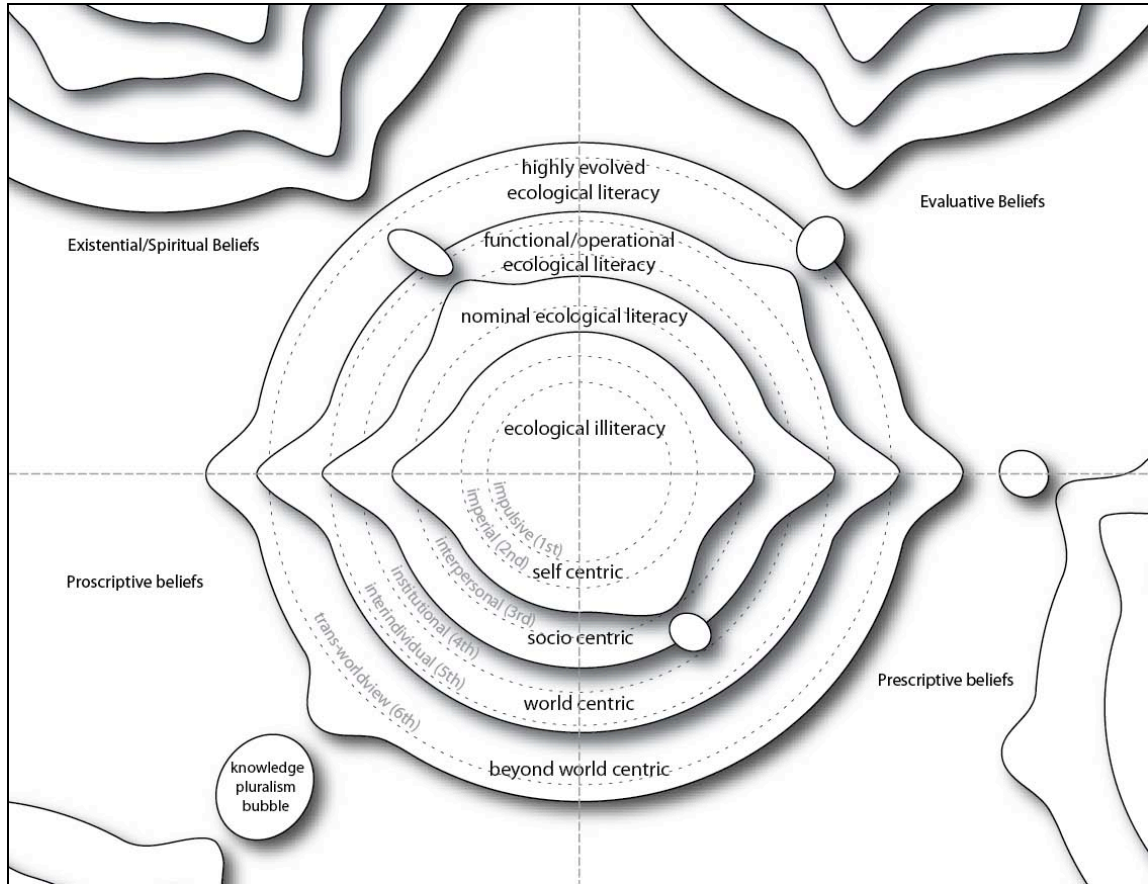


Figure 5. Ecological literacy matrix. This matrix is represented through layers of orders of consciousness, ecological literacy, and worldview beliefs. Super-imposed on this figure (extraneous bubbles) are other un-identified worldviews.

The four quadrants of a worldview statement or expression are shown as Koltko-Rivera describes:

Beliefs may be existential, evaluative, or prescriptive/proscriptive, of which values refer only to the last kind; a given world-view may include all of these kinds of beliefs, but not all beliefs are worldview beliefs. (p. 5)

I use these four quadrants to map the participants' worldview statements and artistic expressions in relation to their ecological literacy. By overlaying both Kegan's

orders of consciousness with Cutter-Mackenzie and Smith's ecological literacy matrix, I am able to cross-reference the students' personal and experiential statements with their ecological literacy level. For instance, a participant might discuss existence on this earth with a deeply spiritual connection and thus score in a "beyond world-centric" level in the existential quadrant. I would plot their point in the existential quadrant within the "beyond world-centric" layer. However, they might also describe the importance of "getting a tan" as part of The Island School experience, hinting at the prescriptive actions of the student as being egocentric. Essentially, I plotted a point in each quadrant based on their language or intention, not their artistic merit, and subsequently connect the dots to create a visual map of their ecological literacy level. In order to test my research questions, I monitored the changes in these maps of the participants' art pieces throughout the semester and compared them against the (Danylchuk, Bachand, & Maxey, 2004) themes.

This research consisted of three phases. In the first phase, participants completed a pre-semester art assignment called tree of 'ecological literacy', an adaptation of Thomashow's 'tree of environmentalism' that uses a tree image as a metaphor of personal ecological literacy growth (Thomashow, 1995) (Figure 6).

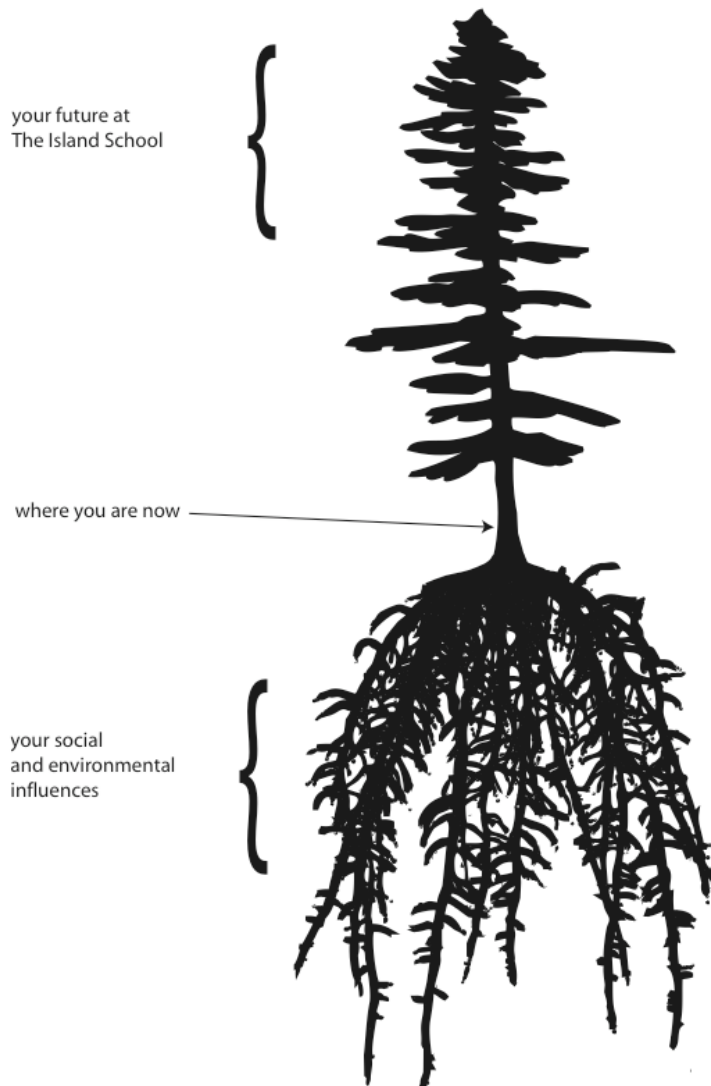


Figure 6. Tree of Ecological Literacy project diagram.

Roots represent social and environmental influences, the trunk is where the student is now, and the branches and leaves are the future of the student at The Island School in terms of ecological goals.

The tree was constructed as a personal identity project where the physical elements of the tree represented concepts of the past, present, and future elements of emotional and physical self with particular reverence towards ecological connectedness. The roots of the tree represented past personal foundations of the student's ecological

literacy. The trunk represented the participants' home and environmental issues that exist there. The branches represented future goals, what their hopes were in learning about the environment, and what they wanted to learn and experience in relation to ecological literacy at The Island School. The students presented their trees to each other within the first week of school. Essentially, the trees acted as a baseline for the phase two and three comparison as they were completed before arriving at The Island School.

Phase two and three of the research represented the bulk of the case study process, where student's artwork was analyzed using ethnographic observation methods. The 16 students' works were tracked through the four-unit Land and Environmental Art course, a course designed to reflect personal and group development. Each unit represented an exploration into a development stage of the student using Tuckman's (1965) stages of team development (Table 3). The units were integrated with the overall curricula of The Island School.

Table 3. Land and Environmental Art units and the student's developmental stages (Tuckman, 1965)

Land and Environmental Art Curriculum Unit	Developmental stage
ecoPortrait – Using digital photography, represent yourself through nature. This could be done as a traditional self-portrait, sculpture, or artistic photography piece.	Forming – Students present their work to each other and reveal the meaning behind their work. This project is directly related to their orientation week.
Symbiosis – In groups of two, create a sculpture that represents a symbiotic relationship between a) two real organisms b) two made-up organisms or c) figurative organisms (ex. Earth and clouds)	Storming – Students are expected to work through their small group issues, and present complicated works to each other whilst giving critical feedback. This project is directly related to their science class.
Modalities – celebrate the environment around you through a non-visual art piece. This could be a recorded creation story of a	Norming – Students can be in large groups and explore new media. This project is celebrated as part of a special media room

local species, a soundscape, or exploration into another non-visual sense.	in a gallery on campus. This project is partially related to their humanities class
Open Conceptual Art – Propose a giant installation project to me that addresses a local (Bahamian) environmental issue. Include a sketch, budget, and timeline with your work.	Performing – Students can utilize various disciplines within the curricula of The Island School as inspiration for their work.

This curriculum was developed to support the community nature of the school, understanding that much of the teaching opportunities occur within a team setting.

Although this research focuses on the individual’s experience, the collective experience has as much to do with their time at The Island School as the singular one.

A wide community-level lens was used to evaluate this second phase (Figure 7). With this lens, I studied the processes of self-evaluation and knowledge integration using ethnographic observation and interviewing methods. This observation focused on language-use, ecological depth in the artistic works, and exploration of personal and ecological understanding. Essentially, this process was designed to look for integration of scholastic and personal learning demonstrated within the creative exercises of the art projects.

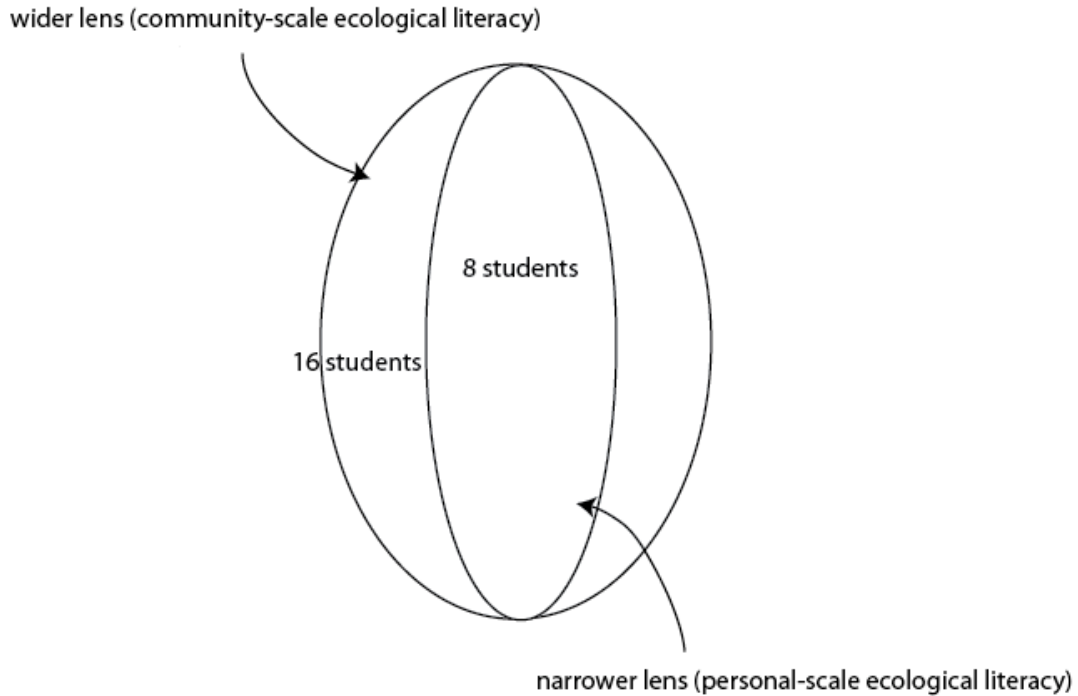


Figure 7. Lenses of methodological foci

The third phase of research triangulated the data that were collected within the first lens. This phase utilized a narrower lens that examined a subset of eight participants' personal growth in ecological literacy. In this phase I interviewed voluntary participants using a semi-structured (see Appendix A for interview instrument) and informal interview method that focused on the four quadrants described in Figure 5.

In addition to the ethnographic observation and interviewing of the students, I observed the use of their placebooks, a creative journal given to them at the beginning of the school year. These small, blank notebooks were presented as a safe, un-graded place to collect thoughts, create sketches and diagrams, explore their own creativity, and reflect. I observed their use and diversity of their entries haphazardly throughout the term when the students were willing to share what they had entered.

Data Analysis

The resulting data derived from all three phases were jointly used to construct the participants' views. They were transcribed and coded using a thematic analysis approach (Fereday & Muir-Cochrane, 2006) to analyze for themes and concepts related to ecological literacy. These themes were then compared against the pedagogical themes as defined by Danylchuk, Bachand, & Maxey (2004) in order measure the overall effects of The Island School as a transformative experience.

Using my personal subjective bias, I compared each student's progression through the term via his or her ecological literacy level map. These maps were used to assess each student project's ecological literacy level and compare their levels throughout the term. These maps were not based on artistic merit, but more to do with their ability to express their understanding of the environment around them creatively.

Despite the singular nature of this case study design, as opposed to a multiple case study comparison, this methodology holds the four principles of design quality (Yin, 2003): a) construct validity through the comparative phases, b) internal validity through triangulation of data collection, c) external validity through the sample size, literature review, and diversity of the student's backgrounds, and d) reliability through the length of process (3 months) and collaborative nature of The Island School curricula.

Chapter 4: Results

The results section is separated into four parts. The first section describes the analysis of the *trees of ecological literacy* that act as a baseline of the participant's levels of ecological literacy. The second section analyzes the art pieces of the 16 students over the three-month semester. The third section analyzes seven eight interviews and the elements that they found within The Island School curricula that helped them develop their level of ecological literacy. Finally, the fourth section highlights the value of the creative journal, or placebook.

Overall, I found that learners who started with an initial resolution to change within their tree of ecological literacy developed higher ecological literacy within all four quadrants of the ecological literacy matrix. I observed that fifteen out of sixteen students developed a greater ecological literacy due to the curricula and art course at The Island School.

The Baseline of Ecological Literacy Expression

The tree of ecological literacy represents a snapshot in time of a student's environmental life before they arrived at The Island School. The disparity among the participants' pre-existing knowledge is seen most conspicuously when evaluating this pre-semester assignment. On the ecological literacy matrix, the participants ranged from very self-centric for all four quadrants to some world-centric actions within the prescriptive beliefs quadrant. In the sampling of the 16 youth, six youths' trees were labeled ecologically illiterate where they only referenced ego-centric concepts, eight had nominal ecological illiteracy, and finally two had functional/operational ecological

literacy. All of the participants had a limited breadth when mapped on the matrix, meaning they were confined to the ego-centric and socio-centric layers.

The six participants who were assessed at the ecologically illiterate level presented trees that consisted of vague and confused links to the environment. These participants had higher incidences of biographical elements, showing their overall personal influences rather than the environmental factors that had influenced them. For instance, one student, hereon Student A, used magazine clippings to create her tree of ecological literacy including advertisements from Tiffany and CoTM. In some cases, these students were able to identify socio-centric influences including friends and family. The few references to environmental systems were limited to personal views and proscriptive values such as “dirty streets” or “want to learn more of the world” (Figure 8). Thus she was assessed at an ecologically illiterate towards nominal ecological literacy because of focus on social life and consumerism being her interaction with the environment.



Figure 8. Student A's Tree of Ecological Literacy (distinguishable photos removed)

The participants with nominal ecological literacy trees referenced complex systems with a socio-centric view. These trees showed a minor level of understanding of environmental influences but lacked thoughtful systems integration. Many nominal

ecologically literate trees focused on the effects of local issues on the students or on their immediate families. This group was committed to the remediation of environmental issues within an anthropocentric matrix such as fixing or “building a world we can all live in”. These students tended to focus on prescriptive actions and personal learning goals. Student B created a nominal ecological literate tree that appealed to functional/operational ecological literacy in the evaluative belief quadrant, but lacked in the exploration of existential beliefs. His interest in sustainability is clearly laid out in the goals (branches) section of the tree, however he does not expand on this directly (Figure 9). His roots to do with this same theme focus on social environmental practice and thus this tree was identified as being nominally ecologically illiterate.

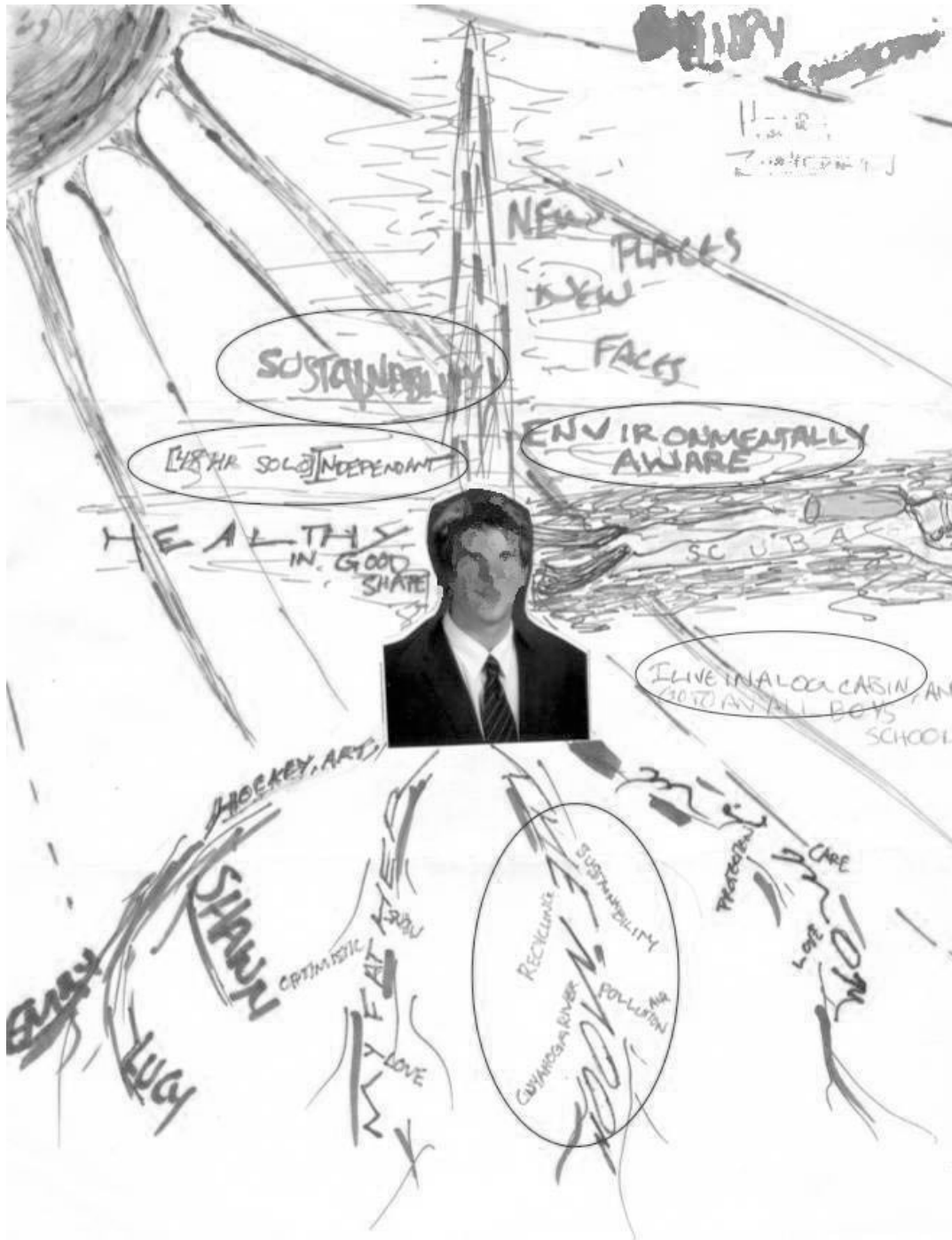


Figure 9. Student B's tree of ecological literacy.

Finally, two of the participant's trees were categorized as functional/operational ecological literate as they had a sophisticated expression of ecological understanding.

These trees utilized concept mapping and themed association with ecological systems.

The two participants both stated a commitment to environmental education, sustainability, life-long learning, and a greater sense of relation to the environment around them. They focused on both existential and evaluative belief statements that were beyond world-centric statements such as the balance between fisheries, climate change, personal growth, and human development. For instance, a particularly insightful student, hereon Student C, created a tree that scored highly in all four quadrants because of his use of the balance among his understanding of his home community in the USA, over-fishing and climate change (Figure 10). He references other species as being influential to his development and has a high sense of personal identity in the fishing culture of his hometown in the Eastern Seaboard. Student C stated that his main goal of coming to The Island School was to “broaden my outlook of the world”, essentially referencing his interest in personal development towards a more world-centric way of knowing.

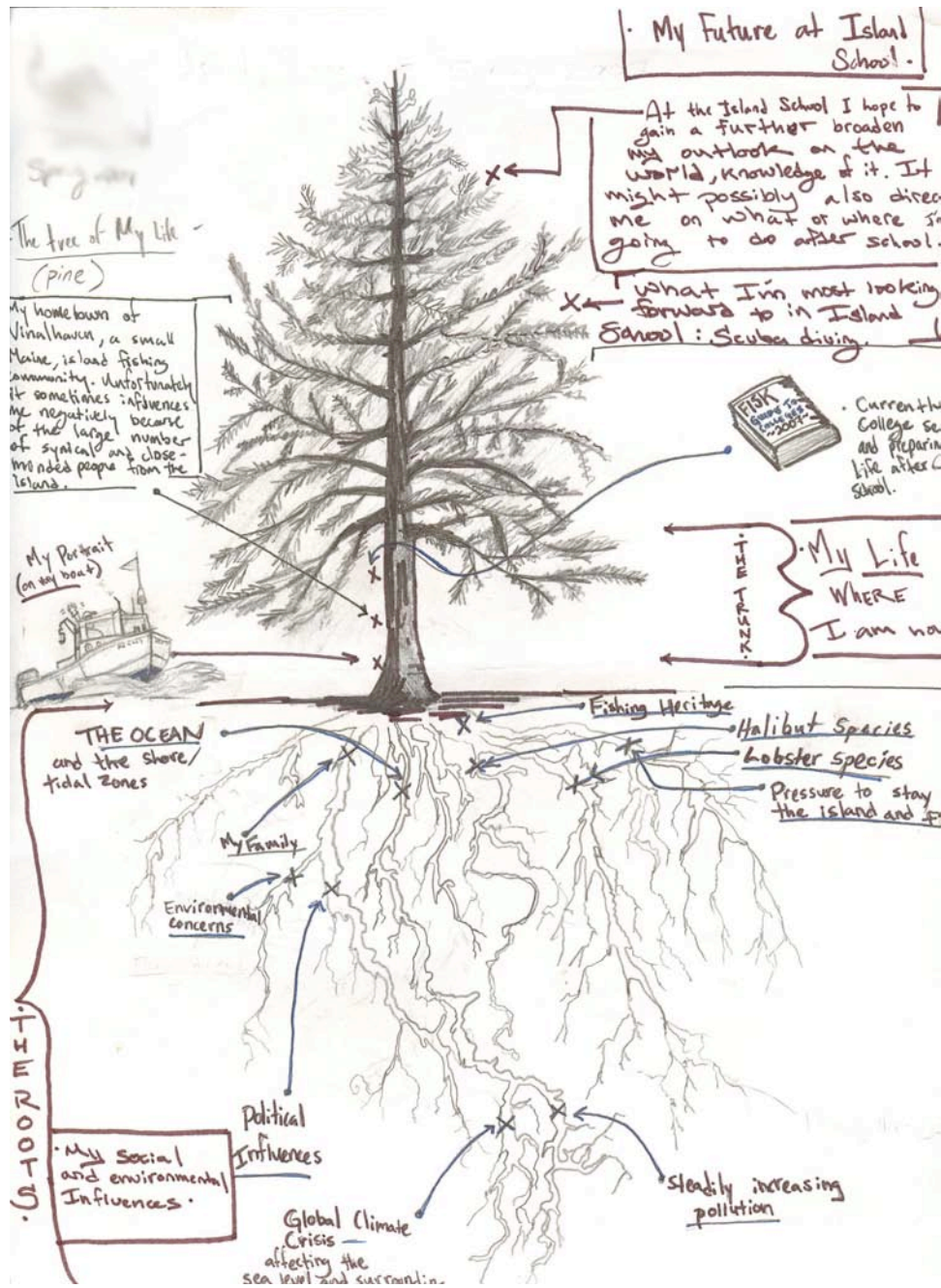


Figure 10. Student C's Tree of Ecological Literacy.

Generally, the trees that linked social, personal, and ecological processes as being influences and interests were identified as functional/operationally literate.

For the four major units within the Land and Environmental Art course, the units that specifically related to other classes had the highest incidence of higher ecological literacy. The *ecoPortrait* project was limited to personal reflection within nature. Many students focused on existential beliefs within this project. Despite this limitation, students expanded their thoughts and actions to include larger topics, rather than focusing on themselves and the social networks around them. Six students' works could be labeled as functional/operational ecologically literate, six as nominal ecologically literate, and four as ecologically illiterate within their project. The students that were assessed at the functional/operational ecological literacy level included references to the complexity of biodiversity around them and their relation to ecological processes. Student K stated her connection to the geomorphological processes occurring around her as she submitted her photograph (Appendix F2) of a sea grape leaf with a hand-print cut out:

This photograph is the representation of myself in nature; illustrating the influential connection between the land and the sea... As a whole, my image shows the relationship between the ocean, an aspect of my new culture at The Island School that shapes my life, and the land, one that is constantly changing, which is why it is floating away. This photograph signifies myself changing and growing in this new environment.

Student P's *ecoPortrait* exhibited a much more limited ecological literacy level and was found to be ecologically illiterate. Her project consisted of a photo of a shadow of herself on the beach (Figure 11). Her connection with nature was only stated as "the beach, my ultimate getaway, and my favorite place here at Island School".



Figure 11. Student P's ecoPortrait exhibiting an eco-illiterate project.

Many of the participants found the ecoPortrait project to be challenging. The nature of the project encouraged them to think self-centric but with reverence to world-centric thoughts. Students stated to me in the interviews, reviewed in the next subsection, that they had never considered how they relate to the environment and found it particularly challenging to express what they were beginning to feel at The Island School. Many students expressed a “sense of wonder” in collaboration with this stage of the Land

and Environmental Art course. The sense of wonder referenced the concepts of an exceptional community and sense of ecology. Student F noticed her first sense of wonder when she was alone working on her ecoPortrait in nature.

It conveys how majestic and awesome nature really is, and how insignificant we are in comparison...[and] further emphasizes the idea of a beginning and of new things to come.

The interviews below explore this feeling of awe and intrigue that students developed over the course of the art course.

The second major unit of the Land and Environmental Art course challenged students in a different way. I found that the creativity and the team atmosphere in this assignment re-affirmed and solidified the students' understanding of the real biological process of symbiosis. Student E created a thought-provoking sculpture by suspending sea grape leaves using fishing line across a bay (Figure 12).



Figure 12. Student F's abstract celebration of mutualism between plants and air.

Student F's approach to this project explored both the socio and enviro realms of the project, whilst stating prescriptive and proscriptive goals that existed within a world-centric layer.

The symbiosis between plants and air is one of the most important naturally occurring relationships in the world. The plants remove carbon dioxide from the air and release oxygen, giving life to all organisms. Meanwhile, the air allows the plants to undergo respiration and reproduction; giving plants their essential carbon while also dispersing their seeds. This relationship is clearly beneficial for both, thus a clear example of mutualism.... It was as if we, the human population, were the wind. This collapse, this destruction, was a warning that our current

lifestyles are simply not sustainable based on the resources we currently have.

Therefore our picture should be viewed as a celebration of the magnificent resource that we should treasure so much, our world. Rather than show the negative impact we currently have on the world, our picture can hopefully serve to inspire people to embrace the nature we are often unaware and uncaring of.

Many students improvised new and bizarre creatures to symbolize the processes that they had recently learned in science class. Students B and O co-created a seven-foot diameter dream-catcher, similar to many indigenous peoples' sacred dream-catchers. This project, called cloud catchers (Figure 13) consisted of three catchers that cleansed the air of pollutants and were installed 20-feet off of the ground in the forest around The Island School:

This sculpture is an example of parasitism. It represents how humans are a parasite to the environment and the world we live in because we pollute and destroy the places we should love without haste or regret. This sculpture is a way to represent this violation we commit against our earth by creating an artistically symbolic solution to the issue....They emerge from the brush, reaching for the clouds as a symbol of an organic purity that shines across the natural world.



Figure 13. Students B and O with *Cloud-catcher* installed in a Gallery.

Many of the students chose to portray the interaction of humans on nature by extrapolating the negative effects of human species on the living organism of “mother earth”. Again, students artists’ statements continuously referenced a sense of wonder and the beauty of the complexity within the environment around them. Students D and J describe the balance of learning and celebrating complexity within their highly-evolved ecologically literate artwork, where a fish is interacting with a terrestrial flower:

The seemingly simple adaptations that insects and plants have, become to the eye of the observer much more complex and strange when placed on fish and underwater botanicals. If one considers the relationship that the organisms around the Island School have with the foreign presence of the school, it becomes clear that this is the approach taken by animals when interacting with foreign objects. A safe enough distance to inspect and be

curious at the same time. That is the kind of relationship that the Island School wants to have with the organisms it interacts with on a daily basis.

We want a presence that is obvious, but beautiful and harmless.

Students directly quoted their science, humanities, and math classes within this project. Referencing other classes and their own experience and spiritual connections helped the students score higher levels in the ecological literacy matrix. Five students' works were labeled as highly evolved ecologically literate, five as functional/operational ecologically literate, five as nominal ecologically literate, and one as ecologically illiterate. At this early stage, one month into the curriculum, the students had already established the continuing trend towards an effective expression of the ecological knowledge.

The third unit, *Modalities*, yielded a high diversity of art media. The students explored abstract expression of their knowledge of the ecological systems around them as well as different forms of non-visual art including touch-art, smell-art, sound-art, and video-art. For instance, many of the students created sound mosaics that explored the sounds of The Island School. Also, a few students created "creation stories" similar to Rudyard Kipling's *Just So Stories* that explained the origins behind a local species or geological formation. Six students' works were labeled as highly evolved ecologically literate, five were functional/operational ecologically literate, four were nominal ecologically literate, and one was labeled ecologically illiterate.

By the end of the term, many of the students jokingly referred to their projects as being "ultra-place-based" in reference to the constant reminder of the pedagogy of The Island School by the staff. The modalities project is a good representative of the

immersive quality of The Island School, pushing students to think beyond visual art. For instance, student J decided to explore the role of technology on our senses and were assessed at highly-evolved ecologically literate (Figure 14).



Figure 14. Student J's Modalities Film - *There is more than one way to see the ocean*

There is more than one way to see the ocean is a short movie on a sensory experiment that limited the sense of sight. In the first part of the movie, he shows a shorts-clad, blindfolded student within a closed room. The student was seen standing in a container with sand and ocean water up to his ankles. He has set up an electrical fan to blow seaweed onto the person. Finally, he recorded the sound of the ocean and listened to it on headphones. The second part of the movie showed another person, standing on

the beach in full clothing and shoes listening to rap music with a blindfold on. On discussion of his project, he stated that he “wanted to show the various ways that we experience nature, and that technology will never be able to replace our true, first-hand senses”.

Finally, the students’ open conceptual projects asked them to specifically tackle an environmental issue. Each student chose to use a problem that had been presented to them within their environmental studies seminar or science classes, pointing out the importance of cross-disciplinary inspiration for an art course. Six students presented highly evolved ecologically literate projects. These projects consisted of deeply important issues to the environmental movement and referenced both cultural and biological vulnerabilities such as overfishing, lack of environmental education, physical and mental health, and waste management. These students chose to explore how humans, nature, and creativity interact and proposed thoughtful pieces that spoke to both the local Eleuthera Island environment as well as global initiatives. Student N, who had up to this point been oscillating between nominal and functional/operational ecological literacy with his projects, presented a highly-evolved project. He submitted a video screenplay that explored environmental education through film, highlighting the need to inspire people about the environments around them. It also focused on a personal message:

The purpose of this piece is to let people get past the overwhelming environmental problems we have caused and appreciate what we've still got. The idea of this project is to create a movie that presents a solution to the overwhelming problems we are facing.... In my case, when I look at our problems I can't help but feel like giving up. It is hard grasp what has

to be done. What keeps me going is my love for nature. Maybe that isn't what drives other people to work for a cause, but love is what drives me. Though I'm not a carbon neutral person and I do have negative effects on environment I have the desire to help..... The purpose of the movie is to start this desire to help and to inspire people through showing them the beauty of nature.

This particular student embodied the need for inspiration as he created extra-curricular films and art projects on the local flora and fauna on Eleuthera that he showed to his fellow students.

Six functional/operational ecologically literate, two nominal ecologically literate, and two ecologically literate projects were also submitted. The nominal and ecologically illiterate students were focused on similarly large concepts, however, did not explore the connection or significance to nature in the same depth. At this point, each of the students had increased their ecological literacy level for at least one of the projects.

Over the course of the semester, the sixteen students increased their ecological literacy (Figure 15). Some students tended to excel at their expression better than others such as students B, C, D, F, J, K, L, and N (Table 4). For instance, all the students that began with functional/operational ecological literacy levels were assessed, at the end of the semester, with highly-evolved ecological literacy. The major difference between these two classifications being the ability to synthesize multiple ways of knowing, appreciating, and disciplines into their expression, such as some of the examples above.

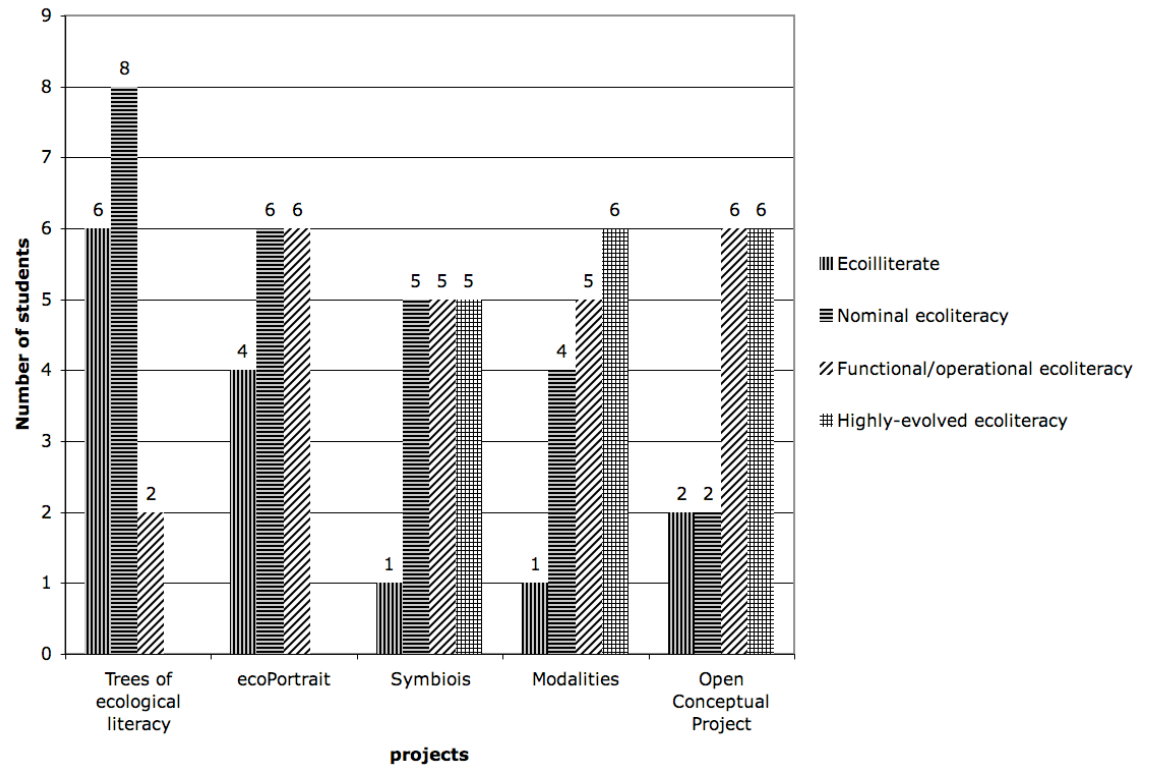


Figure 15. Ecological literacy levels of the participants' artworks over the course of the term including the pre-semester assignment, tree of ecological literacy.

This figure shows a steady increase in ecologically literate students throughout the course of the semester at The Island School.

Table 4. Individual students and their ecological literacy assessments for each project over the course of the term.

Student	Trees of ecological literacy	ecoPortrait	Symbiosis	Modalities	Open Conceptual Project
A	Eco-Illiterate	Nominal	Nominal	Nominal	Highly Evolved
B	Nominal	Nominal	Functional/Operational	Functional/Operational	Highly Evolved
C	Functional/Operational	Functional/Operational	Functional/Operational	Highly Evolved	Highly Evolved
D	Nominal	Functional/Operational	Highly Evolved	Highly Evolved	Functional/Operational
E	Eco-Illiterate	Eco-Illiterate	Highly Evolved	Nominal	Functional/Operational
F	Functional/Operational	Functional/Operational	Highly Evolved	Functional/Operational	Highly Evolved
G	Eco-Illiterate	Eco-Illiterate	Nominal	Nominal	Functional/Operational
H	Nominal	Functional/Operational	Nominal	Eco-Illiterate	Eco-Illiterate
I	Nominal	Functional/Operational	Functional/Operational	Nominal	Functional/Operational
J	Eco-Illiterate	Nominal	Highly Evolved	Highly Evolved	Functional/Operational
K	Nominal	Functional/Operational	Functional/Operational	Highly Evolved	Functional/Operational
L	Nominal	Nominal	Highly Evolved	Highly Evolved	Highly Evolved
M	Eco-Illiterate	Nominal	Nominal	Nominal	Nominal
N	Nominal	Functional/Operational	Nominal	Functional/Operational	Highly Evolved
O	Eco-Illiterate	Eco-Illiterate	Functional/Operational	Highly Evolved	Nominal
P	Nominal	Eco-Illiterate	Eco-Illiterate	Functional/Operational	Eco-Illiterate

Interviews

Eight participants were interviewed at the end of the Spring 2007 semester, providing further insight into shifts in ecological literacy. The transcribed interviews were coded using the ecological literacy matrix and a thematic analysis. The participant's language and answers fell easily into the four quadrants and levels of ecological literacy, which provided a complete map of their beliefs and values associated with their experiences at The Island School (Figure 16).

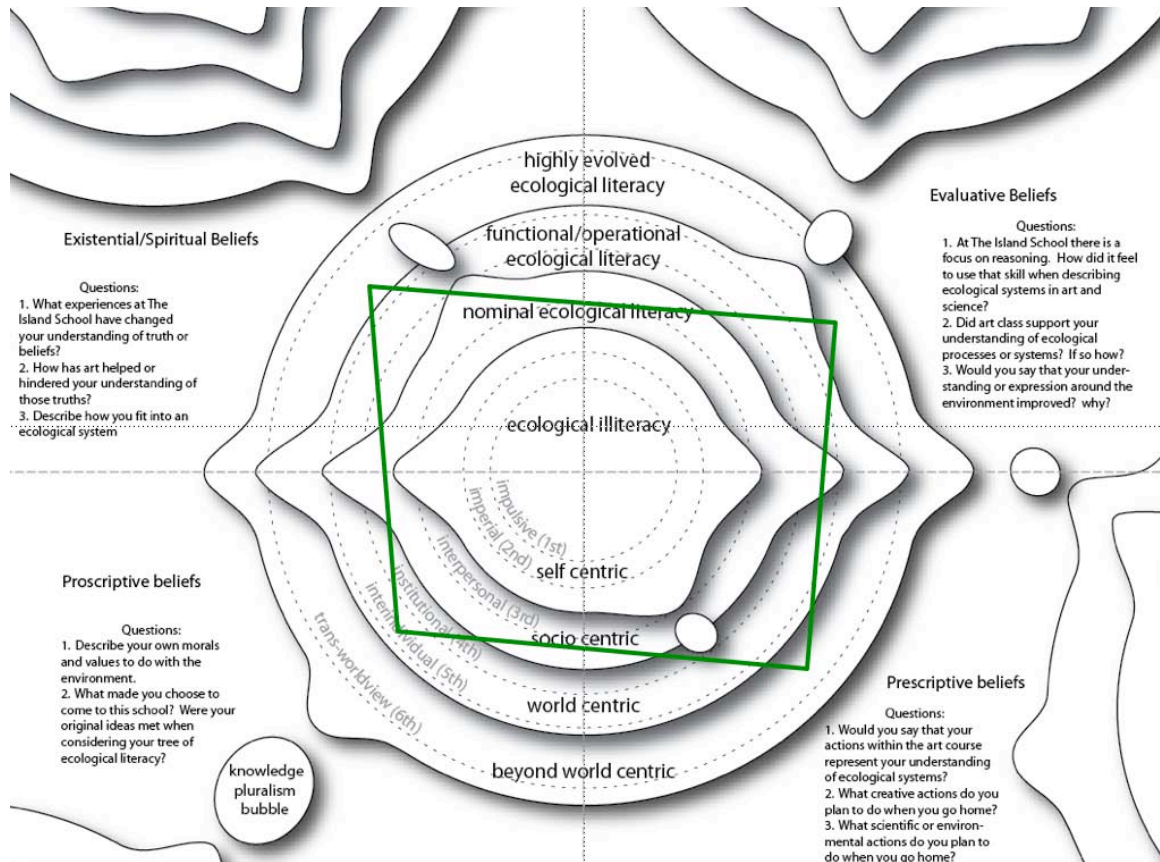


Figure 16. An example of a highly-evolved ecological literacy map. Notice that a student only needs to be considered highly evolved in two quadrants to be an overall highly-evolved individual.

Out of the eight students interviewed, six were assessed as highly developed ecological literate individuals. The two remaining were considered to have nominal ecological literacy and functional/operational ecological literacy. For the six individuals assessed as highly-evolved ecological literacy, these conversations revolved around development, growth, and personal experience. Each of these participants was impressed at the amount that they had personally grown when presented with their original tree of ecological literacy. Student B describes this growth through the art class:

This art course has changed me in a way. I noticed how I start thinking about what I am drawing and before I would just start drawing shapes. I am making the same shapes but I am changing them into things. In the art course I have been able to demonstrate what I know and what I learned in science class in the symbiosis project. Like in Seminar, and the cloud catcher and how pollutants are a parasite of the environment. The modalities project was more of a poem. It was just regarding this man as a fisherman and what that must be like. Open Conceptual allowed me to demonstrate what I had learned in seminar in other places, like what I had picked up talking to David and people here about the environment, especially in the Bahamas.

The participants realized that their original goals for coming to The Island School had been more than exceeded, as Student N says:

I learned so much more than I thought I ever would. I never thought I would learn so much about myself. I mean I was a looking forward to looking at the science classes. I have never really had a good science teacher. I have always been more enthusiastic about the science classes than my science teachers. The science class here is good, but you just learn things in ways that I would never thought I would.

They also considered themselves to have a higher ability to express their understanding of the ecology around them. This understanding of personal growth was made apparent in direct questioning and also when the participants were asked what they would change if they were to re-create their tree of ecological literacy. When considering

their personal growth, all of the students said they would change the trunks of their trees (who they are) to represent their connection with the environment. Student F reacts to seeing her original tree and asked what she would do if she were to recreate her tree now that the term is finished:

Wow I think that this is pretty amazing. Everything was met [in the branches/goals].

Well, the trunk would be the Island school. These roots would be much more to do with the environment. Many of the things here have little to do with the environment I come from. I mean I guess I feel a connection with the environment in coastal Maine but probably even stronger here.

So there would be a lot more roots having to do with that. Desire to conserve the marine environment in particular.

I found that students appealed to the quadrants of the ecological literacy matrix through the interviews. Table 5 shows the diversity of language that talks to the experiences of the students.

Table 5. Examples of ecological literacy statements from eight interviews with students concerning their experience at The Island School.

Quadrants of worldview statements: Existential		
Ecological Literacy axial (direct quotes)	Eco-illiterate	N/A
	Nominal Ecological Literacy	I think that it [art] has and helped me express myself. You really have to go out there and be apart of what is going on.
	Functional/Operational ecological literacy	But I fit into the ecological system just like everyone by consuming and producing waste. I don't see myself as anything more than just a being on this planet. I guess because I am trying to figure out what I can be.

	Highly-evolved ecological literacy	Another thing is that I have adopted this view of my life as a journey, which I had never seen before. I guess I had seen it before as just a time period.... [Art] let me explore what my views were on the environment and how I expressed...I guess I have found it has helped me to open up another part of my brain about what I am thinking about what I am doing in art....Environmental art is sculptural, but it so much more because you are thinking so much more deeply in terms of how you are affecting the environment and the meaning of your projects.
Quadrants of worldview statements: Evaluative		
	Eco-Illiterate	N/A
	Nominal Ecological Literacy	When we had the discussion about Marine Protected Areas[MPAs]. I was pro-MPAs, and the anti MPAs [students] were like – how would we establish [them]? why would we want it?...[In reality] I am pro-MPA. They are really helpful in the long-run. It was really helpful to actually argue something you believe in rather than you don't believe.
	Functional/Operational ecological literacy	Reasoning helped me understand adaptations in organisms in a lot of our field studies we had to identify different adaptations that some of the animals had and I would look at the jellyfish in the cut and I would realize that everything that makes them up is because of their environment and the reason that that is all there is because of how the environment affected them.
	Highly-evolved ecological literacy	I had never really thought about how I relate to nature. I felt like when I was searching for it and getting it in a presentable form, made me realize a lot more about myself. I would say that it helped me realize, how I related to that environment and how that environment related to me.
Quadrants of worldview statements: Proscriptive		
	Eco-Illiterate	N/A
	Nominal Ecological Literacy	I think I am very environmentally safe. I will suggest environmentally safe stuff when my mom is shopping. I suggested we should recycle back at home to the owner of my building and he put some bins in.

	Functional/Operational ecological literacy	I don't think that I was all that environmentally conscious back home. I was aware but I didn't really know what I could do myself....I think that I want to try to make a change in my style and help others too.
	Highly-evolved ecological literacy	I believe in supporting conservation efforts more through research and volunteerism. Just making people aware of what is going on, because I think that is the number one thing that needs to be done...That ties in pretty significantly with the issues that I care deeply about. It is that we need to understand one another better to live more sustainably. Understanding and having a closer connection to the world and people around us would obviously make us not want to just destroy other people by taking resources or even terrorism.
Quadrants of worldview statements: Prescriptive		
	Eco-Illiterate	N/A
	Nominal Ecological Literacy	I had a lot of fun playing with nature and stuff here. But I can't say that I strongly feel about or strongly have opinions on environmental issues.
	Functional/Operational ecological literacy	[When I go home] I am going to start by going into my local hills that I use to just hike in but now I will see things in a different way. Now I will be more inspired to make something while I am there...to spend time.
	Highly-evolved ecological literacy	I struggled a bit with art [at The Island School], because I never have been used to relating my art to larger issues. I had never seen art as having an impact on ecological systems and bring awareness to them in general. In fact, it can be one of the most powerful forms of bringing attention to problems or raising awareness to ecological problems. I think the fact that we did have limited resources and limited time, I think that helped stimulate other creative parts my brain that I wouldn't have necessarily used if I didn't have access to things that I wanted to use.

The two participants that were labeled lower than the other students in ecological literacy were the same students that were typically lower in other assigned projects. However, all of the participants found the entire Cape Eleuthera Island experience a complete and transformative package. Words like “place-based”, “experiential”, and “real world” were used extensively in the conversations about educational styles. As well, there was an awe-inspired quality to the student’s responses when discussing the community experience at the school. Student F was moved to a semi-religious belief around the complexity of the environment around her.

There must be someone up there that must be providing us with these incredible blessings. But also seeing the natural environment around here has been absolutely awesome. It just awes you and I think that again that means that there is some greater being that is up there creating all the biodiversity around here. I mean we were diving today and we were going along the wall looking at one little outcropping on a rock which was covered in different zillions of heads of algae and zillions of little fish and you look off to the side and it just drops off completely it is just blue. And it is just fascinating to me that there are these tiny little ecosystems and there is just so much more. It is the first time I had been thinking about this and there must have been something that created all that. It gives me more appreciation; just like thankfulness that I am here to be able to see it.

The participants were proficient in expressing their feelings of personal growth and development. Student B remarked on his newfound interest in ecology as directly relating to art:

Art has made me think about all the interconnectedness of all things. Like today I was out on the loop [an abandoned road], I was just thinking about this lizard. I was wondering what it was eating, and I don't know why. I don't know much about lizards. But I am curious about how everything works and how the rest of the environment supports something.

The experience at The Island School was transformative for these students. Through their experiences both in and out of classrooms, they were able to gain tools and language to express their own ecological literacy. For the students, the immersive quality, mixed with the overlapping curriculum provided for an extremely powerful experience. These experiences were linked to their understanding of systems, as student F commented:

In science class I found it incredibly challenging to be presented with facts and we had to figure out how something completely different worked. Something that you had never heard of before. But once you figure it out, it is amazing, it is like figuring out this incredibly tough puzzle and it is so cool to be aware of that skill. It gives you a better understanding of how everything works together and things are connected; how one thing allows you to infer something else about the next thing. Because it is all connected.

This particular student was highly motivated to use her new knowledge. She commented to me that “at the beginning of term, we talked everything, what home was like and things we like buying, and what we missed. But throughout the rest of the term, I noticed that we would start talking casually about the environment around us.” The

place had started to filter into their casual conversations, expressions, and motivation to act. These students began to seek out ecological experiences as an activity in their free time.

Reflection and Placebooks

In addition to the experiential and place-based results from the art projects and activities, the participants were also observed to use their placebooks, their creative journal, throughout the semester. They used a multitude of media and were diverse in their inspiration to use the book, from classes to personal reflections. Many participants stated that their placebook was the “most important product they created at The Island School”. To them it represented a safe and secure place to observe their personal changes as well as synthesize observations of the systems and beauty in the ecology around them. Reflection is stressed at The Island School as an incredibly important part of their journey. The participants in this study were no exception to the depth and quality in which they utilized their placebooks. These journals represented an avenue for the students to explore their multiple intelligences where both comforting activities as well as creative risks were taken.

Students that were initially assessed at ecologically illiterate (students A, E, G, J, M, O) were limited in their diversity of entries in their placebooks in the early part of the term. They would use simple lists, single writing utensils, and basic quickly-drawn diagrams. Student E exhibits a simple early drawing (Figure 17).



Figure 17. Student E's placebok sketch for their ecoPortrait Assignment.

Student E's project resulting from this sketch ended up being assessed at an ecologically illiterate scale due to its lack of reference to the connection to nature and self-centric language. Student's with higher initial levels of ecological literacy spent more time creating diverse placebok entries and thus had resulting more ecologically literate projects as a result. Student K created a series of placebok entries for her ecoPortrait where she experimented with her project and its meaning. She was assessed at a functional/operational ecological literacy level for her final product (Figure 18).

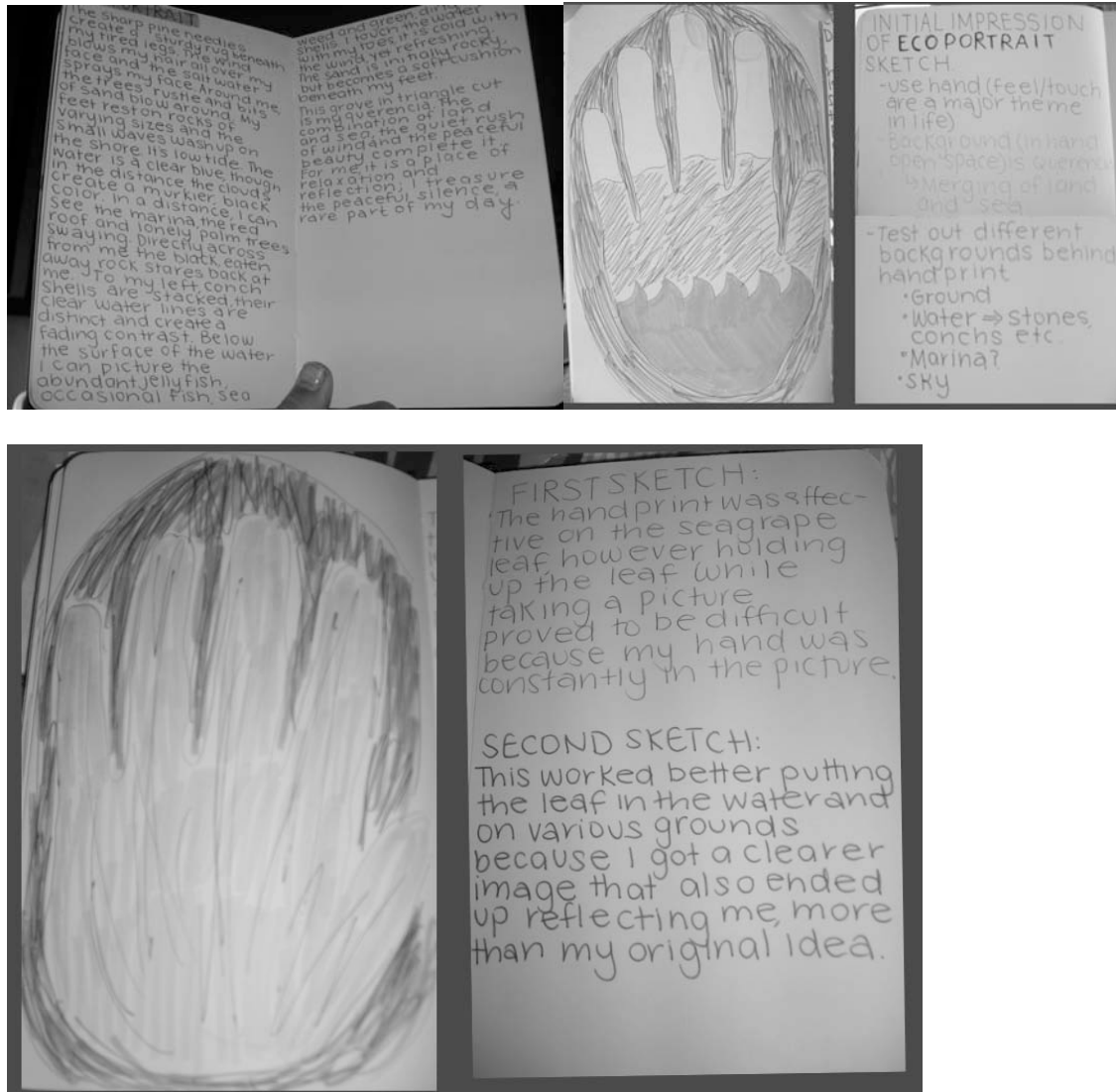


Figure 18. Student K's placebok entries for her ecoPortrait assignment.

By the end of the semester, the operational/functional and highly-evolved ecological literacy participants had diverse and rich placebok entries that utilized different media including watercolour, glued-in pieces of nature, and diagrams. Some students would paste in local species of plant, wood, or even sand, to represent their interest in their surroundings. Over the course of their time at The Island School, most of the participants increased the diversity and quality of entries within the placebok. They were self-motivated to diversify their entries adding their own interpretations to reflection

and environment. Due to the nature of the placebooks as sacred places, I only received pictures of their entries when I specifically asked for them as part of an art project.

Therefore, I have limited photographic data evidence to present in this section.

A final project for the students at The Island School is to create a portfolio of their work, which acts as a presentation tool back to their colleagues and teachers. Many of the students used direct quotes and pictures from their placebooks to reflect and discuss their personal learning.

As the student's ecological literacy level increased over the term, so did the diversity and complexity of their placebook entries. Student L created a foldable sculpture that fit into her placebook for her portfolio assignment where she outlined her plethora of work from the Island School in physical metaphors to the environment. The piece represented a turtle, where various elements of her work were represented through the anatomical pieces of the turtle. The eyes represented work that she wants to continue pursuing in the future. The work carried on its back represented the work she wants to hold on to as a representation of her time at the Island School. The work on the feet of the turtle represented the projects that motivated her to think deeply.

I observed that the placebooks were used for sketching and reflecting for personal reasons and was brought with them in their free-time, an unstructured time for exploration at 4:15 pm everyday. Students used the books as a place to escape and to explore their own Island School experiences. They were also very respectful to each other's placebooks. They would return them to the owner when found without "snooping" through them.

Chapter 5: Discussion and Conclusions

As a method of measurement, ecological literacy differs from other forms of literacy in that it includes morals and ethics as constructive elements. Cutter-Mackenzie and Smith have come closest to qualifying the various levels of ecological literacy with their definitions (found in Appendix A). However, this research tests these definitions within an educational setting using participants' experiences and artwork as media for expression. Using the original research questions, I explore the power of The Island School as an environmental education institution.

How does place-based environmental education affect a youth's expression and level of ecological literacy?

Place-based learning atmospheres such as The Island School are greatly enhanced by the diversity within the student population. The pre-existing understandings, or schema, of students provides for a dynamic peer-learning environment as well as a range of opinions and experiences. The participants' schema affects their expression of ecological literacy, which is either an undeveloped or non-existent component of their worldview (Morgan, 2006).

The Island School provided an environment where students were eager to express their knowledge and when given the room to create, they presented a diversity of thoughtful art. Some students found this easier than others by referencing deep subjects using systems thinking in addition to creating visually captivating pieces. Other students found the freedom to create as a somewhat overwhelming concept and were unable to pick a topic or make connections among ecology and art at first. Over the course of the term, this overwhelming feeling waned and the participants began seizing the

opportunities to create and reflect as powerful elements of their Cape Eleuthera Island School experience. As students became used to The Island School workload, they were able to create increasingly rich artwork. Student J provides insight into this development. His work developed from an ecologically illiterate tree through the remaining levels of ecological literacy and could be described as a student with highly-evolved ecological literacy when he left The Island School:

During the last three months I have developed many more roots with the experience and knowledge I have gained at the island school. I see the experiences I have had here at the school as events that will aid me, and help me in being more successful during my life.

The participants were given philosophical freedom within the art course, which gave them opportunities to look deeply within themselves and connect to nature around them. They were encouraged to reference the other disciplines taught at The Island School with every piece of work, not only utilizing other learning but also their own experiences. I believe that this newfound freedom was overwhelming for some at first, but became a source of pride throughout the semester. Many of the students developed strong communications skills especially seen in their open conceptual project. This project yielded the highest number of highly-evolved ecological literacy levels and a substantial number of functional/operational ecological literacy levels.

The interviews within the smaller lens of this study revealed the substantial development the students experienced as a result of their experience at The Island School. The evolution of their experience and thoughtfulness around their connection with the environment was a conspicuous reaction to questions about their own development. The

Island School encouraged the students to enroll in their own life and interest in understanding their existence and evaluative abilities. The student's abilities to reflect, analyze and connect with nature were increased substantially by their environmental education experiences.

How does The Island School support the development of ecological understanding and expression?

Using thematic analysis, I utilized four areas of ecological worldview statements, built as quadrants into the ecological literacy matrix: existential, evaluative, proscriptive, and prescriptive. Overall results reveal that within these themes various activities at The Island School triggered different worldview reactions. From these reactions, I was able to identify three pedagogical characteristics from the students' language that were elemental to the framework of The Island School's success: immersion, integration, and reflection.

Immersion

The students' sense of place was enhanced due to the isolation from distracting media, such as television and video games. Many participants stated that they were in awe of how entertained they could be by just being outside. This sense of wonder and awe played into their creativity and understanding of the processes occurring in the environment around them. Student L came to The Island School with a nominal ecological literacy level and developed a highly-evolved ecological literacy level. She stated this sense of awe as being derived specifically from "simply being here and isolated from everything else".

The students began to look at the environment in new active and inquisitive ways. My results show that this awe-inspiration of nature derives from the sheer act of being in and interacting with nature. Some students found the immersive atmosphere “intense” while others found it “exhilarating”. Student F describes the curricula as being pervasive. “We would get out of science class, get back in the vans to head back to campus and just keep talking about ecology; like how things interact”

The student’s sense of wonder embedded within locally relevant and rich instruction acts as a type of *immersion* and they believe it to be the primary reason The Island School is so successful in developing global citizens. Immersion is an elemental component to place-based learning atmospheres, where the curricula derives from the surrounding culture and biology. The Island School is particularly successful in its development of ecologically literate global citizens because of its isolation in a wilderness setting and the students are constantly embedded in the environment.

Danylchuck *et al.* (2004) discuss The Island School as being successful because of the following pedagogical constructs: immersion, involvement, ownership, and legacy. Indeed, these four principles play an integral role in the students’ experiences at The Island School. My results reinforce immersion as the key element in changing the level of expression and understanding of ecological literacy. From my observations, the participants increased in creativity as well as environmental awareness within the first four weeks of school life. Within the first four weeks of school, the participants were exposed to a series of sustainable living principles, ecology lessons, community outreach, and experiential learning opportunities including kayaking and SCUBA diving. Essentially, they were thrown in the figurative “deep end” of Bahamian life. Because of

this immersion, they began to use complex language and systems thinking in relevant and appropriate ways in their projects. In particular, they started to link their new knowledge of Bahamian ecology among their math, science, humanities, and research disciplines within the *Symbiosis*, *Modalities*, and the *Open Conceptual Assignment*.

Ecological literacy that is taught in all facets of curricula is a type of immersion, similar to schools that boast language immersion programmes in North America. Over the course of the entire three-month period, the majority of the participants in this study became excellent communicators in the language of ecology. As the results show, all of the participants experienced an increase in their ecological literacy (Figure 15, Table 4).

The Land and Environmental Art course allows the students to graduate from a ‘place of knowing’ to a ‘place of doing’ through artistic expression and reflection. The differences I saw among the participants’ trees of ecological literacy and their remaining projects were astounding. Through photography and journaling, the majority of my participants graduated from ecologically illiterate to an operational/functional and highly-evolved level of ecological literacy.

Further to the immersive qualities of The Island School, the place-based curricula encouraged students to engage fully in their studies. Engagement at The Island School resulted in a cross pollination of creative expression among the variety of disciplines. The participants were given the ability to engage in their surroundings through their academic curricula as well as their community dynamics, communications, and interpersonal relations. This engagement was also where learners begin to teach others, as The Island School provided formal and informal opportunities for the students to pass along their knowledge.

The group projects in the art course provided a place for building off of each other's creativity. By creating avenues to work in groups, the students were able to learn from each other's observations of the ecology around them. Creative actions within a team-setting produced more thoughtful and dynamic pieces that reflected a synergy of ideas. Similar to Meadow's approach to systems thinking (Meadows, 2002), the group projects allowed for dynamic interactions among the student's and their creative ideas.

It is this team-setting and community mix of learners and teachers that creates such a unusual experience for many of the learners. "It really is the people that makes this place so special" said one of the highly-developed ecological literacy participants. As I taught in art, creative actions encourage further creative actions.

Integration

From my results, I saw and heard the participants continuously cross-referencing academic and non-academic learning experiences as influences to their ecological understanding. It was through the balance of free time, outdoor programmes, community outreach, and academics that the students were able to better express their understandings. I refer to this cross-referencing as *integration*. Integration is both intentional within the pedagogy of The Island School and is reflected by the students when they start to connect the various elements of the curricula at the school.

Each discipline fed into the other curricula allowing students to cross-reference and explore major themes using creative expression. Their inspiration derived from the places surrounding them and in particular the knowledge they have gained through the math, science, humanities, research, and history courses that all focus on The Bahamian cultural and biological environment.

Within the Land and Environmental Art course, students have a level of creative freedom to explore their personal relationship to the environment. Creative freedom combined with the scaffolding of specific artistic skills creates an arena for a rich culture of ecological expression. My participants have utilized video, photography, performance, sculpture, and mixed media to express their understanding of Bahamian ecology far beyond their pre-semester ecological literacy status. Immersion mixed with integration supports creative expression. However, a final piece that is necessary to long-term retention of this new knowledge is reflection.

Reflection

Another major concept that I found through the students was the constant reference to power of personal time, and in particular the creative journaling that is encouraged as a daily activity. Each student at The Island School was provided with a small blank journal, already referred to as a *Placebook*, which acted as a creative journal for helping brainstorm assignments, sketch concepts, and connect deeply with the environment around them. The placebook is a space for conceptualizing ideas, recognizing patterns, and reinforcing learnt concepts. Hammond (2002) describes an environmental education journal as “a power tool for learning”. Each discipline at The Island School utilizes the placebook with activities that are relevant to the student. Times for reflection and creativity were both formalized and non-formalized into the curricula and acted as places for reflection and creation. Their placebooks were un-assessed and acted as a sacred place for their own thoughts and observations. Many used these books as place to paint, glue, draw, and write about their experiences.

In the beginning of the semester, the variability and quality of the participants' placebook entries corresponded with their level of ecological literacy. The ecologically illiterate participants had less diverse and creative entries. These entries typically used a single type of writing implement and presented lists. The trend in the use of these books was that they used them outside of class time and didn't associate them with anything but a safe place for their own reflection. No teachers looked inside them, unless the student offered to show them. The placebooks represented their own free time and were used widely for a variety of personal reflection. I believe that the placebooks provided a sense of comfort and this is why they were successful as a supportive tool to The Island School curricula and in personal ecological literacy development.

What is the connection between environmental art, place-based learning, and ecological literacy?

This research points to the strength of the arts as one of the foci for enhancing a person's academic and logical development within a school. In particular, it shows the power of an art class as a place for reflection and creative exploration of various concepts, systems, and other-disciplinary content. A successful environmental art class is not due to development of excellent sketchers, where they can accurately draw a plant, but it is due to the development of creative individuals who are willing to take creative risks. The art class provides a space where the students synthesized and acted upon concepts in a free and imaginative way. Through the act of creating art, students exercised their four quadrants of a worldview statement, thus exploring both the spiritual and logistical elements of their new knowledge.

The participants in this study described art as being a major influence on their understanding and appreciation around the environment. Bowers (1996) states that ecological literacy is incredibly rich and requires reframing within our schools:

What they [students] need to understand through all areas of the curriculum is that intelligence is primarily cultural in nature – in its embodied, taken-for-granted, and intentional/reflective dimensions. They need to understand that achieving meaningful and mutually supportive forms of community life that can exist within the limits of the environment is the ultimate test of cultural intelligence. (¶ 11)

This points us towards a need to develop a more holistic environmental curricula approach in our school systems. That is, environmental education curricula and those interested in developing ecological literacy should encompass an immersive, integrated, and reflective approach similar to that of The Island School. It should strive for spiritual, physical, and emotional connection with nature, especially the ecology surrounding that very community.

By hosting classes outside, providing time for deep reflection, and encouraging creative actions, these students were able to jump orders of consciousness, increase their abilities in diverse expression, and connect with the environment around them.

Discussion of Methods

The adaptations to the Cutter-Mackenzie and Smith matrix provided a deeper and more balanced approach to labeling a person's ecological literacy. The goal of this revised matrix was to discover the effects of an educational system on the participants' ecological literacy development. By super-imposing the multiple opinions on

worldviews into this model, I feel I was able to produce a robust and useful matrix for development comparison. The quadrants provided a holistic approach to themes and good starting points for discussion. I would have been interested in more explicitly exploring the spiritual value of the participants' experience through the existential theme, and perhaps renaming this section of the model to spiritual/existential would be a helpful solution. In addition, Cutter-Mackenzie and Smith's nomenclature for the various ecological-literacy levels were difficult to interpret when compared to the orders of consciousness. I was inspired to add another order of consciousness that hints at Naess' work in pluralism and total-view conceptualization, namely a trans-worldview layer of consciousness. This layer corresponded to the highly-evolved ecological literacy layer. In my analysis, I would like to have split this layer into two, thus addressing the participants that had defined religious connections to the environment and those that had a more undefined spiritual connection to the environment. That is not to say that religion or spirituality could be gauged as "more developed" than one another.

Conclusions

The immersive and experiential curricula of The Island School had substantive effects on the students. The expression of one's ecological literacy reinforces and supports the acceleration of one's development in place-based environments. In particular, art can act as an extremely powerful tool for students to explore their creativity and integrate their knowledge among the disciplines developing existential beliefs, evaluative beliefs, and prescriptive and proscriptive actions. In particular, students that are encouraged to take risks outside of their normal comfort zone in relation to their surroundings are able to act on their new knowledge in profound and useful ways. This

knowledge and action translates into transformative experiences which allows the student to develop, or at the very least expand, their worldview to include an acknowledgement of the environment. This is especially true for ecological literacy development.

Essentially, students are empowered through immersion, integration, and reflection. The Island School acts as an outstanding model for environmental education, teaching with new and trans-disciplinary methods, and referencing a holistic approach to education.

Case studies can be challenging when using them to generalize to larger audiences or systems. Despite this challenge, the content of this study is useful as a model for future schools, and to schools that are considering moving towards an experiential holistic model. In particular, this study focused on how art, coupled with environmentally-minded curricula, acted as a catalyst for ecological literacy development. The need to integrate curricula for teenagers around the world is still a pressing issue (Barrett, 2001; Thompson, 1997; WEEC, 2007). As educators, we seem to keep talking about the need for place-based integrated environmental education, but trans-disciplinary curricula is still rare in the classrooms of North American, South American, and European high schools.

Recommendations

Further research into student's experiences in place-based schools is essential to explore the effects of the worldwide movement towards environmental education. In addition, through this thesis I am contributing to the knowledge that there is a epistemological link between understanding our human-ness and our relation to the ecological systems. Many people in our culture don't consider the environment beyond

their suburban street or backyard grass. It is apparent to me that we need to stand up for our duty of sustainable living and begin to help others acknowledge what lies beyond materialism and free markets.

One of my main reasons for conducting this research project was to explore the connection between getting youth interested in the environment and the use of creativity as a healing tool for humankind. Art and the creative process is a true integrative mechanism that encourages further appreciation and understanding of the world around us, whether it is spiritual or practical. Unleashing people's creativity and supporting it with structures of sustainability and environmental knowledge will help support a more responsible future for the human race.

It would be naïve of me to simply state that curricula should be integrated among the various disciplines to create meaningful learning opportunities. So instead, I will give a list of suggestions on how to make art and creativity a central focus to the integration of and environmental education curricula:

1. Host an integration workshop among department heads where syllabi and instructional design are contrasted and compared. Focus on the places that could be overlapped and reorganize this curricula to fit time-frames and institutional needs
2. Provide time and space for the students to input into an integrative curricular process through continual informal feedback, suggestions, and generative curricula.
3. Provide contiguous and connective learning tools such as a creative journal for peer-teaching opportunities.

4. Give students time and space in the ecology around them – both structured and unstructured. Create small but ambiguous projects for them to explore the nature around them.
5. Provide spaces to explore non-scientific ways of knowing as a comparison, and more importantly as a partner to science.
6. Develop “real-life” and hands-on projects that have consequences to the local cultural and biological environment.
7. Celebrate all of the student’s works in a gallery

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Appendix A

Interview Instrument used in the semi-structured interviews with the group of eight students.

Existential beliefs questions

1. What experiences at The Island School have changed your understanding of truth or beliefs?
2. How has art helped or hindered your understanding of those truths?
3. Describe how you fit into an ecological system

Evaluative beliefs questions

1. At The Island School there is a focus on reasoning. How did it feel to use that skill when describing ecological systems in art and science?
2. Did art class support your understanding of ecological processes or systems? If so how?
3. Would you say that your understanding or expression around the environment improved? why?

Prescriptive beliefs questions

1. Would you say that your actions within the art course represent your understanding of ecological systems?
2. What creative actions do you plan to do when you go home?
3. What scientific or environmental actions do you plan to do when you go home?

Proscriptive beliefs questions

1. Describe your own morals and values to do with the environment.
2. What made you choose to come to this school?
3. Were your original ideas met when considering your tree of ecological literacy?