

**EXPERIENTIAL ENVIRONMENTAL LEARNING:
A CASE STUDY OF INNOVATIVE PEDAGOGY IN BAJA
SUR, MEXICO**

By

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ABSTRACT

This mixed methods case study describes an innovative two-semester middle school environmental learning course that departs from traditional Mexican expository pedagogy through the incorporation of experiential and service learning. This research takes place in a small middle school in Pescadero, Baja California Sur, Mexico. The research approach utilized in the study adds to the handful of studies in this cross-disciplinary field by employing quantitative methodologies to measure course outcomes on student environmental knowledge, perceptions, and actions, while simultaneously qualitatively describing the behavioral, educational, environmental, and social experiences of students. This research employs Dewey's theories of experience — as well as those of more contemporary authenticity theorists — in order to identify the philosophies that advocate incorporating experiential pedagogy within the curriculum. Implications for Mexican educational policy, practical pedagogical applications, and theory are discussed.

CHAPTER 1

INTRODUCTION

Baja California Sur, Mexico (B.C.S.) is blessed with a breathtaking environment rich in both terrestrial and aquatic flora and fauna. In the vicinity of Pescadero, B.C.S. is a narrow strip of peninsular land on the Tropic of Cancer that provides interesting opportunities to study ocean and desert ecosystems and the environmental issues facing the region. It is here that a group of Telesecundaria¹ (middle school) students participate in a unique environmental learning course that incorporates experiential coursework and environmental service learning. This mixed methods case study quantitatively evaluated the outcomes of this environmental learning course on student environmental knowledge, perceptions, and actions, while qualitatively explored the students' varied learning experiences.

Overview of Environmental Issues in Pescadero, Baja California Sur

Increasingly, off-road vehicle traffic, commercial resource extraction, unsustainable farming and fishing practices, sea turtle poaching, and demanding pressures from local and foreign land developers are threatening the region's water supply, species habitat, and endangering the species themselves. Many of these environmental concerns are absent from local Telesecundaria curriculum; public education efforts in Pescadero are inconsistently implemented by four environmental agencies – SEMARNAT (creates environmental policies and laws), PROFEPA (environmental enforcement), PROBEA (builds curriculum and facilitates

¹ Telesecundaria was launched in Mexico in 1968 as a means of extending lower secondary school learning with television support to remote and small communities at a cost inferior to that of conventional secondary schools (SEP, 2007).

workshops for educators and NGOs), and PRONEA (government sponsored environmental education programs).

The environmental learning course under investigation for this research addresses bioregional issues as well as additional subjects discussed in detail in Chapter 3. While all of the environmental issues discussed are pressing and individually important, for the purposes of this introductory chapter we will focus primarily on threats to the endangered sea turtles of the region. While the region is rich in biological diversity, species such as the intrepid sea turtle have declined in number due to unsustainable fishing practices, poaching, pollution, and habitat destruction. Between 7,800 and 30,000 sea turtles are poached each year in Baja despite a presidential decree in 1990 that banned the killing of sea turtles. Unfortunately, numbers of mature female sea turtles returning to B.C.S. has dropped from some 25,000 in 1970 to fewer than 500 in the year 2000 (Pesenti, 2002). Although the state of B.C.S. is considered a secondary location of importance for sea turtle nesting beaches in Mexico (as opposed to Oaxaca, Guerrero, and Michoacan), the ocean in the vicinity of Pescadero is considered a feeding zone of extreme importance for Olive Ridley, Leatherback, and Green, and a nesting zone for Olive Ridley and Leatherbacks (Baum, 2006).

Due to a serious decline in fish populations over the last 10 years resulting from the detrimental and widespread effects of the longline fishing and shrimping industries, local fishermen in the vicinity of Pescadero and Todos Santos are illegally supplementing their income through sales of endangered sea turtle products. At times, fishermen butcher the species at sea and weight and sink sea turtle shells in the ocean to cover-up their illegal activities that fetch between \$50-\$200 for mature sea turtles (Baum, 2006; Pesenti, 2002). Although the Mexican Federal Ministry for Environmental Protection (PROFEPA) is responsible for implementing the

severe penalties for possessing or exploiting any part of the turtle (be it meat, eggs, or shell), neither poachers nor consumers in the vicinity of Pescadero have ever been arrested (Baum, 2006).

Problem Context

This research investigated and evaluated the outcomes of an environmental learning course that is innovative – in presence, content, and pedagogy – in the Pueblo of Pescadero. The majority of Mexican schoolteachers employ a top-down teaching style whereby “influenced through the style of their training, use the reading of the textbook as the central classroom activity; it may also be that the textbook is the only resource which they have available” (Barraza & Walford, 2002, p. 179). At the Telesecundaria in Pescadero, students and teachers utilize textbooks as well as other nationalized curriculum that is administered through televisions in each classroom. This technology is in its infancy in Pescadero and is not yet fully implemented; some of the equipment has not been completely installed while other equipment is dysfunctional.

It should be noted that while PROFEPA supports environmental learning programs at local fairs and events around Pescadero, they do not facilitate a comprehensive environmental learning program in Pescadero’s Telesecundaria to address the environmental actions of future consumers (the students). Furthermore, teachers at Pescadero’s Telesecundaria do not administer environmental learning activities or lessons as supplied by the government sponsored National Environmental Education Programme (PRONEA). Some of the teachers implement day or weeklong environmental learning lessons in-class as provided by the Ministry of Public Education’s (SEP) textbooks, and one teacher also involves students in a hands-on project.

Barraza's (2001) research found that while Mexican school textbooks can (weakly) increase knowledge regarding environmental issues, it is the teacher's pedagogical approach, attitude, and interest in the material that are most instrumental for instigating change in environmental actions: one of the most important goals of environmental learning. Additionally she found that Mexican students who participated in practical activities in addition to classroom learning were more likely to retain information and develop positive attitudes towards the environment (Barraza, 1996). And finally, while the Mexican educational system and the Mexican government is slowly beginning to promote the environment as an interest area in the schools, Barraza (2001) states that more research is needed regarding teacher practice and the outcomes of creative pedagogical approaches with Mexican students.

In response to the overall absence of instruction of basic concepts in environmental learning (recycling, endangered species, water conservation, pollution, etc.), and the continued consumption of sea turtle meat among both adults and children in Pescadero, United States expatriate Patricia Baum implements an experiential environmental learning course in Pescadero's Telesecundaria. Baum, the co-founder of Grupo Tortuguero de Todos Santos AC (Turtle Group of Todos Santos) and Grupo Ecológico y Tortuga de Pescadero AC (Ecology and Turtle Group of Pescadero), is currently (as of 2007) employed by the region's oldest sea turtle conservation organization, ASUPMATOMA, AC (The Association for the Protection of the Environment and the Marine Turtle in Southern Baja). Her course is designed to introduce Telesecundaria students to Baja's unique environment, the community of Pescadero, and the local environmental issues the community faces. Additionally, the course is designed to involve students in environmental problem solving and to change a variety of their environmental behaviors.

While Baum has implemented the yearlong course for the last five years (2001-2006), no evaluation of its outcomes on student environmental knowledge, perceptions, or actions has taken place. The curriculum she designed – complete with elements of experiential and service learning – presented an exciting opportunity to decipher if and how such an environmental learning course instigates changes in Mexican student participants that could ultimately benefit the bioregion and its many human and non-human inhabitants.

Baum's education program at Pescadero's Telesecundaria is contending with harmful inveterate environmental behaviors, and a deficient municipal infrastructure, both of which negatively affect environmental and human health and treatment and perceptions of nature. These social and economic influences are deeply ingrained in the older population; a serious hurdle for positively conditioning the environmental perceptions and actions of younger generations. For instance, "community influentials" such as politicians and police regularly serve turtle meat at their private banquets, and it is local knowledge that sea turtles are the preferred food of *narcotraficantes* (drugtraffickers) and the rich and influential. According to Baum, even educators have fallen under the spell of sea turtle meat. As she said, "Several years ago the teachers at an [undisclosed] primary school served sea turtle for their Christmas banquet" (Baum, 2006).

Purpose Statement

The intent of this case study was to document a unique environmental learning course taught in Pescadero's Telesecundaria and describe the outcomes of this program on student environmental knowledge, perceptions, and actions. This research concurrently works to assess the environmental learning course design in Pescadero as it departs from traditional pedagogy

and embraces the “school as a form of community life” spirit as espoused by John Dewey and his theory of experience. It is through Dewey’s lens that this researcher related to the study at hand as many of Dewey’s ideas are potentially manifested and enacted through Pescadero’s environmental learning course. We believe that Dewey’s ideas are successfully enacted in the experiential elements in the environmental learning course, and we seek to bolster his ideas that have helped to influence the students in the course.

Dewey (1929) proposed that human interaction with the natural and artificial environments is necessary for both personal and societal growth and progress. Dewey’s eventual work with educational reform resulted in his promotion of progressive pedagogical designs that emphasize connecting school lessons to the real life experiences of students. “The school must represent present life – life as real and vital to the child as that which he carries on in the home, in the neighborhood, or on the playground” (Dewey, 1929, p. 7).

Importance of the Study

(a) Practical Significance

The results of this study may be of value to middle schools throughout Baja, Mexico where multiple communities face similar environmental issues as identified by community leaders and the Government of Mexico. Schools both north and south of Pescadero are implementing new courses, have in the past taught similar courses, or presently offer environmental learning courses of varying designs; feedback on the outcomes of this course may be of interest to them. Additionally, funders and NGOs offering current educational support (and looking to expand their support) in Baja’s schools may benefit from the outcomes of this research. Given that many regional environmental NGOs are supplying schools with short-term

educators and materials with no knowledge of how the outreach has affected the students or the environment, this study will shed light on the potential for experiential and service learning in Baja, Mexico's middle schools.

(b) Theoretical Significance

On a broader scale, the professional educational community focusing on research of environmental learning (in both Mexico and the U.S.) may be interested to learn of the findings that relate to environmental learning in Mexico. There is a serious lack of research in this specific area, and little exists for experiential programs in Mexico. Applying Dewey's theories to situations as experienced in Pescadero, and exploring how they affect student experience will help curriculum designers and environmental educators better understand the outcomes of utilizing pedagogy steeped in authenticity.

(c) Policy Implications

The government of Mexico (in partnership with NGOs) has recently been (minimally) stepping up its public education efforts in regards to sea turtle protection and various other environmental issues. Outreach and public relations specialists within the Mexican environmental agencies (namely, SEMARNAT, PROFEPA, and the nonprofit groups ProPeninsula and WildCoast) will hopefully also find the results of this research (and the course) as complementary to their current and future efforts to increase public awareness of environmental concerns throughout in Baja and mainland Mexico.

Definition of Terms

Mixed methods- The mixed methods approach to research includes employing both qualitative and quantitative methodologies and strategies in order for the researcher to garner a more holistic view of the research situation and results.

Concurrent- The use of quantitative and qualitative research methods will occur simultaneously. That is, portions of the research that require the use a survey will happen very shortly before (possibly the same day) as the utilization of in-depth interviews.

Environmental education- Environmental education is a broad term used to describe education about, and relating to the natural environment, and the role of humans: how humans fit into and affect the planet's natural processes.

Environmental learning- Pedagogy focused on bringing learners into a greater understanding about the natural environment while encouraging respectful and purposeful positive behavior in order to preserve biological diversity and conserve natural resources.

Environmental knowledge- Familiarity with facts, concepts, and issues in regard to the natural surroundings-including the flora and fauna-that are within the focus of the environmental learning course in Baja California Sur.

Environmental perception- An individual's preservation, conservation, and utilization preferences as seen from attitudinal and behavioral points of view (Bogner, 1999).

Environmental actions- One's behaviors and/or habits in regard to conservation of natural resources and preservation/protection of nature and its biodiversity in order to reduce human impact on nature.

Authenticity- Doyle defines authenticity:

An authentic task is one that is inherently meaningful to the child, i.e., it is consistent with the child's interests and the child's ways of thinking, knowing, and understanding. A second meaning is more subject centered: An authentic task is one that corresponds to or is equivalent with a task that might exist in a parent discipline, such as science, math, or history. Finally, there is a situated meaning of authenticity: An authentic task is situated as actual activity in which [children] participate in real-world settings. (2000, p. 1).

Service learning- Pedagogy, curriculum, activities, and programs that embrace organized, hands-on, community service and volunteerism to enhance student learning and the schooling experience. According to the North American Association for Environmental Education (2007):

Too often, for example, community service is mistaken for service-learning. Though community service is undeniably valuable, both its process and outcomes are notably different from those service-learning. This example illustrates some of the distinction: Picking up trash by a riverbank is (community) service; studying water samples under a microscope is learning; when students collect and analyze water samples and collaborate with the local pollution control agency to develop and enact a river clean-up plan ... that is service-learning (p.1).

According to Schine (1997), service learning is distinctly different than academic learning in that students often:

1. Work in groups to complete service activities,
2. Work with people who are outside of the school community and who may be different than the students,

3. Reflect upon their activity and how it benefited themselves and the entity (human and non-humans, or the community as a whole),
4. Encounter affective experiences that are not evaluated by tests and traditional evaluation measures. Students also deal with issues of self-efficacy and locus of control,
5. Become effective citizens, more mature young-adults, and deal with different responsibilities than those experiences solely in the classroom,
6. Learn both inside and outside of the school within the context of the formal curriculum.

Experiential education- Both a philosophy and pedagogical methodology, experiential education includes learning scenarios that develop knowledge and “skills” concurrently, each transforming the other. Students most likely engage in fieldwork and off-campus projects to complement the subject matter that is being studied (Wutzdorff & Giles, 1997).

Community influential- People of high regard in the local community. Politicians, mayors, clergy, education administrators, teachers, businessmen, celebrities, and sports figures could all be considered community influentials. This research will use a *pluralist* approach whereby community influentials who are participants in decisions are interviewed (Dahl, 1963).

CHAPTER 2

REVIEW OF THE LITERATURE

This research assessed and documented the outcomes of an experiential environmental learning course with service learning components designed to immerse Telesecundaria students in bioregional environmental issues while facilitating their participation in community conservation actions. The intent of this study was to evaluate how the experiential nature of the course affected Telesecundaria students' environmental knowledge, perceptions, and actions. The impetus for this research emanated from interest in an environmental learning course that is uncommon in its geographical/political location, content matter, and pedagogy. Therefore, it is appropriate for this literature review to recognize and rationalize the employment of experiential learning for the advancement of the goals of environmental learning; examine the theoretical underpinnings of this paradigm; and synthesize the outcomes of pedagogical applications of experiential learning that have been identified in recent research projects concerning environmental learning. Furthermore, this literature review will explore the historical and more recent outcomes of research on environmental learning in Mexico.

The literature review sections include:

Overview of Environmental Learning

Environmental Knowledge

Environmental Perceptions

Environmental Actions

Theory: Advocates of Experiential Pedagogy

Research Methodologies for Service Learning

Recent Research on Environmental Learning Programs with Service Learning Components

A Synthesis of Research on Environmental Learning in Mexico

Linking Environmental Issues with Social Justice

Overview of Environmental Learning

It should be noted that there is visible movement among and within professional environmental researchers and educators to delineate the different facets of pedagogy based on study of the environment. Much of this debate focuses on working to define the differences in approaches, implementation methodologies, and the philosophical frameworks that guide such endeavors; that is to say, when one employs the term “environmental education,” they may in fact be referring to a very specific style of environmental pedagogy, one that is separate from “earth education” (Van Matre, 1990), “environmental learning” (Scott & Gough, 2003), “outdoor education” (McRae, 1990), or “sustainability education” (Santone, 2004). More simply put, the researchers subscribing to this school of thought point out that while environmental education may fall under the larger umbrella of environmental learning, not all environmental learning is achieved through the methodologies or philosophies pertaining to environmental education. But while some in the environmental community are entrenched (possibly obsessed) with this debate, it is not apparent from the literature that all involved in the field of environmental learning are aware of this emerging (and heated) discussion. To delve deeply into the details and semantics of this debate would be inappropriate for the goals of this literature review; however, it is important to point out that for this research effort we have chosen to employ the broader term “environmental learning” as defined by Scott and Gough (2003) who more generically define environmental learning as “Learning which accrues from an engagement with the environment or environmental ideas” (p. 14).

Li (1996) singles out “environmental education” as another generic term used to describe formal schooling curriculums that regard environmental issues and problems. He goes on further to note that those working in the field have not agreed upon the logistical intricacies of this

particular domain, yet agree that “nature” is the rallying point and centerpiece for the pedagogy. More importantly, Li (1996) makes a distinction between science-oriented environmental education programs that perpetuate “objective” scientific knowledge as a solution to environmental ills as opposed to or different from educational programs that emphasize the intrinsic values of nature - as espoused by Earth Education and its embrace of the philosophy of deep ecology – “as the key to re-orient our ecologically exploitative cultural practices” (p. 1).

Van Matre (1990) writes critically that environmental education “tends” to be “supplemental and random; classroom based; issues oriented; relies heavily upon conducting group discussions to achieve its institutional objectives; infused with cornucopian management messages and views” (p. 252). Furthermore, Van Matre (1999) criticizes environmental education’s viewpoint that “The earth is our horn of plenty, our cornucopia and all of this is just here for our benefit if we just do a little better job of managing it, everything will be all right” (p. 1). On a similar note, Catton and Dunlap (1980) agree that environmental education has a tendency to perpetuate the dominant social paradigm which espouses unlimited resources and human exemptionalism.

Programmatic Approaches vs. Infusion Approaches

Wohlers and Johnson (2003) explore the finer points of the programmatic approach to environmental learning and explain that the programmatic approach involves meticulous planning with an accent on purposefulness and specific outcomes. The approach is a “carefully crafted, fully integrated series of learning experiences that are focused, sequential and cumulative, and are designed with specific outcomes in mind” (Wohlers & Johnson, 2003, p. 1). Similarly, Van Matre (2006) gives an example by pointing out the pedagogical methodology

behind Earth Education that involves programmatic and integral environmental learning for enhancing broader conceptual understandings, as opposed to random and supplemental attempts at environmental education.

The infusion approach takes a different tact in that teachers integrate environmental messages and lessons in smaller portions throughout the curriculum. The infusion approach can be seen as an effort to bring some/any environmental learning to the classroom that is already stretched thin by testing and the school curriculum (Wohlers & Johnson, 2003). Historically the approach has its downsides and is criticized by Wohlers and Johnson (2003) as ineffective. They point out that the approach has achieved poor results without evidence of student impacts. Furthermore, Wohlers and Johnson (2003) note that the infusion approach is often implemented on the fly by teachers with little environmental background; provides superficial coverage of complex environmental topics; trivializes the importance of environmental learning as a curriculum item; and can overall be less meaningful for students; in short, a waste of time.

Environmental Knowledge

The research on environmental knowledge is expansive and well documented. Researchers measuring environmental knowledge work to quantify and better understand a student's comprehension of environmental concepts using various methodologies. Recent research has explored assessment of environmental learning programs through gathering data on changes in student environmental knowledge. Results on changes in environmental knowledge are acquired typically through the use of pre-tests and post-tests with treatment and control groups, where researchers attempt to uncover changes in student knowledge through measuring cognitive differences (Armstrong & Impara, 1991).

The following section will focus on studies that investigated participant baseline environmental knowledge as well as studies measuring the outcomes of formal and informal environmental education programs. Participants in the following studies ranged from elementary years through adult and represent citizens from the US, Mexico, Europe, and Asia.

Recent Research Involving Measurement of Environmental Knowledge

Barraza and Cuaron (2004) researched familiarity and understanding of 10 environmental concepts between 246 Mexican and English students aged 7 to 9. The school environmental ethos was incorporated as a factor in student understanding. The researchers reported an overall low to moderate level of environmental understanding in light of their national curriculums.

Students were asked if they were familiar with specific environmental terms and were then asked to circle the correct meaning of the terms. Of the 10 terms, English students were familiar with 7.7 words while Mexican students were familiar with 6.9. English students knew the meaning of 6.9 terms and Mexican students 5.1 terms. Schools with specific environmental policies and an environmental ethos tended to produce students who had a higher familiarity and understanding of the terms (Barraza & Cuaron, 2004). Furthermore, they note the teacher's role as immensely important in the promotion of environmental information.

Both Mexican and English students also reported to the researchers that they encountered most of the terms from their teachers and from television (almost equally, therefore highlighting the need for more environmental programming). Students also reported that they preferred watching programs regarding the environment as opposed to reading about it. Parents and schoolbooks were also mentioned as sources of term familiarity. Mexican students reported almost equally (percentage wise) that school (28.7%), television (28.3%), and parents (27%)

were the sources of environmental information. The most familiar phrase among Mexican students was the term 'ozone layer;' 90.9% heard the term and 82.6% understood the term (Barraza & Cuaron, 2004).

The researchers also raised some important questions surrounding the differences in Mexican and English pedagogy, as unlike English students, Mexican students do not usually undertake practical activities to complement their lessons. They reported that 20% of the English students had heard all of the terms, while 8.8% knew all of the meanings; for Mexicans, 13.2% had heard all of the terms while only 1.3% knew all of the meanings. The researchers leave by posing this question: "Is this because teaching science in Mexican schools has been focused mainly on content and the acquisition of correct information (memorizing), rather than the development of problem-solving skills, including practical activities?" (Barraza & Cuaron, 2004, p. 21).

Dimopoulos and Pantis (2003) undertook research on baselines of existing student environmental knowledge in Zakynthos, Greece as a precursor to the government's future plans to design an environmental learning program regarding sea turtles in the National Marine Park at Zakynthos. The researchers also measured student attitudes toward sea turtles by quantifying verbal commitment, issue understanding and concerns, and locus of control. The researchers surveyed 332 5th and 6th grade students from three different geographic settings to describe the students' environmental knowledge. Much of their work focused on student knowledge of sea turtle biology and the state sponsored conservation measures practiced in the park near their hometowns. The researchers conducted only one survey as a precursor to course design and presented the results to the authorities at the National Marine Park of Zakynthos. They concluded that the overall students' knowledge of sea turtles and conservation measures was

low. Their knowledge measurements were in fact correlated to two of the attitude measurements (understanding and concern for sea turtles, locus of control). Grade level was found to be positively correlated to the four indices they measured.

Thapa, Graefe, & Meyer (2005) continue within the marine theme by researching the mediating effects of the degree of specialization in scuba diving on marine-based environmental knowledge and behavior. Through surveying 370 adult scuba divers with a self-reporting instrument; the authors found that levels of specialization in scuba diving played a strong role in mediating the relationship between environmental knowledge and behaviors. The study found that the effect of scuba specialization is stronger than the effect of knowledge on environmental behaviors. A diver's level of specialization is directly related to the levels of marine environmental knowledge; specialization has a significant effect on in-water pro-environmental diving behaviors; environmental behavior is also related to marine-based knowledge (Thapa et al., 2005).

In a study targeting Taiwanese community leaders' environmental knowledge and attitudes, Hsu and Roth (1996) surveyed 176 participants with a 55-item instrument and found that education level was the best and only predictor of environmental knowledge and attitudes. They determined that the overall level of environmental knowledge was moderately high in civil servants, politicians, religious, industrial/business/mining, professional, communication, agricultural, NGO, and minority group leaders (Hsu & Roth, 1996). The correct response rate to self administered surveys was 75.9%.

Also of note in their worthwhile study of environmental knowledge in community leaders was the fact that there were many differences in respect to age, education level, income level, and ethnicity, but not gender, as found in six prior studies (outside of Taiwan). Younger

respondents had higher scores than older respondents, while non-aboriginals scored higher than aboriginals. Knowledge and attitudes were positively correlated. Furthermore, pollution and ecosystem destruction were of penultimate importance to the leaders, who garnered 70% of their environmental knowledge from newspapers, books, and magazines; almost 30% listed TV and radio as important sources, while none of the 176 participants listed formal education as a major source of environmental knowledge (Hsu & Roth, 1996).

Bradley, Waliczek, and Zajicek (1999) measured environmental knowledge and attitudes in 475 Texas high school students from 18 different schools, exposed to a 10-day agriscience course. Their intent was to unravel whether increases in environmental knowledge translated to an increase in environmental attitudes. The course under investigation included in-class and hands-on activities regarding the physical environment as well as environmental issues. Researchers used the pre-test/post-test design using the pre-test as the control group. They concluded that after exposure to the treatment both the knowledge and attitude increases were statistically significant and correlated, suggesting “increased knowledge may help improve environmental attitude” (Bradley, Waliczek, & Zajicek, 1999 p. 4).

Research on environmental knowledge was also conducted by Armstrong and Impara (1991) to measure the effects of *NatureScope* – an eight-week environmental education supplement designed by the National Wildlife Federation – on student environmental knowledge. Their findings showed that the treatment groups outscored the control groups in all but one case. They note that the changes in environmental knowledge were not “tremendous” due to numerous other demands on the teacher and students.

Researchers documenting the baseline environmental knowledge in 7-9 year olds and 10-11 year olds in Mexico, US, and Greece all found that when not exposed to a specific

environmental learning program, study participants had low to moderate knowledge of environmental concepts. It is interesting to note the benefits of these baseline studies and their usefulness in the design of environmental curriculum as well as for influencing public education policy.

The adult study participants in the US and Asia were found to have a moderately high level of environmental knowledge when not exposed to a specific environmental learning program which highlights the potential effectiveness of informal educational outlets such as magazines, newspapers, and television media. This parallels the findings of Barraza and Cuaron, 2004 who noted that school (28.7%), television (28.3%), and parents (27%) were the main sources of environmental information in youngsters. As one matures and becomes better equipped to access these informal educational mediums, potentially, the knowledge of environmental concepts increases. This is not to discount the effectiveness of exposing learners to formal curriculum that incorporates environmental concepts. Both of the studies by Armstrong and Impara (1991), and Bradley, Waliczek, and Zajicek (1999) demonstrated increases in student environmental knowledge when compared to control groups.

Environmental Perceptions

Studying environmental perceptions and feelings towards the environment – sometimes referred to elsewhere, and operationalized or expressed in studies as environmental ‘attitudes’ – involves consideration of how individuals view and treat the natural environment and how and where they place value on the environment. Measuring and exploring the environmental perceptions of individuals can be conducted using Likert type instruments as well as open-ended interviews.

There are various models designed and tested for measuring environmental perceptions. It should also be noted that throughout the literature authors measured perceptions and attitudes with differing scales, under various treatment circumstances, and used a variety of constructs/statements when deciphering perceptions and attitudes. Therefore, the varying results of investigations into environmental perceptions should be valued in light of the experiment's individual context and instrumentation.

The following studies highlight research endeavors that have utilized The Environment Questionnaire, the Model of Ecological Values (Wiseman & Bogner, 1999), and The New Ecological Paradigm (Dunlap et al., 2000). These studies involved participants from age 10 through adult and were conducted on environmental learning programs from a variety of settings including university classrooms, national parks, and residential outdoor centers. Two of the five studies were conducted on participants who received no exposure to an informal or formal educational program.

Bogner (1998) measured changes in student environmental knowledge, perceptions, and behaviors after one- and five-day outdoor ecology programs in a national park in Germany. He employed pre and post surveys with two control groups and two treatment groups with a total of 700 middle school students. In the realm of shifts in perception, Bogner (1998) recorded positive shifts in both the one- and five-day treatment groups for increases in the subdivision Human-Altered Nature; no other significant gains were reported in the realm of environmental perception. The positive changes in perception were correlated to the changes in environmental knowledge. Bogner (1998) noted further that the increases in perception scores were encouraging, as neither the one nor five-day course explicitly discussed topics related to Human-

Altered Nature, but did in fact include affective experiences that may have contributed to these positive results.

Interestingly, he includes insights that point to the vital importance of incorporating affective experiences in environmental programs when shifts in perception are sought. Planning for positive attitude changes requires more than just educating for cognitive learning advancements. The course as the basis for treatment utilized sensual, hands-on and cooperative experiences such as barefoot walks in the forest, simulation games that emphasized emotion approaches and sensory awareness, as well as all-day hikes.

Johnson and Manoli (in press) utilized The Environment Questionnaire – based in part on Wiseman and Bogner’s (1999) Model of Ecological Values (ENV) and in part on The New Ecological Paradigm (NEP) (Dunlap et al., 2000) – to measure changes in environmental attitudes in 166 5th graders from the southern US and 111 5th and 6th graders from the eastern US. The treatment employed Sunship Earth (Van Matre, 1979) over the course of a five-day residential experience. Sunship Earth addresses cognitive, affective, and action oriented experiential learning that focuses on bigger picture ecological concepts; discovery, solitude, feelings, and observation; and taking action later at home after to reduce resource consumption.

Johnson and Manoli (in press) used a pre-test/post-test design to decipher that participants in both programs – most of whom came to the program exhibiting preexisting pro-environmental dispositions – moved in a positive (pro-environmental) direction in regards to preservation and utilization.

Dunlap et al. (2000) improved upon their original New Environmental Paradigm scale with a more contemporary set of New Ecological Paradigm items and tested it on 676 participants throughout the state of Washington. The newer version of the NEP addresses more

varied facets of environmental perception such as attitudes about human exemptionalism and ecocrisis, while overall the survey is more directionally balanced. Their test results point to respondents espousing strong pro-environmental beliefs, and the authors propose that there is 'modest' evidence that the ecological worldview is gaining momentum (when compared to a study they conducted in 1976).

Rideout (2005) measured student endorsement of positive environmental perceptions as espoused in the New Ecological Paradigm (NEP) (Dunlap, Van Liere, Mertig, and Jones, 2000). He found that after a short three-week university level problem module with a focus on global environmental issues and energy, students in an undergraduate psychology research methods course showed an increase in NEP endorsement. The study comprised 85 participants most of whom were female.

The environmental module consisted of readings, discussions, and writing assignments. Rideout (2005) conducted a longitudinal study of the students over three semesters and incorporated a control group; he also measured environmental knowledge. He found that the short issues course increased NEP endorsement in students with results that sustained over the three semesters of measurement; in contrast, the environmental knowledge and factual performance of the students declined.

Lee and Moscardo (2005) studied the participant effects of spending a holiday at an award winning Australian eco-resort in Frasier Island. The researchers distributed pre and post surveys to two independent samples of 242 and 396 respectively. Although there was no specific environmental learning course/activity/program/treatment given to the guests, all of the visitors to the island had the opportunity to become familiarized with the permaculture and sustainable

technology practices employed by the resort. All of the visitors also had the opportunity to participate in educational programs and nature tours.

Although the authors measured changes in environmental knowledge, awareness, behaviors, and attitudes using the New Environmental Paradigm scale (Dunlap & Van Liere, 1978), they could find no significant differences between the pre and post surveys; both surveys returned almost identical responses. The authors note that visitors to the island and resort probably engender high levels of environmental traits before they arrive, thus making detectable changes more difficult to pinpoint (Lee & Moscardo, 2005).

Researchers successfully explored various applications of the The Environment Questionnaire, the Model of Ecological Values (Wiseman & Bogner, 1999), and The New Ecological Paradigm (Dunlap et al., 2000). The results of the five studies point out the range of sensitivity of the models as results were mixed between findings that exhibited no increases, small increases, and larger longer term increases in environmental perceptions in participants.

Three of the authors have pointed out the clinical difficulties in measuring environmental perceptions in participants who exhibit high degrees of environmental perceptions at pre-test. While this ceiling effect was evident in some participants the authors were still able to document small changes in environmental perceptions. This raises the question of the need to further improve upon the sensitivity of the instruments. Authors also highlight the benefits of facilitating affective experiences during treatments as well as the usefulness of longitudinal research endeavors. In one study by Bogner (1998), he noted the unexpected positive shifts in measurements of human altered nature that were exhibited by participants as a result of affective experiences that were not specifically facilitated for these results.

Environmental Actions

The following studies explored and measured changes in environmental behaviors (actions) in participants. Participants in these studies ranged in age from 10 years to adult learners and represented Australia, US, Spain, and Switzerland. Two of the studies explored the effectiveness of formal pedagogical applications for altering participant pro-environmental actions, while the other two assessed the effectiveness of informal pedagogical applications.

Ballantyne, Fien, and Packer (2001) discussed the features of an environmental education course that are necessary for intergenerational behavioral influences. The authors point out that although adults mostly rely upon mass media for acquiring environmental literacy, this activity does not translate into changes in positive environmental behaviors. Their interest in intergenerational influences led them to research the effectiveness of six different environmental education programs for 5th-12th graders, as well as research on how environmental educators can better assist students in influencing their households to adopt pro-environmental behaviors.

The authors surveyed 284 students, interviewed 117 parents, and surveyed 177 parents from nine schools in Australia and found that overall 32% of students reported that they had changed their environmental behaviors as a result of their participation in their particular program; parents reported that 22% of the students had changed environmental behaviors in some way. Seventy-three percent of the students reported that they discussed their respective programs with their parents at least once, while only 28% reported that they had discussed actions the family could take collectively to conserve resources. These claims were verified with parent interviews. The authors did not report the age of households that eventually successfully adopted pro-environmental behaviors.

Ballantyne et al. (2001) wrote that environmentally related homework assignments, participation in novelty and out of class environmental activities, and greater program length were cited as the three most important factors for instigating intergenerational transfer of knowledge. It should be noted that not all student/parent discussions pertained to environmental behavior change; some discussions were limited to course experience and environmental issues. Furthermore, the authors suggest that when designing programs, facilitators should include hands-on activities, action components, and involve parents in activities/research/presentations; these components have a greater potential to foster behavior change at a family and community level.

Ramsey, Hungerford and Tomera (1989) conducted research in 1977-78 with three heterogeneous eighth-grade classes. Students were given both pre and post-tests; parents were surveyed as well. One of the treatment groups received environmental awareness instruction in a case study format; the teacher remained neutral in instruction style. One of the treatment groups received environmental action instruction; the teacher encouraged student involvement in problems. The control group received science instruction using a standard textbook.

Ramsey et al. (1989) found that the action instruction group had a higher knowledge of action skills and reported a higher number of environmental action behaviors and a higher number of types of actions taken. While there was no difference found between the case study and control groups in regard to environmental actions taken, the case study group did have a higher knowledge of different kinds of environmental actions that *could* be taken.

The parental surveys accurately bolstered results uncovered from the students. As opposed to the case study and control groups, the action group parents responded that the students verbally discussed environmental awareness and took action to remedy environmental

problems. When the case study and control group parents were compared, the parents of the case study group reported more verbalization and actions in students when compared to the control group. Unfortunately, the verbalizations and actions of both the action and case study groups declined by at least 50% after instruction ended.

Meneses (2006) undertook cognitive approach research to demonstrate that recycling behavior is a routine environmental behavior and social conduct that should be taught as such in environmental education materials. The author emphasizes that personality and individual values (psychographic characteristics) will influence the learning process and any subsequent pro-environmental behaviors. Meneses proposes additionally that the know-do-feel model of education for adoption of recycling behavior is more appropriate than the know-feel-do model.

Meneses used a questionnaire to gather information concerning recycling behavior and psychographic characteristics among 246 individuals (in Spain, average age of 45). Household members of the respondents were employed as recycling spies who observed family members in their recycling behaviors.

The results indicated that peripheral learning strategies (low-involvement/habit) of recycling education achieved the most effective and efficient results. This strategy espouses that educators probably are wasting their efforts on influencing beliefs and relaying in depth information about recycling as “People may or may not pay attention; they are more likely to respond to a minimal amount of information before starting to recycle and to have an evaluative response only after acting” (Meneses, 2006, p. 30). Unfortunately, although this model is effective for producing pro-environmental recycling behavior, it does not produce higher order ecological thought which could subsequently 1) increase participants’ environmental

awareness/consciousness; and 2) lead as a gateway topic to more complex environmental issues that need action.

Hansmann, Scholz, Francke, and Weymann (2005) created a computer based environmental learning tool/game that addressed the economic and environmental effects of food purchasing choices. A total of 215 students (average age 17) were divided into 12 classes; six classes received lecture style education while the other six were exposed only to the computer based environmental learning tool with subsequent debriefing. The game was specifically designed to improve the environmental knowledge, attitudes, and behavior of participants in regards to food purchasing. Topics that related to environmental issues included organic food production, distance that food traveled for potential purchase, amount of meat consumed by participants, and the ability for environmentally positive food consumption choices to be seen as a positive model for social behavior.

Students completed a pre and post-test measuring nine factors of environmental attitudes. The researchers found significant increases in attitude in both the treatment and control groups; overall attitudinal increases in the treatment group were more pronounced (.33 control vs. .44 treatment). Hansmann et al. (2005) also noted that the intrinsic motivation of *fun* is a useful tool for environmental education.

Hansmann et al. (2005) also assessed (in a separate experiment) how control and treatment groups would perform in regards to environmentally positive consumption patterns (behaviors). The researchers utilized a convenience sample of 212 participants at the Swiss Federal Institute of Technology (76% students). While all of the participants eventually partook in a computer simulated shopping trip with phony money, half were first exposed to the educational software/game. The authors found that the treatment group performed significantly

better than the control group in regards to organically produced foods and locally produced foods, but that there were no observable differences between the two groups in regards to overall consumption of meat. Hansmann et al. (2005) stated that “At least for a limited period of time, simulation games can effectively modify attitudes and behaviors in the specific areas they target” (p. 376). The sustainability of the effect was not studied and the authors further noted that they could not state the extent to which the effect would last over time.

Positive outcomes in regards to influencing the pro-environmental actions of learners is ultimately one of the most important components of effective environmental learning programs. As presented above and in other studies that measure changes in environmental actions, directed and meaningful teaching methodologies as well as properly designed programs are paramount for sustaining pro-environmental behaviors, intergenerational learning, and encouraging collateral learning. In younger students, teaching for explicit issue understanding, coupled with related actions that are manageable for that age level, as well as opportunities for parental involvement, have been found to have positive results. More longitudinal studies of the longer-term effects of these interventions are necessary as highlighted by Ramsey et al. (1989) who found declines in actions in 50% of the treatment group; what are the longer term effects in the absence of subsequent treatments?

In poorly designed and extremely informal programs these studies point out issues with sustainability of pro-environmental actions as well as a lack of collateral learning. Teaching explicitly for pro-environmental behavior without addressing the affective domain or the broader environmental and social issues at hand has potential short-term benefits but engenders longer-term deficiencies such as loss of pro-environmental behaviors, lack of environmental

consciousness expansion, and personal meaning. The debate over programmatic and infusion approaches to environmental learning echoes the results of these four studies.

Theory: Advocates of Experiential Pedagogy

There is a wealth of literature touting the benefits of experiential pedagogy, yet this research will focus and draw upon the early classical work of John Dewey as well as a sampling of more contemporary theorists. This literature review applies Dewey's Theory of Experience to the advent of service learning used within environmental learning. Since much of Dewey's work seems to have been neglected at the national level planning of environmental learning curriculum in Mexico, it is interesting to explore how Dewey's ideas are potentially enacted and expressed in the more unique service learning scenario in Pescadero. Simultaneously, through the foundation of the course design and its outcomes we will have a better idea if the course itself resounds with Dewey's theories, and how Dewey's ideas might help educators to better serve their students.

Orr (1992) echoes that to achieve ecological literacy in learners, pedagogy should reflect the theories surrounding Dewey:

Learning in this view best occurs in response to real needs and the life situation of the learner. The radical distinctions typically drawn between teacher and student, between the school and the community, and those between areas of knowledge, are dissolved. Real learning is participatory and experiential, not just didactic. (p. 91)

Not only is this methodology essential for meaningful and thoughtful learning, but the practical applications and benefits of experiential learning are necessary if communities are serious about sustainability (Orr, 1992).

Service learning requires that students work directly with and in the company of community members who may be professional tradespersons, researchers, biologists, etc. This

complex situation is clarified by Dewey's (1938) ideas surrounding authenticity: "Basing education upon personal experience may mean more multiplied and more intimate contacts between the mature and the immature than ever existed in the traditional school, and consequently more, rather than less, guidance by others" (p. 8). Surrounding students with so many "guiding" adults may compromise the freedom for learners sought out by proponents of experiential pedagogy.

This is a challenging predicament, for in order to learn through personal experience, educators as well as community members must restrain themselves from coddling learners, thus sabotaging the ideals behind the pedagogy (Dewey, 1938). This restriction is not only somewhat impossible at times, but goes against the intuitive behavior of most adults when they interact with youth. This careful dance of freedom must therefore be delimited (planned) by the educators so that the goal of freedom is realized, but under some degree of control or predetermined conditions. The process therefore would seem open to interpretation.

According to Dewey (1938), of utmost importance for the educator is to provide a meaningful experience for the students that results in desirable future experiences and behaviors, whether this be the next adventure in service learning or a direct change in conservation behavior. This is of course the challenge discussed above. "The greater maturity of experience which should belong to the adult as educator puts him in a position to evaluate each experience of the young in a way in which the one having the less mature experience cannot do" (Dewey, 1938, p. 31). Dewey exposes this philosophy to encompass the experiential continuum, whereby educators evaluate which activities positively complement continued capacity for growth in the experiential pedagogy; this is the constant feedback loop that educators must be mindful of in both content and student learning.

It is important to note that the words “service learning” do not exist in any of Dewey’s writings; the coinage of that term is far more recent. What is most interesting is that Dewey’s Theory of Experience underlies much of the sentiment behind the advent of service learning.

With regard to experiential methodology to be used, Dewey (1938) offers that:

A primary responsibility of educators is that they not only be aware of the general shaping of actual experience by environing conditions, but that they also recognize in the concrete what surroundings are conducive to having experiences that lead to growth. Above all, they should know how to utilize the surroundings, physical and social, that exist so as to extract from them all that they have to contribute to building up experiences that are worthwhile. (p. 35)

Teaching experiential pedagogy not only works under a unique learning philosophy, but it encompasses a whole set of logistical particulars that traditional modes of education never dealt with, and does not deal with on a frequent basis. In fact, experiential pedagogy requires that educators constantly be mindful of the local community, environmental concerns, historical, economic, political, social, and vocational influences on students, because sooner or later, these elements will come into play at school (Dewey, 1938).

The utilization of subject-matter found in the present life-experience of the learner towards science is perhaps the best illustration that can be found of the basic principle of using existing experience as the means of carrying learners on to a wider, more refined, and better organized environing world, physical and human, than is found in the experiences from which educative growth sets out. (p. 101)

This sentiment is also instrumental in accomplishing one of the major goals of environmental learning: behavior change. According to Dewey (1938), those experiences that tend to be more educative relate to the real-life experiences of students. For educators to achieve these results, and the results of environmental learning, a longer-term view must be kept in mind. Present relevant experiences will hopefully relate directly to the past, while also influencing future experience and ultimately, actions.

The more contemporary work of Doyle (1986) details the important logistical differences in a Deweyesque pedagogy based on experiential learning and authenticity. Traditional didactic modes of education are heavy in *familiar work* that includes routinized and predictable exercises where ambiguity and risk are low. Alternatively, experiential education charts a different tact that seems almost radical in the face a learner's prior experience in school. Such novel work involves learners in unpredictable situations where both ambiguity and risk are high. With novel work, students are given greater flexibility and responsibility in decision making often in scenarios where the teacher is absent, takes a back seat, or furnishes a peripheral role in the implementation of the lesson. It is this philosophy that underlies the service learning experience and is responsible for creating a learning experience with heightened and more sustainable outcomes.

Doyle (1986) notes that "Students respond in class more actively to familiar work than to novel work, and they perform more successfully on familiar tasks than on novel tasks even when the content (e.g. writing topic sentences) is the same" (p. 373). According to the recent research on environmental learning with service learning components, the opposite is true when novel work is implemented outside of the classroom. Mentioned in more detail later, special needs students and students with disabilities were shown to have excelled in many areas when novel work situations were invoked. And overall, researchers reported that mainstream students achieved both academic and social advancements.

Novel tasks in service learning are steeped in situated authenticity. That is, according to Doyle (2000), "Situations might be said to co-produce knowledge through activity, and thus, learning and cognition are fundamentally situated" (p. 2). Students engaged with a community of environmentalists working for sustainability will learn the culture's philosophy, working

concepts, tools, and behaviors through authentic activity and lessons. Furthermore, the authenticity engendered within experiential tasks contextualizes the learning experience for greater meaning and knowledge transfer.

Doyle's (2000) important contribution of authenticity to curriculum theory advocates a minimalist approach in pedagogy that calls for a reduction in diluted content and instead, real-life situations learners may encounter. The implication for service learning is important: "For situated advocates, the students should be taken, presumably, to the sites in which authentic activity of a community of practice occurs to avoid the distortions which easily follow from moving such activity into school contexts" (p. 4). Within this framework environmental service learners could potentially be involved with habitat restoration projects, public education, environmental monitoring, ecological site surveys, trash removal, tree planting, species protection, political advocacy, protests, and even sustainable facilities construction, etc.

Lave and Wenger (1991) work to describe and better understand learning contexts and to explore the nature of situated learning. The authors write that mastering both skills and knowledge requires learners to participate in the "Sociocultural practices of a community" (p. 29). Learning however does not just happen as a simple component of participation, but through legitimate peripheral participation, people engage in social practices that require "Learning as an integral constituent" (p. 35). Thus, the authors here are not advocating for any specific pedagogical methodology, rather they are dissecting and explaining the nature of learning processes under various community circumstances.

Lave and Wenger (1991) make an explicit point to distinguish between *learning curriculums* and *teaching curriculums*; the former consisting of potential opportunities for membership and the development of practice, "is thus characteristic of a community" (p. 97).

Teaching curriculums are constructed devices for instruction. This community of practice as described by the authors echoes Doyle's (2000) description above, and can be understood as a comprehensive social and cultural entity comprised of philosophy, working concepts, behaviors, etc. The various unique attributes of specific communities provide a context under which individuals are socialized and are therefore able to learn.

Service Learning

Service learning is a subtype of experiential learning. The phrase "service learning" was coined by the Southern Regional Education Board and William R. Ramsay in the late 1960's (Eberly, 1997). The National Commission on Resources for Youth, Inc. developed some of the earliest service learning programs such as "Youth Participation" in 1967 in New York City. This program emphasized youth leadership and sought to enhance students' personal and community responsibility. Under Youth Participation students worked on publications such as *Foxfire*, *The Fourth Street I*, and other publications that introduced them to community/neighborhood involvement, political and community activism, adult collaboration efforts, all while incorporating curriculum subjects such as language arts, fine arts, social studies, and mathematics (Klienbard, 1997). Many of the following Youth Participation programs that were designed in the early 1970 resemble programs currently being designed and implemented in 2006; while others are actually still facilitated in 2006! (Klienbard, 1997).

A Sample of early Service Learning Programs

- Students in Denver designed a Computerized Car Pooling program later adopted by the City of Denver,
- The West High School Ecology Club in Manchester New Hampshire brought legal action against corporate river polluters, designed ecology lessons that were later taught by high school students to elementary students, obtained river monitoring equipment through petitions, trained students and teachers in the use of monitoring equipment,
- In Adams, Minnesota, high school students were trained in physical therapy at the Mayo Clinic and used their study hall and lunch hours to help rehabilitate and provide companionship for handicapped students whose special education classes met at the high school,
- Students in New York City's City Arts program (still in operation in 2006), allows students to design and work with (painting) amazing public mural art for various neighborhoods.

Service Learning manifests itself in a multitude of national and international programs (often called "study service" abroad) offered through non-profit organizations, schools, cities, states, and federal programs, and even mandatory national youth service programs such as Germany's "Civilian Service," Costa Rica's "University Community Service," and Nigeria's "National Youth Service Corps" (Eberly, 1997).

Service learning has broad implications for pedagogy nationally and internationally; much of the (available) research on service learning has shown positive results for both students and the communities they serve. Community members have skills that can be investigated, shared, and learned by students, while students also have the ability to influence and educate the

public. Sobel (1996) advocated for the inclusion of this type of service learning in the curriculum and notes that “What we need, beginning in middle school is an orientation toward service. Environmental projects that serve the community show students the relevance of the curriculum and give community organizations an injection of youthful energy” (p. 33).

But according to Sinclair and Lillis (1980), unfortunately, teachers have historically not been very good at facilitating the much needed contact between students and adults in the community. For the many proponents of service learning, employment of this most unique pedagogy – one that integrates the curriculum with real life problems and authentic community situations – is paramount to progressive educational reform and thoughtful/meaningful learning experiences. As Schine (1997) so eloquently states:

If our children are to become competent adults and effective citizens, if they are to be prepared to meet the challenges that lie ahead, then public education must seek to combine rigorous academic instruction with an equally rigorous and demanding experience of learning through service to the community. (p.186)

Research Methodologies for Service Learning

Educational research on environmental learning with service learning components evaluates students for untraditional results when compared to the mainstream educational research, as “service is not a uni-dimensional, easily identifiable task with uniform objectives, as many classroom lessons are” (Arenas, Bosworth, & Kwandayi, 2006, p. 28). Arenas et al. (2006) go on to say that effects can be identified in the realms of “personal and social growth, academic and intellectual performance and civic and political involvement” (p. 28).

Doyle (2000) similarly writes that with authentic learning activity we encounter invisible pedagogies where “criteria for performance are implicit, multiple, and diffuse and differences in achievement are seen as expressions of uniqueness rather than differential attainments of a

standard” (p. 5). That is, activated authenticity should mimic or be closely involved with real community life (defined in relation to the individual site), close enough that it will hardly resemble what many educators consider to be schoolwork; teacher and student roles are blurred and outcomes between similar programs may present a high degree of variance.

The ideas espoused by both Arenas et al. (2006) and Doyle (2000) have direct implications for research on service learning. The more elusive and holistic outcomes (for students) achieved through authentic activities in service learning ultimately challenge the way researchers must evaluate effect. Additionally, as the more recent research on service learning is also concerned with hypothesizing about the longer-term benefits of service learning for building community social capital, relying too heavily on quantification of effects on students (without more descriptive qualitative methodologies) may result in losing important data. And although measuring long-term effects is an overarching goal of service learning, evaluation and measurement of social capital in the short term may remain completely elusive in some instances (Putnam, 2001).

Unfortunately, although there is a plethora of research on the effects of field-based experiential, as well as classroom-based environmental learning programs, there is a serious deficiency of systematic research that assesses environmental learning programs with service learning components. And while some of the research takes place outside of the US, the published English language research did not include research endeavors in Mexico. One of the broader goals of this research project in Pescadero is to contribute to, and respond to calls in the educational field (emanating from Mexico and the US) for more systematic analysis of service learning regarding the environment.

Some of the early researchers on service learning – e.g., Sinclair and Lillis (1980) – believed that service learning projects (what they called “relevance” education) positively contributed to the process of education, and in some way had a positive impact on social problems; they were however skeptical about the ability of researchers to directly measure service learning outcomes. While this is not exactly an inconsistency in the literature, a handful of results emerging from recent research on service learning paint a bright picture for research applications. Many of the more current research projects have been able to qualitatively and quantitatively assess experiential pedagogy that combines elements of service learning.

Waterman (1997) describes that the focus of education research on service learning is to uncover if the program is effective in enhancing learning through action, promoting personal development, fostering civic responsibility, contributing to the community: “The nature of the student populations most likely to benefit from such programs, and the identification of those program components that contribute most to success” (p. 9). The more narrow “evaluation” of service learning programs is intertwined with research, but is more concerned with program planning, implementation, and outcomes. The evaluation of the outcomes could be seen as either direct effects on students (as mentioned above), or possibly the longer term and broader effects on the community, environment, and potential for building social capital.

According to Waterman (1997), the research on service learning is more generalizable if program and curriculum designers (the potential audience) can more closely match their specific program goals and objectives to the programs under investigation in the research literature. With this in mind, a growing body of research on service learning is vital if educators are working to enhance programs (existing or future) that incorporate innovative pedagogical practices;

researchers (Buchen & Fertman, 1994; Serow, 1997) point out that anecdotal evidence dominates the field due to a lack of hard evidence of outcomes.

Serow (1997) warns that relying solely on the quantification of program effects on students excludes much of the pertinent detailed holistic information as well as the researchers who are not blessed with abundant funding to satisfy the more stringent rigors of quantitative analysis. He details the use of the life history technique (Bertaux, 1981) whereby researchers interview students to uncover the details of their lives before, during, and after the treatment, in order to judge the extent to which the program affected and/or changed the life of the learner. Thus, interviewers must be competent at asking pertinent questions if they are to draw conclusions about effects of treatments (Serow, 1997). He writes that performing research on service learning is also more involved than traditional education research:

What makes the assessment of service-learning so challenging is that it ultimately requires the evaluator or researcher not only to capture the essence of the experience itself, but also to show that students are converting that experience into other outcomes, among which are competence, participation, understanding, and relationships. (p. 22)

It is additionally important to take into account other perspectives to adequately document outcomes (triangulation): those of the instructors, parents, and community stakeholders, etc.

Another methodology for qualitative assessment of program effects is portfolio assessment. This includes using the cumulative information garnered from looking at student journals, as well as viewing drawings, essays, photos, awards, etc. Serow (1997) also advises looking at written and oral feedback from teachers, parents, and those impacted by the service project. Interviewing these subjects, as well as reading written documents has the potential to provide insight into the aspects of the course that were both effective and ineffective. In the past, according to Serow (1997), these portfolio resources have been underutilized.

Hamilton (1981) describes situations where service learners interact with so many variables (other students, community members, teachers, supervisors, prior experience, etc.) in their programs that what is learned on an individual basis is highly variable (and dependent) upon each student as well as the community/program environment. Therefore, Hamilton advises that longitudinal studies be employed to follow treatment and control groups into adulthood, look at career choices/achievements, and propensity for service to community. This is an important method for assessment and verification of effects of service learning programs.

Another author who has expressed concerns is Lipka (1997) who attended to the supposed validity of the usefulness of service learning for creating lasting and long-term effects in learners. His apprehension is partially due to the biased anecdotal evidence that suggests success with the pedagogy, as well as the lack of empirical longitudinal data available regarding service learning; more longitudinal research is needed to decide whether service learning is effective in “Adult life, particularly in terms of persistent, long-range effects on behavior, attitudes, and predispositions” (p. 56). Shumer (1997) echoes this sentiment and calls for more research regarding the longer-term effects of service learning on social and civic behavior. He proposes questions similar to Hamilton (1981) to guide such longitudinal research:

1. Do people who practice service activities while in formal schooling continue this as a regular practice throughout life?
2. If so, how and why is it done?
3. What is the benefit to communities in having service learning programs and how does the benefit manifest itself?

Recent Research on Environmental Learning Programs with Service Learning Components

The following section describes recent research on environmental service learning. Below is a comprehensive review of the literature published in English. While more research on environmental service learning may have taken place, it is possible that some of the results are not published, others are published in foreign countries in languages not accessible to this researcher, or that researchers in the third world who performed research did not have access to the internet to be used as a tool to share their un/published results.

Silcox (1993) used a mixed-methods approach to study a three-week environmental service learning program in Novgorod, Russia whereby 26 US high school students from Philadelphia, PA traveled abroad to work hand-in-hand with their Russian counterparts to undertake a river monitoring program in the city. The project was sponsored and organized by the Pennsylvania Institute for Environmental and Community Service Learning. Students measured toxins in the City's Volkhov River for detergents, cyanide, cobalt, and nickel.

Silcox (1993) focused his analysis of the program on measuring scientific knowledge and attitudinal changes in participants, as well as exploring whether or not the program was valuable in transmitting environmental knowledge between the two cultures. Assessment was undertaken through a mixed methodological approach that employed pre and post-testing of students through interviews and written testing. His findings were mostly positive. Silcox reported that the service learning methodologies increased the student's overall awareness of environmental issues.

Attitudinal measurements in students included topics related to student sense of social responsibility, self-confidence, motivation, locus of control, and acceptance of others. Silcox

(1993) found that while there were no increases in cultural tolerance between the two groups, the experiential (service learning) nature of the course was still an effective educational methodology in regards to the other factors between the US and Russian students:

The combined sample of American and Russian students showed a significant increase in students' concern about societal issues and in their perceptions of their own roles as agents of change. They expressed a greater understanding of the need for group action and action in confronting international problems. Environmental consciousness was emphatically higher in both Russians and Americans. Slight but insignificant increases occurred in self-confidence and intrinsic motivation. (p. 707)

Furthermore, the responses from Russian students indicated a distinct heightened sense of optimism and locus of control. Silcox (1993) notes that this positive result is more important when viewed in light of the context of traditional Russian pedagogy:

Authoritarian, repetitious, and based strongly on the writings of experts. A prevalent view exists among young Russians that "nothing will change," so effort is futile. This attitude is fostered by the utter hopelessness of a world that lacks opportunity for personal advancement and the chance of self-actualization. (p. 708)

Silcox admits that while his findings are positive, they are hardly generalizable in light of the small sample size and the unreplicable nature of the research. He calls for further research on the many issues brought to light by his work.

Johnson-Pynn & Johnson (2005) assessed two programs through an exploratory mixed-methods approach in East Africa-The Jane Goodall Institute's Roots & Shoots and Wildlife Clubs of Uganda-by interviewing and surveying primary and secondary students, teachers, and program coordinators. They explored the effects of the program on student conservation knowledge, cognitive and social competencies, affective experience, self-efficacy (empowerment and locus of control), and civic responsibility. Ultimately, they concluded that the school-based service learning pedagogy included projects that resulted in positively "increasing conservation knowledge, fostering members' personal and social development, and raising community

awareness” (p. 1). The research scenario and logistical situation in Pescadero, Mexico is similar in many ways to the work of Johnson-Pynn & Johnson, as both environmental learning programs operate in third world countries; both studies investigate experiential learning programs with elements of service learning that worked towards similar goals and employed similar approaches; and similar research questions were pursued.

Akin to the work of Johnson-Pynn & Johnson (2005), Powers (2004) evaluated the effectiveness of four environmental service learning programs in the eastern US to expand the field’s knowledge of how service learning affects students and teachers, and to improve upon the programs under assessment. Powers noted that service learning education is still in the novelty phase, and as such, the theories behind the pedagogy require more attention from evaluators. She specifically points to various service learning success stories, including those of a rural case study of more general service learning conducted by researchers at the Harvard Graduate School of Education for the Rural Trust (1999) which found that service learning in the curriculum improved academic achievement; heightened student interest in the community; resulted in greater teacher satisfaction (with their jobs); and strengthened bonds between community members, students, and schools.

Through the Place-Based Education Evaluation Collaborative (PEEC), Powers (2004) reported on her evaluation of the design of four different environmental service learning programs (CO-SEED Project, Sustainable Schools Project, Community Mapping Program, A Forest for Every Classroom Project). Her research utilized a mixed-methods design (primarily qualitative) using semi-structured interviews and focus groups with teachers, middle school students, administrators, community partners, parents, and program staff members.

Powers reports in her findings that the experiential nature of the four service learning programs benefited students with special needs, and increased student motivation and engagement in school. Teachers stated that special needs students (especially those with ADD and ADHD) worked more independently in service learning scenarios when compared to lecture and classroom lessons; enjoyed engaging with adult mentors in the community; and heightened their personal respect among non-special education peers (Powers, 2004). Benefits were similarly noted for ESL students. Finally, students in the program explained that they tried harder, paid greater attention, and learned more under the service learning circumstances because there were higher stakes involved. Most teachers reported an overall increase in student maturity and confidence, and students taking on greater responsibilities.

Bogner (1999) conducted research on service learning when he evaluated the effects of a year-long environmental learning course (habitat restoration) on 226 students in the 10 to 16 year-old range. The course was developed by two Swiss environmental non-profit agencies and focused students on learning about the natural history of the swift (an endangered bird), constructing and installing nest-boxes, communicating with student counterparts in Senegal (the wintering grounds for the swift), and observation of the bird in protected colonies. Student perceptions and knowledge were measured through a written questionnaire; the study was primarily quantitative in nature.

Bogner (1999) reported positive results that indicated increases in student perception in two areas: intent to support more personal environmental actions, and heightened enjoyment of nature. The course also resulted in a significant positive shift (26%) in the specific knowledge levels that concerned questions related to the environmental learning program. He noted that Fazio and Zanna (1981) and Bogner (1998) found that these attitude shifts were found to be more

sustainable in the long term if they were initially influenced by experiential activities in environmental learning. Bogner's study did not undertake a more descriptive qualitative analysis of personal and social growth, or civic and political involvement, as mentioned above by Powers (2004), Johnson-Pynn & Johnson (2005), and Arenas et al. (2006).

The four research projects presented above lack a plan for research (or none was mentioned in the literature) concerning assessment of the longer-term and broader effects of service learning. Three of the projects were published rather recently (1993, 1999, 2004, and 2005) and it is possible that longitudinal data is not yet available or is currently being collected. These research projects – as well as our work in Pescadero – are deciphering the outcomes of a specific pedagogy on students. This field of inquiry is young, yet as the field matures, it will become increasingly important to detail the broader and longer-term outcomes.

If the research on service learning has been moderately successful up until now at deciphering the vehicles within service learning that enhance student/community-member social relationships, attachment to place, and community action skills, etc., then there exists a need to also document its effects on heightening social capital. As noted by Powers, 2004: “When this civic engagement increases in a community, social capital- the invisible web of relationship- broadens and deepens. Social capital refers to features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit” (p. 19). If social capital is an invisible web of relationships then documenting the longer-term effects of service learning may entail embarking upon difficult genealogies that result in sometimes inconclusive findings. It is also a reality that researchers will never be able to claim in absolute terms that service learning alone influenced participant behaviors, attitudes, predispositions, etc.

A Synthesis of Research on Environmental Learning in Mexico

Much of the historical and current efforts led by educators, non-profits, activists, city, US, state, and federal entities to design and implement environmental learning is extensively documented. Few researchers are investigating environmental learning facilitation or outcomes in Mexico. This is not to say that there is a lack of an environmental movement pushing for more environmental learning in Mexico, but more accurately, formal research efforts are scant, have not been made public, or have not been published. The following section details the work of Barraza (2001), Barraza and Walford (2002), and a handful of other researchers who have embarked upon research on environmental learning in Mexico, as well as document its progression, or lack thereof.

Barraza (2001) and Barraza & Walford (2002), have performed the most extensive research on the current and historical state of environmental learning in Mexico. Barraza (2001) stated that in Mexico there is less of a focus on enquiry and investigative pedagogy and more of a top-down focus on textbooks. And while the government of Mexico has provided and promoted “official” manuals and textbooks containing environmental education topics, environmental education is not an independent item in the National Curriculum (Barraza, 2001). “The National Curriculum appears to have a potentially rich environmental content. Though this is widely recognized at the level of rhetoric, more research is needed to explore such content and its relationship to teaching” (Barraza & Walford, 2002, p. 184).

This formal focus on printed environmental education materials in Mexico differs from the situation in the US. Ramsey (1987) cited both Childress (1978) and Volk (1984) who

reported in the late seventies and mid eighties that environmental curriculum focusing on citizenship action skills barely existed in the US. The current state of environmental learning (sanctioned by U.S. federal and state guidelines) in 2006 remains almost unchanged. Ramsey (1987) found that environmental learning in the U.S. falls far short of meeting its goal of affecting environmental behavior change. Likewise in the US, materials were and still are heavy on awareness instruction where the ineffective means do not complement the ends.

After documenting the experience of teachers who implemented an environmental learning course on the topic of wetlands in Sonora, Mexico, De la Garza Trevino (2006) concluded that the Mexican education system lacks a systematic strategy for facilitating environmental education in the schools. The Ministry of Education does not include teachers in policy planning regarding environmental learning, it does not provide teachers with environmental training and support, nor does it incorporate any comprehensive environmental curriculum. Furthermore, De la Garza Trevino (2006) noted that in Mexico, “Environmental education is still classified as a special program, alternative, elective, non-compulsory and, so, highly sensitive to budget constraints” (p. 15). Fortunately, nonprofit organizations do provide resources for designing and implementing environmental learning efforts in the schools and communities.

De la Garza Trevino (2006) also found that out of 23 teachers interviewed in the wetlands education program, 8 (35%) did not feel comfortable teaching environmental learning due to a lack of training, background materials, and information. Six teachers (26%) were amenable to increasing their partnerships with nongovernmental entities for guidance and support with environmental learning. Many of the 23 teachers felt most comfortable using didactic and top-down methodologies while according to the researcher: “Most of the teachers thought that more

structured outdoor experiences and hands-on learning opportunities led by experts were needed to strengthen the impact of environmental education on their students” (p. 55).

History of Environmental Learning and Educational Policy in Mexico

- During the 1982-1988 educational reforms in Mexico the K-12 curriculum was restructured and eventually included environmental education as a topic to be taught (Barraza & Walford, 2002). Wuest’s research published in 1992 (as cited in Barraza, 2001) found that the policy was not enacted in practice due to lack of an specific implementation strategy.
- In 1983 SEDUE (Ministry of Urban Development and Ecology) was created by the Mexican government. SEDUE designated a specific department for the promotion of environmental education (Barraza, 2001).
- DeAlba, Gonzales-Gaudiano, & Morelos’ (1988) research published in 1988 (as cited in Barraza & Walford, 2002) found that in 1986 Mexico City experienced high levels of air pollution that instigated then President Miguel de la Madrid to announce a decree that the Ministry of Public Education (SEP) should create methodologies to facilitate ecological education in Mexico. According to Barraza (2001), in addition to educational policies, schools also began implementing environmental policies in facilities management regarding transportation.
- SEDUE’s report published in 1987 (as cited in Barraza, 2001) showed that during 1987 SEDUE, SEP, and the Ministry of Public Health (SSA) created the National Environmental Education Programme (PRONEA) to guide primary school teachers

through environmental education methodologies and activities with the help of a published teacher's manual.

- According to Zurita, Serrano, & Tovar's (1990), research published in 1990 (as cited in Barraza, 2001), public debate spurred primary education to incorporate environmental knowledge and the formation of values and attitudes into the curriculum. DeAlba's research published in 1994 (as cited in Barraza, 2001) showed that the SEP redesigned textbooks in 1993 to include environmental issues in the context of natural and social science issues; these textbooks were distributed during the 1995-1996 school year. If these environmental texts/lessons have been utilized in Pescadero at the primary or secondary levels it will be revealed through surveys and student interviews.
- The National Academy of Environmental Educators was founded in 1999 to "promote and facilitate the development of the theory and practice of environmental education" in Mexico (Barraza & Walford, 2002, p. 173).
- Mexico's Secretary of Environment and Natural Resources (SEMARNAT) recognized the environment as a subject area of importance in the schools. In the *Strategy of Environmental Education for Sustainability in Mexico*, SEMARNAT (2006) proposed broad educational goals to be implemented by 2014. The agency promoted the creation of an environmentally literate culture through 1) consolidating environmental education for sustainability as a public policy based in legislation; 2) provisions for significant financial resources and; 3) training teachers and environmentalists able to respond to the demands of sustainability. For the purposes of middle school education, the agency highlighted the environmental subject areas of personal responsibility; consequences of

human activity; biology; civic and ethical responsibility; loss of biodiversity; and environmental conservation.

Linking Environmental Issues with Social Justice

Educational programs (and associated curriculum) that address the various spheres of environmental studies: education, wildlife and resource management, policy, communication and awareness, science, etc. have in many instances neglected to incorporate and investigate the linkages between social and environmental justice. Innovative and comprehensive solutions to environmental and social issues demand that pedagogical and intellectual endeavors transcend the artificial separation of these two intertwined themes. And because study of the environment (and environmental issues) is interdisciplinary by its very nature, there is no legitimate reason to perpetuate the oversight of these human dimensions.

The following authors' ideas are presented to represent ideologies that work to sustain the linkages between education, environmental, and social justice issues. Traditional cultural values are seen by these authors as crucial for instigating and preserving intergenerational knowledge that ultimately works to protect a population's identity, diversity, and sustainability; their commonly held lands; and their societal autonomy and self-sufficiency.

Prakash and Esteva (1998) write that our current era, dominated by experts of the establishment, is dying. As a result the authors have noticed that the commons are being reclaimed through localization and ruralization and a shift away from the monocultures of education. Modern pedagogy often neglects local protection of place, traditional sense of place, cultural customs, and traditional teaching and learning patterns. The imposition of modern education on traditional cultures is instigated and facilitated by knowledge brokers who promote

capitalism and associated lifestyle and consumption choices. The authors discuss events in 1994 in the south of Mexico where Indians in the Zapatista movement fought to reclaim the commons “And to govern themselves autonomously, well-rooted in the space to which they belong and that belongs to them” (p. 50). Furthermore, this movement is not limited to the third world, as seen in the “Alternatives to Education Campaign” in Ireland. This campaign works to marginalize the economy of the educators and promotes “Meaningful and productive life within their own community, and in their own locality. In rural areas in particular, this policy would tackle the twin problems of rural depopulation and rural unemployment” (Molloy, 1991, p. 53).

Bowers (2005) and Esteva, Stuchul and Prakash (2005) explain how the much-revered Freirean approaches to population empowerment and emancipation through education are in many instances disguised forms of colonization that promotes education lacking important attention to the current ecological crisis and the Third World grassroots cultural resistance to economic globalization. That is, motivating and empowering the oppressed and illiterate “Is based on a lack of understanding and appreciation of the knowledge of indigenous cultures” (Bowers, 2005, p. 3). Freirean approaches to literacy ignore the potential of communities to rise up and take control of adverse situations under their own free will and have the added detriment of promoting hyperindividuality and the subsequent loss of diversity (community and local traditions). Additionally, the authors point out that through literacy the oppressed are often turned into customers, clients, and beneficiaries, thus widening the separation between the oppressed and their educators; Freire’s pedagogy and curriculum theory thus at times creates dependency (Esteva et al., 2005).

Bowers (2001) offers suggestions to operationalize a pedagogy with an ear towards eco-justice: “Balance critical reflection with the renewal of community-centered traditions that

represent an alternative to cultural trends that are now overshooting the long-term sustaining capacity of the environment” (p. 183). However he warns against implementing a rigid eco-justice curriculum design in favor of a pedagogy that is:

Responsive to the cultural patterns enacted in the relationships that make up the complex ecologies of the classroom and the larger communities. It should also strive to illuminate environmentally destructive patterns and to reinforce cultural patterns that have a less destructive impact on the environment. In short, an eco-justice pedagogy should be understood as a culturally and ecologically responsive form of teaching. (p. 187)

Bower’s (2001) recommendations for the promotion of an eco-justice curriculum imply that teachers (and hopefully graduate schools of teacher education) have a greater set of responsibilities as professionals and thus must work more intensively and thoughtfully to act as mediators who holistically affect and incorporate the learner, the community, and the environment. This retooling requires acknowledging the dominant social paradigm that promotes hyperindividuality and a hyperconsumer culture. It is important therefore to understand where in the curriculum education reproduces language and practice that facilitates the culturally and environmentally destructive patterns of the dominant social paradigm, and to address these issues accordingly.

It is evident from the excerpts above that ideological awareness and subsequent change is necessary to better incorporate social and environmental issues together in education. A knowledge and respect for the environment, local traditions, community, and culture is paramount (and challenging) for successful educational reforms (Bowers, 2005). Graduate programs in colleges of education, in his opinion, need to be held to new standards of accountability so that future educators are not perpetuating the ecologically harmful, hyperindividualistic, and future-consumerist goals of neo-liberalism and capitalism. Currently, higher education at times devalues (perceived and/or constructed) low-status knowledge that

often has much higher regard for community assistance and moral reciprocity (Bowers, 2005). Simply put, minority cultures, their indigenous knowledge, and their ecosophies, are at times ignored by educational institutions. Colleges of education should be training teachers to promote decolonizing approaches to education, uphold and facilitate intergenerational learning, and efforts to create sustainable communities in order to counter the ills that could be addressed by eco-justice pedagogies (Bowers, 2005).

CHAPTER 3

METHODS

The purpose of this study was to document a unique environmental learning course in Mexico and qualitatively and quantitatively explore the outcomes of this program on student environmental knowledge, perceptions, and actions. It was hypothesized that students engaging in this environmental learning course – complete with service learning opportunities – would be positively impacted emotionally, socially, and intellectually, and exhibit achievement in environmental knowledge, perceptions, and actions when compared to control groups not participating in environmental coursework.

The following methodological chapter describes the course instructional design and research setting; and the quantitative and qualitative research designs that include the sample population, methods of data collection, and data analysis; and the measurement instruments, and instrument validity (accuracy) and reliability (consistency).

Research Overview

This research effort combined the methodologies and research questions as presented above in the literature review while simultaneously expanding the scope of those projects. This effort utilized Hamilton's (1981), Johnson-Pynn & Johnson's (2005), Lipka's (1997), Power's (2004), and Shumer's (1997) contributions to the field by pursuing qualitative descriptions of the outcomes of the service learning course on academic achievement, self efficacy, the affective experience, social competency, family, propensity for service to community, and long-term effects in learners. It also employed and expanded upon Bogner's (1999) quantitative methodology that measured service learning effects on student knowledge and perception (we

also measured actions). In summation, the current study used these research projects as models in order to design a research project that quantitatively measured the effects of an environmental service learning course on student environmental knowledge, perception, and actions, while qualitatively describing the courses effects on student experiences.

Through concurrent mixed methods interview and survey this research explored the factors associated with the outcomes of the course on student participants. The mixed methods approach was employed for its usefulness in triangulating responses between interviews and surveys (Creswell, 2003; Silverman, 2006). Semi-structured interviews with students, their teacher, parents, and community influentials provided descriptive depth and additional diversity regarding the student experiences. A written survey was utilized to quantitatively measure potential changes in student environmental knowledge, perceptions, and actions.

Research questions guiding this study:

Qualitative

1. What are the reactions of Mexican students participating in an experiential environmental learning course with service learning components?
2. To what extent do Mexican students involved in (school based) experiential

environmental learning become more aware of, and involved in, environmental issues facing their community.

3. How does the cultural, political, educational, and economic atmosphere in student homes and the community of Pescadero affect students?
4. What specific aspects of the environmental learning course have been most influential in affecting student's learning and environmental experience?

Quantitative

1. Is Mexican student environmental knowledge positively and measurably affected during and after participation in a yearlong experiential environmental learning course?
2. How are Mexican student environmental perceptions influenced during and after participation in a yearlong experiential environmental learning course with service learning components?
3. To what extent do Mexican students exhibit and self report measurable changes in environmental actions during and after involvement with experiential (school based) environmental learning in their community?

Population and Setting

Pescadero Baja California Sur, Mexico is located about 10 km south of the Magic Pueblo of Todos Santos. The Mexican census of 2005 reported a population of 1,634 inhabitants (INEGI, 2005). Pescadero is predominantly an agricultural community growing mangoes, basil, tomatoes, chilies, eggplant, and peppers. The town is home to Sueño Tropical, a major grower,

packer, and distributor of organic produce to the US and Mexico. The parents of students in the course work predominantly in the following professions: 1) Agriculture (50%); 2) Construction (21%); 3) Retail (5%); 4) Textiles, automotive, education, municipal work, mining (24%). The more rural and coastal western portion of the community is popular with foreign and domestic tourists and is rapidly being developed and marketed for real estate investment and recreation.

A few different entities contribute to existing environmental efforts in the town. For instance, the head nurse at a local health center conducts door-to-door campaigns using students to discuss with community members how to reduce breeding areas for Dengue carrying mosquitoes. The students and the health center have also conducted trash removal projects in the community. The Directora commented on the major environmental issues facing Pescadero:

The major problem is the garbage, the landfill location and the locations of the clandestine garbage locations (illegal dumping), having garbage go where it shouldn't go. The places where you're supposed to put the garbage have no recycling or compaction equipment or machines to organize it. Garbage is everywhere, and there's a real problem in the community, people throw their garbage out the window or create illegal dumps.

We need to first educate the population. I work in the schools and we have groups for education to make people conscientious about this problem. A local NGO works to help families to separate garbage.

I think that the government should be more involved to help insist that changes are made and that education is given to the community about how to change the way they live. The government is working with the ejiditarians to improve the [existing] dump and find a different place to build a sanitary landfill.

We talked to the former president of the ejido and he expressed similar concerns:

What is lacking is education. Pipes are left on the ground in the arroyo and water pipes are broken. We need to start a new sanitary landfill because it's a pigsty over there with flies. In the town the trashcans are overflowing and there's trash in the streets and dogs come and raid the cans. Also, houses spill sewage into the street and this is piggy; I don't like this!

There are community representatives, authorities who can monitor these things, so they don't happen. The landfill is in the land of the ejidos of Todos Santos. We [from Pescadero] are trying to work with the authorities in Todos Santos, but the authorities say

it is very costly to put in a new landfill, and we think Pescadero should have its own landfill and Todos Santos should have its own landfill. We are checking up on the hill for a space. We're not able to compete with other countries. I worked with the landfill in Los Angeles, CA and the wood is separated, everything is separated. Here, it's not like that, it's very piggy, what we need to do is educate the people.

We spoke with a local NGO research organization that not only helps other civil organizations in decision making, but provides environmental research, education, and consulting concerning natural resources. Among other community projects, the NGO works in Pescadero on solid waste issues and supports households and the Telesecundaria with their recycling efforts. This NGO is funding Baum's environmental learning program in the Telesecundaria during the 2007/2008 school year. According to the Directora of the organization, Pescadero is currently facing serious changes in land management:

Deforestation is a big issue, as is care with water. This is a town with water, and we are in an oasis area. Being in the desert with water is a privilege and the people are used to the water but they don't take care of the water. The water is there and it can be lost easily, and we use too much of it. Development, the ejidos are selling everything! For us it's a terrible environmental threat. The thing is that it is like Los Cabos development which means a real environmental threat from our point of view. The people do not value the land or the water or any other resources. We have a really terrible cultural problem, that's the largest problem. We are not used to being aware of, or taking care of our resources. I said "we" meaning the Mexicans. A very, very low consciousness about natural resources all over the country.

A few different sea turtle protection NGOs work in Pescadero and the surrounding beaches to relocate endangered sea turtle eggs to safe "viveros" where biologists, volunteers, and students look after the eggs until they are ready to hatch. These organizations also facilitate educational opportunities for students to learn about sea turtle protection efforts, the biology of sea turtles, and threats to their survival. Students from the Telesecundaria have visited the vivero when sea turtles are hatching, and are given the opportunity to release sea turtles to the ocean

from the beach. A biologist from one of the organizations explained to us the why so many in the community are concerned with protecting these endangered species:

It's the indiscriminate fishing; this is the area where people consume more turtles than anywhere else in Baja. It's also that the politicians are eating turtle too and are not doing anything about the problem. I think the contamination that's getting to the sea, like the garbage, is also really affecting the turtles. For example the plastic bags that look like jellyfish, the turtles ingest these.

I think people are consuming endangered species because the government hasn't properly showed them how to consume other species that aren't endangered. The fishermen have been eating sea turtles for so long now, that they can't eat them, they need to have something in it's place. The government needs to help the fishermen find other things to take the place of the turtle.

Sampling

The Telesecundaria has an attendance of approximately 150 students in grades 7-9. The 7th graders are in the midst of a curriculum revision, and they watch satellite programming; however, much less than the other grades. The 7th grade education is dependent on their teachers as well as media like internet, Encarta online (not yet connected), and various DVD's and CD's. The two 7th grade teachers commute each day to from La Paz (1.5 hours each way).

The research focused on interviewing and surveying four groups of middle school students (See Table 2). Fifteen of the 18 students who already completed the environmental learning course during the 2004/2005 school year were surveyed and interviewed (see Appendix A for survey instrument and Appendix B for sample student interview questions). Interviews were useful for delving deeper into the potential outcomes of the environmental learning course on students over time. The results of using both interviews and surveys painted a more accurate picture of how the course affected student knowledge, perceptions, and actions over the long term, and were helpful in uncovering and explaining the potential for increasing environmental

awareness among students, describing comprehensive experiences, and determining how the service learning components of the course impacted the students.

One control group of approximately 15 students from an unrelated course were administered written surveys; a small random sample of five students were interviewed. This control group was comprised of students who attended the Telesecundaria at the same time as the 2004/2005 treatment group, but during the 2004/2005 school year did not participate in the environmental learning course.

One intact class of 23 students in the process of taking the course during the 2006/2007 school year were longitudinally surveyed and interviewed on two occasions during the school year. One control group of 17 students during the 2006/2007 school year (in an unrelated class) were longitudinally surveyed, five were interviewed at the beginning and end of the school year. For ease of sampling, this control group was comprised of students from a preassembled intact class (Van Dalen, 1973).

Pre-interviews with students whom are taking the course during the 2006/2007 school year (and the control group) covered similar questions related to personal backgrounds and prior involvement in, and exposure to, environmental learning and activities. Post-interviews with the treatment group focused on student experiences and participation in the course, while post-interviews with the control group focused on their involvement in environmental activities and behaviors over the course of the 2006/2007 school year not related to the environmental learning course (that they have never taken).

Students that completed the course over the 2004/2005 school year were asked questions concerning their experience participating in the environmental learning course. Students in the control group for that year were asked questions regarding their participation in environmental

learning in other courses as well as their environmental behaviors and volunteerism outside of school.

Concerning the quantitative instrument (survey) administered to the control groups and students that completed the course in a prior school year: looking at the course outcomes on environmental knowledge, perceptions, and actions longitudinally provided us with comparison data that revealed changes (advancement, retention, or reduction in measurable environmental attributes) in cohorts over a two year time span (Menard, 1991; Marshall & Rossman, 1999). This research resulted in (at least) a retrospective panel design “In which data collection may occur only once, at one period, but in which data are collected for two or more periods (prior to or during the period in which data are being collected)” (Menard, 1991, p. 29). There is also an important potential here for this research to be continued on a yearly basis as a longitudinal panel design.

Students that took the course in 2004/2005, and the control group from that same year, were administered a questionnaire (post-test) that covered the entirety of the environmental learning course. Students taking the course during the 2006/2007 school year were given the same version of the questionnaire during both the pre and post-tests. The questionnaire was relevant to lessons conducted during the entire school year (semesters 1 and 2). See Appendix A for the quantitative instrument. In summary this specific design accomplished the following:

- The study acquired data on students who took the course two years ago in order to immediately assess the outcomes of the course over time.
- The study acquired data on students who completed the course in 2007 vs. students who completed the course two years ago (2005); this provided a useful comparison of how

time effected student environmental knowledge, perception, actions, involvement, and consciousness.

- We gathered data from two different years of treatment groups vs. two years of data from students who never took the course (the control groups), thus providing more (powerful) comparative data on course outcomes.

The two treatment groups participating in the environmental learning course total 37 students (n = 15 from 2004/2005 and n = 23 from 2006/2007). The two control groups consisted of 30 students (n = 15 from 2004/2005 and n = 17 students from 2006/2007) who participated in unrelated (non-environmental) courses. Each treatment and control group was heterogeneously structured in regard to age, gender, and ability (see Table 1). Baum, the Directora, and the science teachers at Pescadero's Telesecundaria chose the treatment group to participate in the environmental learning class during the 2006/2007 school year. In short, two incoming classes were arriving in 2006. One of the teachers volunteered for his class to participate in Baum's course while the other agreed to have his class be part of the control group. Teachers of older students who had not taken Baum's course in 2004/2005 also agreed for their students to be part of the control group.

TABLE 1:

Student Demographics

	Mean age	Mean yrs. living in Pescadero	Lifelong residents
Treatment group 2004/2005	15.2	11.73	11 of 15
Treatment group 2006/2007	12.5	7.7	11 of 23
Control group 2006/2007	12.7	11	6 of 15

Students taking the course during the 2006/2007 school year (and the control group) were given pre-test interviews and surveys. The researcher administered all pre-testing instruments for both the control and treatment groups in September of 2006, two weeks before the treatment course began. Students whom already completed the course during the 2004/2005 school year (and the control group) were given written surveys and interviews in January of 2007. This schedule allowed for about one year and seven months to pass (since completing the course) before the students in the 2004/2005 treatment group were surveyed and interviewed.

Telesecundaria personnel and a paid interpreter were present to assist students with any questions during the written portions of the survey. While the researcher's Spanish is "good," a fluent Spanish interpreter was hired to assist with all student interviews on every occasion.

In the weeks before and after Semana Santa (early April, 2007) the researcher observed service learning coursework and participated in the student's service learning activity at Los Cerritos Beach (see Unit 10 above).

The final written tests and student interviews (post-testing) for students taking the course (and the control group) during the 2006/2007 school year were conducted in June, 2007, two weeks after treatment ended. Both the treatment and control groups were administered the

written (quantitative) portions of the tests on the same day on all occasions. Students in both groups were interviewed by the researcher; details of the interview schedule and methodology are presented in Table 2.

TABLE 2:

Quasi-experimental design: Nonrandomized Control-group Pre-test-Post-test Design (Van Dalen, 1973)

Nonrandomized Control Group Design				
	Group	Pre-test	Treatment	Post-test
	A	O	X	O
	B	O		O
	C			O
	D			O

“O” represents a measurement. “X” represents the treatment

- A) Treatment group 2006/2007 n = 23
- B) Control group 2006/2007 n = 17
- C) Treatment group 2004/2005 n = 15
- D) Control group 2004/2005 n = 15

In addition to student interviews, three other types of interviews took place (Serow, 1997). The principal of the Telesecundaria as well as the homeroom teacher were interviewed in June of 2007. Patricia Baum, course designer and facilitator, was also interviewed in order to verify the student reported insights (Yin, 2003). These interviews were also useful for gathering information concerning various course outcomes that the students overlooked, forgot, or lacked the expertise to identify. Baum has taught the course for the past five years and proved instrumental in uncovering various course results in regards to student, familial, community, and environmental outcomes.

Additionally, in order to further triangulate and corroborate student responses and to better understand the context of the student responses, a sample of seven parents of students who completed the environmental learning course were also interviewed at their homes (see Appendix C) (Serow, 1997). These seven parental interviews added additional data to our knowledge of course outcomes on students, student experiences in the course, and we also had the opportunity to uncover if, and how, these students are impacting the family (behaviorally and socially). Baum made recommendations concerning parents that she believed to be amenable to interviews. For instance, these parents included individuals with whom Baum had prior contact with and would understand the nature of our research. None of the individuals we approached to interview declined our invitation.

A sampling of eight community influentials were interviewed in order to ascertain some of the broader environmental issues facing the broader community (see Appendix D) (Serow, 1997). These interviews assisted in contextualizing the social environment and provided multiple insights and prior history (Serow, 1997; Yin, 2003) of the community and environmental issues students are studying and working within. Individuals were chosen by Baum and the researcher for their long-standing commitment to, and understanding of, the social, economic, political, environmental, educational, and health issues in the community. These individuals were more than happy to contribute to the research and provided lengthy and candid interviews.

Qualitative Instrumentation

Students were interviewed by the researcher using a semi-structured interview style. The interviews took place at the Telesecundaria and student homes in Pescadero, Baja California Sur

with the assistance of the interpreter. Parent and community influential interviews took place in the homes of parents and the work-places of community members. All interviews were audio recorded, transcribed, and coded for thematic trends. The coding included measuring and scoring individual responses to specific questions and were categorized according to the four broader research questions guiding this effort as well as the sub-themes within the research questions.

Before student interviews were implemented the researcher and interpreter had an opportunity to field-test and conduct practice interviews with fluent Spanish and English-speaking adults in order to practice performing reliable and valid interviews. Interviewees informed this researcher and the interpreter when the information relay was accurately depicted.

Field-observations were conducted in the winter and spring while the environmental learning course was in session. The researcher visited the Telesecundaria and service learning field-sites to witness the course in action; recorded field notes and observations of the activities instigated by the course; and observed student and community experiences and related outcomes. Such observations and related field notes were valuable for contextualizing interview responses from students, and other interviewees (Yin, 2003). Photographic documentation by the instructor and researcher was included during school and field sessions.

Analysis of Qualitative Data

Qualitative descriptive narratives are used to present the interview data gathered in this case study (Creswell, 2003). The recorded participant interviews were transcribed and coded. Representative participant quotes are detailed in Chapter 4 to answer the four qualitative research

questions guiding this research. These descriptive narratives were useful for explaining participant and course phenomenon and conveying the multiple research findings.

Validity of the qualitative findings was further addressed by using accounts of discrepant information (deviant cases) (Creswell, 2003). Highlighting the outlying participant perspectives provided for a more holistic understanding of the potential variations in responses while allowing for a more contextualized and descriptive participant response framework. The prevalence or lack of discrepant information therefore allowed for greater insights into the credibility of perceived patterns of phenomenon identified by the research.

The qualitative analysis employs tabulation of type 1 and 2 tabulations as prescribed by Silverman (2006). These tabulation techniques are used to further enhance the accuracy of qualitative data by providing prevalence of phenomenon and certain responses through percentages. For instance, type 1 tabulations were used to calculate the percentage of students in the course who, in their opinion, believe that species extinction is the gravest environmental issue. A type 2 tabulation was used to “count participants’ own categories as used in naturally occurring places” (Silverman, p. 300). In regards to this research, we noticed the phenomenon that when some students returned home from school, although they were not specifically instructed to do so, they informed their families about environmental issues and encouraged pro-environmental behaviors. Therefore, a type 2 tabulation was used to quantify the amount and nature of intergenerational learning taking place.

This research effort is not a grounded theory project; however, application of the constant comparative method that addresses two different groups of participants at one or two time periods was utilized (Silverman, 2006). This cross-case analysis of participant responses

provided useful as a tool for comparing and categorizing participant perspectives and for the identification of common and disparate themes.

Quantitative Instrumentation

Surveys were administered to the two treatment groups as well as the two control groups. Surveys provided important data for measuring course outcomes on student environmental knowledge, perceptions, and actions. The use of surveys during pre-testing provided an important baseline for comparing and measuring student changes due to treatment effects. The use of surveys also provided greater descriptive information that complemented the student interviews.

A portion of the quantitative written instrument utilized The Environment Questionnaire that is based on the Model of Ecological Values (Wiseman & Bogner, 2003). The instrument was used to investigate the outcomes of the environmental learning program on Mexican adolescent environmental perceptions. The Model of Ecological Values has shown in field tests (in both Europe and the United States) to be an accurate tool for measuring changes in student perceptions in relation to a variety of environmental program designs (Bogner, 1998; Bogner, 1999; Bogner, 2002; Johnson & Manoli, in press). Although calling for more research that incorporates the model, Johnson & Manoli (in press) found that “The Model of Ecological Values is a powerful perspective for examining environmental perceptions in children and for evaluating the effects of environmental learning programs on those perceptions” (p. 13). The model has not been used in Mexico with research that measures the effects of environmental learning with service learning components.

The written portion of the test that measures changes in environmental knowledge was based on general knowledge items and lessons within the context of the environment in Baja, Mexico that is incorporated in the environmental learning course under investigation. Similarly, the change in student environmental action items was measured in relation to those action items that are encouraged and studied in the context of the environmental learning course.

Content Validity

Patricia Baum and committee member Bruce Johnson worked with the researcher during the summer of 2006 to design a survey instrument and interview questions that represented the curriculum and its instruction. Members of the doctoral committee helped to verify construct validity to ascertain whether the survey and interview questions focused on the three research constructs (environmental knowledge, perceptions, and actions). Face validity was also assessed. See Appendix A for the complete survey instrument.

Validity

In order to verify that the instrument was measuring what it was intended to measure, the survey was field-tested in the US with the assistance of a native Spanish speaking interpreter and a Spanish-speaking middle school student during the summer of 2006 (Marshall & Rossman, 1999). Our interpreter translated the English survey into the Spanish language and then had her Spanish speaking 13 year-old cousin complete the instrument. After completion, the survey was revised for clarity and accuracy. With the help of Baum, our Pescadero based interpreter, and a teacher at the school, we further edited items in the survey to reflect the regional dialect. The students completed the instrument during the fall of 2006 at the Telesecundaria and we assessed

that the instrument addressed the environmental constructs under investigation; however, in the conclusion, we offer ideas for further improvement of the device.

Reliability

In order to describe the survey instrument's internal consistency we measured the internal consistency reliability with Cronbach's Alpha. This measurement allowed us a glimpse of how closely the questions within a scale relate to each other. After the 2006/2007 control and treatment groups finished the survey at pre-treatment we determined: the Alpha score for the environmental knowledge portion of the survey to be 0.50; the Alpha score for the environmental perceptions (preservation) portion of the survey to be 0.61; the Alpha score for the environmental perceptions (utilization) portion of the survey to be .71; and the Alpha score for the environmental actions portion of the survey to be 0.72. Alpha scores above 0.70 are commonly considered to be more acceptable (Nunnally, 1978). It is possible that we received deflated Alphas for the environmental knowledge portion of the survey due to the fact that each of the knowledge sections measured different attributes and/or dimensions of knowledge (Yu, 2007). It is also possible that deflated alphas in the knowledge and perception portions of the survey were affected by the small number of samples.

Internal Validity

The pre-test mean survey scores and standard deviations of the treatment and control groups for 2006/2007 were assessed for similarity using an independent sample T-test.

According to Van Dalen (1973):

If similar groups are selected and their similarity is confirmed by the *T* mean scores and standard deviations, this design controls several potential sources of internal invalidity. The presence of a control group enables the *E* to assume that the main effects of history, pre-testing, maturation, and instrumentation will not be mistaken for the effect of *X*, for both the experimental and control groups will experience these effects. (p. 296)

Statistical Analysis

The statistical analysis of pre and post-test survey scores was conducted with parametric statistics: independent sample T-tests and paired samples T-tests (see Table 3). Paired samples T-tests were used to identify differences in student mean pre and post-test survey scores within the 2006/2007 treatment and control groups. Independent sample T-tests were utilized to identify differences in student mean post-test survey scores between the 2004/2005 control and treatment groups. Independent sample T-tests were utilized to identify differences in student mean pre and post-test survey scores between the 2006/2007 control and treatment groups. We cross-checked the 2006/2007 parametric statistic results utilizing nonparametric methods, as in some instances we had small sample sizes of less than 20 individuals (StatSoft, 2003). Nonparametric statistical tests “Are free of assumptions about the specific shape of the distribution of the population of scores” (Minium, 1978, p. 346). Similar to Bogner, we compared pre-tests and post-tests of students by creating individual "tandem" data using the Wilcoxon Matched-Pair Signed Ranks Test.

TABLE 3:

Statistical operations conducted

2006/2007 Respondents	Statistical operation
Control pre-test to Treatment pre-test	Independent sample T-test
Control pre-test to Control post-test	Paired samples T-test
Treatment pre-test to Treatment post-test	Paired samples T-test
Control post-test to Treatment post-test	Independent sample T-test
<u>2004/2005 Respondents</u>	
Control post-test to Treatment post-test	Independent sample T-test

Further Analysis of Environmental Perceptions and Actions

For the 2006/2007 student groups we plotted both the control and treatment group environmental perception scores on the ENV scale (Wiseman & Bogner, 1999). Two scales present pre-course preservation and utilization scores/placements of the control and treatment groups while two scales present post-course preservation and utilization scores for the two groups. For the 2004/2005 groups we plotted both the control and treatment group environmental perception scores on the Model of Ecological Values scale. These two scales only present post-course preservation and utilization scores of the control and treatment groups as there was no pre-test data.

For the 2006/2007 control and treatment groups a student's individual pre-test action score was compared to their post-test score. The mean of the total action score for the control group was statistically compared to the total mean action score for the treatment group (at post-test for both the 2004/2005 and 2006/2007 groups).

Description of the Treatment

This section details the instructional design of the environmental learning course. This course is the basis of analysis for outcomes on the treatment groups when compared to the control groups. Patricia Baum developed the Telesecundaria's Environmental Learning course. Baum has administered the course in Pescadero's Telesecundaria each year from 2001 to 2006. The class encompasses a full school year-both the Fall and Spring Semesters (September through July). The course met more-or-less weekly, on campus, and many times in the field. In past years students have chosen to take her class as an elective. For the purposes of this study, one

class of 23 first-year Telesecundaria students (7th graders) was chosen by the teachers in the school to receive treatment during the 2006/2007 school year.

Baum is a US expatriate living in the town of Todos Santos, approximately six miles north of Pescadero's Telesecundaria. Baum has neither a formal background (degree) in education, nor in the design of environmental learning curricula. Alternatively, she has an extensive community activist background working in both marine and terrestrial conservation issues. She is co-founder of Grupo Tortuguero de Todos Santos AC and Grupo Ecologico y Tortuga De Pescadero AC and is currently (as of 2007) employed by ASUPMATOMA AC, the region's oldest sea turtle conservation organization. These three groups focus on sea turtle, habitat, and conservation education efforts in and around Pescadero and Todos Santos. The groups are comprised of paid employees as well as citizen volunteers who work directly with handling and releasing sea turtle eggs and the hatchlings. Baum is a documentary filmmaker, owner of the Los Cerritos Surf Shop, a community and school based educator, and has voluntarily designed and implemented the environmental learning course for Pescadero's Telesecundaria. Additionally, Baum founded and organized the Pescadero Sea Turtle Festival and other community environmental "fiestas" that promote environmental responsibility and awareness, as well as designed and implemented community projects for youth 12-17 for involvement with beach cleanups and implementation of public environmental education.

The following is an outline of the environmental curriculum administered during the school year. Although the course design and activities change each year, the description below is similar to the activities students encountered during the 2004/2005 and 2006/2007 school years (Baum, 2006).

Unit 1. Who Are We?

Compile and analyze statistics about our families, jobs, where we live, what we do in our spare time, what we eat, what are our dreams and plans for the future?

Unit 2. The Endangered Sea Turtle

Hands on learning with Grupo Ecologico y Tortuguero de Pescadero A.C. and their volunteer biologists in the Olive Ridley Sea Turtle nursery in Los Esteros, Pescadero. Some students participate in releases of Olive Ridley hatchlings, participate in and facilitate the annual sea turtle festival in Pescadero that takes place every December. Students write about their personal experiences with sea turtles and express them on videotape. In January students are chosen (by academic interest, merit, and behavior) to attend the special youth portion of the annual International Turtle Conference in Loreto, Mexico.

Unit 3. My Community

What natural resources does our community have and how can we manage them in sustainable manner? What are the current threats to the community? Growth, increased agricultural usage, sale of communal “ejido” lands. Students participate in a play about privatization of lands and local natural resources. Many students are natives to Pescadero and therefore ‘Ejiditarios.’ Inventory of family lands to see what parcels have been sold to non-Mexicans.

Unit 4. The Importance of Recycling

Garbage and Recycling. Reduce, Reuse, and Recycle in our school, homes, and work places. Implement a recycling program school-wide. Pilot-house project: one of the student's house and garden may be studied and analyzed. Suggestions are made on how to conserve water, recycle, compost, and why it is important for the family to stop burning their garbage. Listen to a talk by biologist MaryJo Mandujana about a proposed recycling plant, how it would function in the region, and what each household would be required to do to separate their garbage.

Unit 5. Consumerism and Nutrition

What do we eat and why? How does advertising influence our purchasing decisions? How can we pre-recycle, i.e. stop buying items packaged in plastic? We can become informed consumers and reduce the amount of plastic garbage in our households.

Unit 6. Water

Where does it come from and how is it used? Why we need to conserve water and the future of our region's most precious and finite resource. What is a watershed and how does deforestation impact the area water supply? At the end of the course some students take a field trip to the Sierra de La Laguna to see the headwaters of the region's water supply. Potential for tree planting day in the community using endemic trees donated by the Federal Forestry Program: CONAFOR.

Unit 7. Plants

Learn about the regions endemic plants and why they so important. How does the invasion of non-native plants impact the ecosystem? What is being done to preserve the region's biological diversity? Take a field trip to nearby Ejido Meliton Albanez to visit an ongoing reforestation project. Measure, map, video, and photograph the native plants and insects living behind the school in the arroyo as well as old-growth cardones in nearby Los Cerritos Beach. Learn about the interaction between plants and animals and how these old-growth cardones serve as shelter/habitat for several endemic species of lizards, iguanas, as well as birds. Create videos with student “reporters” and crew to document the plants and animals living in the community.

Unit 8. Animals

Learn about the region’s endemic animals and why are they so important to the biological diversity of the region. What happens when the region is subject to invasion of non-native invasive species? What can be done to preserve the region's biological diversity yet allow for diverse uses such as small-scale goat ranching? Possibly visit to the local serpentarium to see a project that works with endemic rattlesnake species. Possibly, visit a local goat ranch to see firsthand how destructive goats are to sensitive native plants.

Unit 9. The Ocean

The important role the ocean plays in the overall health of the planet. Study local artisan fishing practices and understand why the two local cooperativos are in crisis. Listen to a talk by fisherman and parent Jorge Castillo Zazueta. How does the collapse of artisan

fishing negatively impact the sea turtle population? What we can do to stop contaminating the ocean? What can we learn from the ocean?

Unit 10.

Students work hands-on with rehabilitation, restoration, and cleanups of the beach, dune, and desert regions to prepare for Easter week. A composting toilet was installed on the beach (2005) and students learn the importance of human impact on the beach environment. Learn the importance of endemic plants and animal species in the dunes and arroyos near the beach, particularly the old-growth cardones cactus clustered in the arroyos.

In 2004/2005 students participated in the following activities at Los Cerritos Beach:

Cleaned up garbage and clandestine dumps; removed and buried old toilets; collected and recycled aluminum cans, glass, and other reusable discarded material; conducted a human impact study during Easter week (March 24-26,) at Los Cerritos Beach: Students walked from camp to camp educating visitors about garbage, recycling, endangered sea turtles, and the need to protect Los Cerritos as a turtle nesting beach. Students conducted counts of visitors, cars, and campsites. Daily garbage patrols by students and talks with campers have greatly improved conditions for all who visit the beach. Garbage and recycled material was brought to one central area and volunteers took it to the dump.

CHAPTER 4

Data Analysis

As stated earlier, this research works in part to address Barraza (2001) and other researchers' (of Mexican environmental learning) statements that more work is needed to uncover Mexican teacher practice and the outcomes of using creative pedagogical approaches to environmental learning with Mexican students. Additionally, this research provided the initial baseline information required for the longitudinal study of student environmental perceptions and actions, their propensity for future service to community, lifetime achievements, and educational and career choices (Hamilton, 1981; Lipka, 1997; Shumer, 1997).

The nine Mexican authors discussed in the literature review represent almost the entirety of educational researchers who have conducted research on environmental learning in Mexico and subsequently presented scholarly articles in English and Spanish language journals and other publications.² As such, it is hoped that the combination of quantitative and qualitative insights garnered through this research effort will contribute to the existing field of research and theory on environmental learning in Mexico. The themes and topics highlighted in this analysis are directly related to this specific field of inquiry as well as to the published literature concerning the intricacies and outcomes of research on environmental learning in both Mexican and American schools.

² We corresponded with one of the most visible researchers and authors of environmental learning in Mexico, Dr. Laura Barraza, of the Centro de Investigaciones en Ecosistemas, UNAM in Michoacán Mexico. I questioned her about the prevalence of research on environmental learning in Mexico. She replies: "I am afraid to confirm that there are less than 10 individuals in México actively conducting research on environmental learning processes."

Qualitative Data Analysis

This analysis of the qualitative portion of the research addresses the student, parent, and community influential interviews; it also incorporates findings from field observations garnered while the course was in session during the 2006/2007 school year. This analysis is guided by the qualitative research questions (1-4) as presented in the methodology section above. These detailed research questions were employed to address four guiding concepts we sought to uncover through this case study:

1. Reactions and experiences of students;
2. Course propensity to instigate issue awareness and involvement;
3. Effects of social factors on environmental traits;
4. Influential course components

Qualitative descriptive narratives are used to present the interview data gathered in this case study (Creswell, 2003). Additionally, validity of the qualitative findings are addressed through accounts of discrepant information (deviant cases) (Creswell, 2003), employing type 1 and 2 tabulations as prescribed by Silverman (2006), and applying the constant comparative method that addresses two different groups of participants at one or two time periods (as utilized in many grounded theory projects) (Silverman, 2006).

This analysis is structured according to the four broader concepts above. Research questions and the related participant interview questions that satisfy the four concepts above are presented along with descriptive participant responses of varying length. Some of the participant responses have also been grouped thematically, categorically, and by sub-themes that are subsequently analyzed for their usefulness in highlighting the various conceptual positions and phenomenon brought to light through this case study.

Experiences of Students

Research Question 1: What are the reactions of Mexican students participating in an experiential environmental learning course with service learning components?

Research Question 1 addressed the experience of Mexican students participating in an experiential environmental learning course with service learning components. Serow (1997) writes that performing research on service learning is more involved than traditional education research:

What makes the assessment of service-learning so challenging is that it ultimately requires the evaluator or researcher not only to capture the essence of the experience itself, but also to show that students are converting that experience into other outcomes, among which are competence, participation, understanding, and relationships. (p. 22)

The experiential nature of the course allowed students to provide service to the environment and their community at school, in the pueblo, in natural settings, and at home. For instance, students implemented a recycling program at their school and participated in collecting and sorting solid waste, while also conducting outreach/education to students at the school as to how the facilities work, and the importance of recycling at home. In the pueblo, students mitigated dump sites in the arroyo located behind the school, which eventually flows through town to the ocean. During this activity students removed garbage, learned about plants and animals living in the arroyo, and produced video footage of their work. At home, students voluntarily instigated horizontal and vertical intergenerational learning concerning environmental behaviors learned in the course, and described instances where they and their families began practicing new environmental behaviors such as composting, recycling, water conservation, and cessation of a variety of environmentally detrimental practices.

In a natural setting, 13 of the 15 students in the treatment group from 2004/2005, and six of the 23 students from 2006/2007 had the opportunity to perform service learning activities and campout at their local beach, Los Cerritos. The Los Cerritos Beach cleanup project in 2004/2005 was an ongoing weekly occurrence; the beach was heavily impacted and needed constant mitigation work by the students. In 2006/2007 the beach was not as badly impacted (due to prior mitigation efforts) and students only had one opportunity to participate in the cleanup during Semana Santa. During the week of Semana Santa (Easter) hundreds of Pescadero locals, Mexicans from surrounding cities (Todos Santos, Cabo San Lucas, San Jose del Cabo, and La Paz), and foreign tourists camp at Los Cerritos with their friends and families. Los Cerritos is a nesting site for Olive Ridley and Leatherback sea turtles. This large social gathering is particularly detrimental to the dune, beach, and desert environments at Los Cerritos; the campers historically have driven on the beach and dunes and leave large amounts of human waste and garbage on the beach and in the surrounding desert. The local municipality of Pescadero has not invested in sufficient solid waste management infrastructures for properly addressing solid waste disposal and recycling. The beach has few facilities to deal with this influx of heavy use. Some students in the service learning course took this opportunity to walk in groups between the various camps and remove garbage, explain to the public how to properly dispose of trash, deal with human waste, conduct recycling, and discuss with the public the detrimental effects of beach driving and littering on the endangered sea turtles and their nests. Students collected recyclable items for transportation off the beach and picked-up trash to be brought to the dump. Baum, working in conjunction with a local solid waste NGO facilitated this effort with the students. We asked the students to describe their service learning experiences at Los Cerritos.

Interview questions that applied to Research Question 1 worked to capture the essence of the student experience while at the same time addressed student understandings that were a result of their coursework. While it is impossible to definitively say that *all* of the student experiences in the course were meaningful events that positively contributed towards their education, the community, or the environment, the sentiments expressed during student interviews were however encouraging.

One of the major activities that defined the experience of the 2004/2005 treatment group (and to a much lesser extent, the 2006/2007 treatment group) was participation in service learning activities and campouts at Los Cerritos Beach. When we asked students to describe their service learning experiences at Los Cerritos some of the students were emphatic that they were able to participate in the rehabilitation of a seriously impacted natural area that is utilized by endangered species and enjoyed by their community (and foreign and domestic tourists alike). During interviews some students discussed the fact they had never worked for their community or the environment before the course began and that they believed their collective efforts were positive contributions. Some students discussed that they learned useful new skills and that their service contributions set an example for others at the beach to follow. As seen below, students discussed advancement in self-efficacy, locus of control, and described the experience as having positive affective results. Through interviews it was apparent that students who had the opportunity to participate in this activity realized that their efforts were positive contributions to entities much larger than themselves; quite possibly an exciting new phenomenon for the participants. At the same time, this direct participation in an environmental mitigation project contributed to the alteration of their perception of human treatment of the natural environment

(man/environment interactions), which ultimately has positively affected their personal environmental behaviors.

Thirteen of the 15 students from the 2004/2005 treatment group participated in this cleanup and public education project, of which 10 had the opportunity to speak with the public about environmental issues; below are representative responses:

Tell me about your experiences when you talked with people at Los Cerritos Beach about the environment? How did you feel?

Pasha 04/05: Yes, when we went to the beach and there were four people in the group and we had big bags to collect the garbage. When we passed people when we were collecting the garbage we told them to take care of the beach so it's attractive to people.

How did it make you feel to talk to the public about this?

Pasha 04/05: It made me feel good to talk to the people about the beach and how to take care of it, and because I am helping to salvage the area.

Do you think that the people listened to you?

Pasha 04/05: Yes, good attention.

Were people disrespectful to you?

Pasha 04/05: No, the people were all happy to hear what I had to say.

Tell me about your experiences when you talked with people at Los Cerritos Beach about the environment? How did you feel?

Porfirio 04/05: When I was at the beach I talked with people at the beach and explained to them if they come and they are eating, or whatever they are doing, that they take the garbage with them when they leave. And if they don't take the garbage with them when they leave that they put it in a bag and close it. [And leave it at the beach for the students to remove it later.]

I felt good to talk to the people in this case because we are starting to clean the beaches and learning the knowledge of how to do it.

Tell me about your experiences when you talked with people at Los Cerritos Beach about the environment? How did you feel?

Myra 04/05: Yes I talked to people, it was very good because I feel that I was setting an example...was setting an example about how to change.

Did you go to Los Cerritos to talk to the public about littering?

Suze 04/05: Yes when I went to the beach I talked to people for example if they were having potato chips, that they put all the garbage together and then put it in the garbage can or take it away with them.

How did this make you feel talking to them?

Suze 04/05: I felt good talking about it because I like going to the beach and I want it to be protected, and it made me feel good to be talking with people. It was hard to talk to Americans and Paty helped, but it made me feel good.

Did the people at the beach listen to you and care about what you were talking about?

Suze 04/05: Yes I think the people paid attention. When we went on a 3 hour walk down the beach and collected things, and when we came back the people had their garbage in piles. People make a mess drinking, and the people should enjoy it, but they need to take responsibility for their stuff.

Although five of the students from the 2004/2005 treatment group thought that the public was receptive to the student efforts, four of the students discussed the public's disinterest in the student's environmental outreach at Los Cerritos Beach. Students who identified the public's disinterest in efforts to protect the natural environment matched the sentiments of the Director of a local waste reduction NGO, who explained during interview that environmental awareness is generally low throughout Mexico. It is interesting to document how students who are for the first time in their lives involved in efforts to protect the environment, are quickly learning why and how the environment has come to exist in such a degraded state.

Did the people have interest when you talked to them?

Maria 04/05: Almost never did the people have interest.

So how did it make you feel that they were disinterested?

Maria 04/05: I felt sad because I thought: "How could they not?" [Have interest.]

Where were these people from?

Maria 04/05: They were from other parts, and they were Mexican.

Did the people have interest when you talked to them?

Michelle 04/05: I was nervous because some of them thought it was a game and they were starting to laugh.

Six of the 23 students from the 2006/2007 treatment group participated in this cleanup project, none took this opportunity to speak with the public about environmental issues. During this campout students also conducted a visitor census by counting vehicle license plates from various parts of Mexico, United States, etc.; identified and studied native plants; and participated in a found-object recycled art project. When asked: *How did this project make you feel?*, students gave the following responses (below). And while their initial responses are far less eloquent than their predecessors' (possibly due to the age difference), the sentiments remain the same. Students expressed that they were pleased with the synergistic effects of their efforts; a positive affective experience in relation to environmental service learning; and exhibited pride in their mature and responsible behavior. Despite the fact that some in the community were indifferent to efforts to protect the environment, the experience overall was meaningful to the students who participated. We attended the Los Cerrito Beach cleanup in 2007 and note that students emphatically participated in all of the activities, and greatly appreciated the fact that adults were taking the time to work with them on projects that directly affected their community, families, and the natural environment.

Yolanda 07/07: I felt good because I was helping my town, and the world. And it made me feel really good because I was not just helping myself, I was helping everyone.

Graciela 06/07: Good because we helped, we were a few people that did a lot.

Jesus 06/07: I felt good because I was helping not to contaminate.

The following six questions were asked to gain insights into the propensity of the course experiences to instigate collateral learning, inspire greater interest in environmental themes, increase/create a nascent appreciation for nature, and/or augment the participant's environmental

consciousness. We first asked participants: *Do you think the course experiences augmented your environmental consciousness? If yes, how so?* Many of the students explained their answers in relation to how the course was influential, and as a result, have changed their environmental behaviors because they understand and care that their actions have a direct effect on human health and the quality of the environment. Some students revealed that they enjoyed learning about plants and animals, and that they now have a greater concern for animals and environmental quality. It was encouraging to find that during interviews this particular question evoked excited and sometimes eloquent responses from participants. Students overall displayed a positive attitude towards the environment and appreciated the environmental learning experience. The advent of incorporating experiential environmental learning in this particular instance was useful; it challenged, and successfully impacted a culturally ingrained behaviors (I.E. littering) through a change in consciousness.

2004/2005

Lino 04/05: Yes, because I don't throw the garbage anywhere. Like for example I see friends throwing garbage wherever, and I pick it up and bring it back here [to his house] and put it in the garbage can.

Ana 04/05: Yes, in the way that I have learned to be careful with the garbage and paper. Yes, this has changed my awareness in that if I see advertisements [public service announcements] on the TV about the environment I pay attention.

Suze 04/05: Yes, because for example before I had the class with Paty and I ate Sabritas and I would throw my garbage everywhere. But during the class with Paty I learned new things and it changed my understanding, and now I don't do that anymore. And I learned that these things affect us.

Vikki 04/05: Yes, when I was a girl I didn't care and would throw things all over in the street and stuff, but now I am more conscious about what I am doing, I am more aware. I have more appreciation, when we go on trips, me and my friends, we always take our garbage with us and put it in bags which we didn't do before.

2006/2007

Crespin 06/07: Yes, well for example, before the class sometimes we would see an animal and we would kill it. But then, after the class with Paty, we learned about them, and now we don't kill them.

Graciela 06/07: Yes, for example before at the house, before I had the class with Paty, we would throw our garbage wherever. And now we throw the garbage in the garbage can and now we collect the garbage if it's on the ground.

Yolanda 06/07: Yes, I think very much it changed my consciousness because I learned how my actions affect things. I know *not* to litter, and I know *why* littering is wrong, and not only how it affects me, but how these behaviors affect the whole world. Wasting water not only affects me, but it affects the whole world; water is an essential element, and so we need to take care of it.

Elsa 06/07: Yes, in the way that I am not littering. And that I am able to teach my friends about their behaviors.

Joel 06/07: Yes, because I learned more about plants and insects, and also, for example, we made a hole in the ground and we put organic garbage in there. And also we're cleaning the school.

Yadid 06/07: I learned about what things can contaminate the environment: Littering the arroyos and the beach. When we go to the beach, to bring the garbage back to our house.

In relation to Research Question 1 we wanted to find out (from an educational standpoint) if students had more of an overall interest in environmental themes, and what themes or topics addressed in the environmental learning course were of most interest. We asked students: *Do you have more interest in the themes about the environment since you took the course? If so, what themes?* All but one of the student responses to this line of questioning was affirmative; most of the responses were succinct. And despite the fact that the course covered a myriad of topics of over the school year, most of the students answered in a similar fashion, naming sea turtles and environmental contamination (in various forms) as the topics in which they now have

more interest. Student responses below relate to their altered interest in environmental themes and the effect of the course experience.

2004/2005

Suze 04/05: Before I took the class I would hang out in the square and I would not hang out in nature and it was not interesting to me. And then I took the class and we went to Cabo Pulmo and Isla Espiritu and I started to see. Paty explained to us about the environment and the things in the ocean and stuff and I started to have more interest in it.

Guilia 04/05: Yes, taking care with the garbage, and with the sea turtles, these themes became more interesting to me after I had a class with her; I was more involved.

Michelle 04/05: Yes, I am more interested in biology.

2006/2007

Thalia 06/07: The water and the contamination.

Sergio 06/07: Collecting garbage and recycling.

Marilu 06/07: Yes, well, that we don't litter garbage because we're contaminating our town.

Linda 06/07: Yes, well the animals that are in danger of extinction.

Yolanda 06/07: I have a lot more interest in the themes, so much so that school is almost over and I will get in touch with Paty to ask her if there are things I can do this summer to continue working and following on this path of the environment.

During post-course interviews all of the students in both of the treatment groups explained to us that they are amenable to future study regarding the environment. These responses are important in light of Dewey's (1938) recommendations that one of the most important goals of meaningful education need not be the specific subject matter at hand, rather how the experience influences the students' openness and desire to continue learning, to

undertake collateral learning. We asked students: *In the future do you want to study more about the environment?* Once again, most of the students did not elaborate upon their responses.

2004/2005

Aura 04/05: Yes because I like it.

Guilia 04/05: Yes, because I want to learn more about this subject.

Juanita 04/05: Yes, to learn how to teach others how to take care of our town.

Porfirio 04/05: Yes, I like to study about the different animals and learn their different behaviors and ways, and how to take care of them. I also like learning about the animals that are in danger of extinction and how to protect them.

Later in the interview, and in response to questioning about plans to attend university, some of the students disclosed their intent to study environmental themes in higher education. All of the 2004/2005 interviewees answered that they do want to attend university; most were unsure of the field of study they would pursue; however, responses given include:

- marine biology/ecology
- astronomy
- education
- interior design
- psychology
- architecture

Only two of the 21 students from the 2006/2007 treatment group replied that they did not wish to attend university. Although most could not say what fields interest them, responses that were given include:

- art
- environmental studies
- education
- farming and water engineering
- biology

marine biology

We also wanted to discover if the environmental learning course experiences instigated students from the 2004/2005 treatment group to spend more time in the natural environment. This question was only appropriate for the older treatment group as two years had passed since their participation in the course. We found that 6/15 (40%) of the students from the 2004/2005 treatment group now spend more time in nature as a result of taking the course two years prior. These six students usually visit Los Cerritos Beach, the Rio Aguaje, and the Sierra de la Laguna National Park.

All of the students from the 2006/2007 treatment group told us during interviews that as a result of the class they *wish* to spend more time in nature. Most of the students replied that they would want to visit the beach more often, or the Sierra de la Laguna National Park and the surrounding foothills. Below are some of the representative responses when asked: *In the future do you think you will spend more time in nature as a result of the class? If so, what would you like to do?*

Yolanda 06/07: I think I am enchanted by nature, and definitely as a result of the class I want to be more involved in nature and the environment.

Andrea 06/07: Yes, going to the forest and the jungle.

Antonio 06/07: Yes, to the Sierra de la Laguna and the Desert of Viscaino.

Felix 06/07: Yes, to the Sierra de la Laguna and to Chiapas to the jungle.

Joel 06/07: I want to live in a house in nature where there are a lot of plants.

Yolanda disclosed to us during interview that as a result of the class she not only wants to spend more time in nature, but wants to volunteer over the summer outside of school, as well as peruse a career with an environmental theme. Through interviews and field observations we

witnessed the positive reactions and experiences that Yolanda had with the course and the extent of her participation. Her environmental knowledge scores were among the highest (among all students tested), and in a similar vein to the environmental attributes formally measured by Dimopoulos and Pantis (2003), Yolanda consistently (informally) exhibited verbal commitment to nature, displayed issue understanding and concern, and possessed a strong locus of control. One month after Baum's course ended for the 2006/2007 school year Yolanda was (outside of school) invited to participate in Baum's marine education and surf instruction course funded by the Surf Industry Manufacturers Association. As a result, Yolanda had the opportunity to continue her involvement in environmental learning as well as spend more time in nature and in the ocean.

We asked students during interviews: *Do you think that this class made a positive difference in the community?* This question addressed student perceptions about the usefulness of their service learning activities to the community of Pescadero and/or the natural environment. Although two of the students were skeptical that their efforts made any difference, most disclosed that they were excited to see first-hand how their mitigation efforts were immediately effective in changing the appearance of heavily impacted areas. Additionally, they mentioned that their community environmental outreach efforts have thus far been effective, and have been important in changing detrimental public environmental behaviors. The following data indicate that most of the students took pride in their service contributions; were pleased with their ability to work as a group (as well as the synergistic effect of the group); and were excited about the larger community's complicity, acceptance, and related behavioral advancements.

2004/2005

Lino 04/05: Yes, I think it made a positive difference because we're clearing the community and the beach of the garbage. The contamination is a disaster. And if the beach is dirty nobody will want to visit the beach.

Suze 04/05: Yes, because when we were in the class as a group we were kind of like a club and we helped the community by sharing with them and telling them. And if we didn't do this then the town would be dirtier. And people are learning and they are littering less.

Ana 04/05: Yes, because already I have seen it's made a difference in the town and there's not as much garbage everywhere.

Aura 04/05: Yes, because first we were telling people not to be piggish about their garbage and about the turtles, and this makes them think. In general, when we made sea turtle signs about sea turtles and garbage, the people learned from the signs.

Juan 04/05: Yes, I think it made a positive difference because the beaches are cleaner and there are also a lot of signs that say "don't litter," that didn't used to be there before, and the signs say "don't drive on the beach because of the eggs."

Vikki 04/05: Yes, not a lot, but some.

2006/2007

Yadid 06/07: Yes, the people are learning that we have garbage cans. And that also they should separate the garbage from the glass, and the cans, and the other garbage.

Yolanda 06/07: Yes, I think that at Cerritos we did good work because people don't litter as much at the beach and in different places. And I think this helped the community.

Joel 06/07: Yes, because it's better for the community because people put their garbage in the places where the garbage goes, and they're not just throwing it everywhere...and they're not being so lazy!

Juana 06/07: Yes, because before Paty came people threw garbage everywhere and nobody knew. And since Paty's class people really know, and it has made a huge difference. And if she did not come there would be no difference.

Graciela 06/07: Yes, because many more people no longer eat the turtles. And we learned how to liberate the turtles. And there's more opportunity for the turtles.

Felix 06/07: Yes, because we helped clean the town and did things that protect the environment and some people are changing.

Crespin 06/07: Now there is more consciousness about not littering, and people are better about putting it in the garbage can.

Cruz 06/07: Almost no because the people still throw the garbage where they want.

Propensity to Instigate Issue Awareness and Involvement

Research Question 2: To what extent do Mexican students involved in (school based) experiential environmental learning become more aware of, and involved in, environmental issues facing their community?

Introduction to local and global environmental issues remains an important aspect of environmental learning and the subsequent adoption of pro-environmental behaviors. We asked students to discuss with us their awareness of the environmental issues facing the Pueblo of Pescadero. Taken as a whole, the environmental issues that the students were able to raise during post-interviews represent most of the major dilemmas that the pueblo and region faces. Students were also asked to identify what they thought was the gravest issue facing their community. Considering the four groups as a whole, students identified the following issues without prompting; the first three items were considered to be the gravest by all four groups of students.

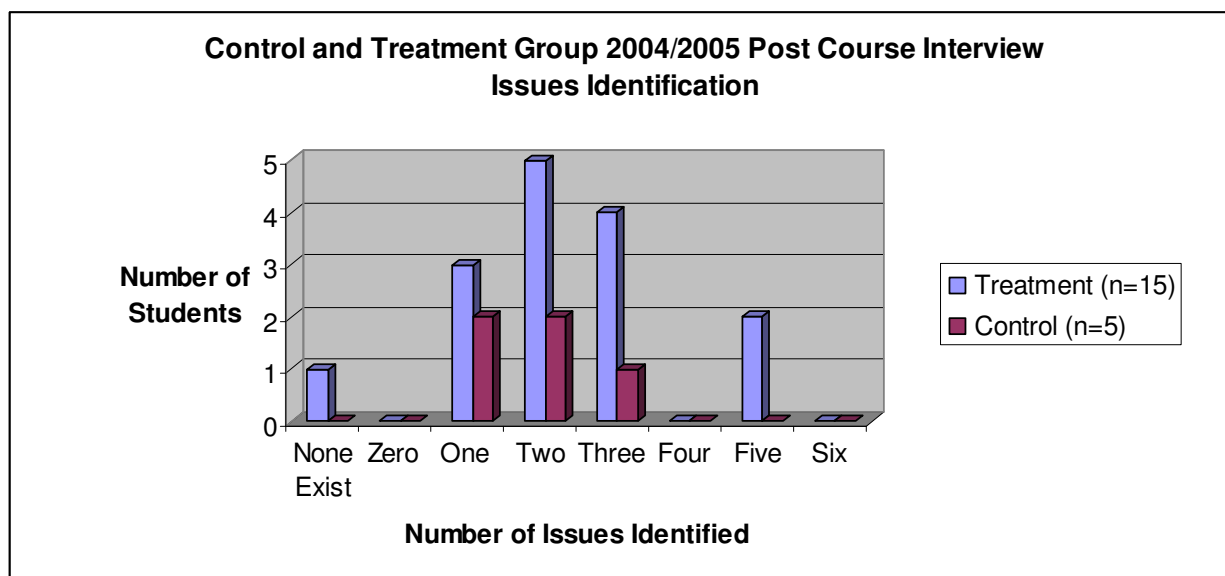
- Garbage littering, illegal dumping in the desert, arroyos, and at the beaches, and associated contamination
- Burning garbage and related air pollution
- Sea turtle and bighorn deer poaching and habitat loss
- Too much garbage and the local dump is overflowing
- Illegal woodcutting
- Sewage spills and associated water contamination
- Wasting water
- Lack of environmental consciousness in the pueblo
- Lack of recycling
- Insect infestations
- Air pollution from cars
- Beach driving

Clearing of desert for development

At post-interview the majority of students in the 2004/2005 treatment group could identify two to three issues (Figure 1).

Figure 1:

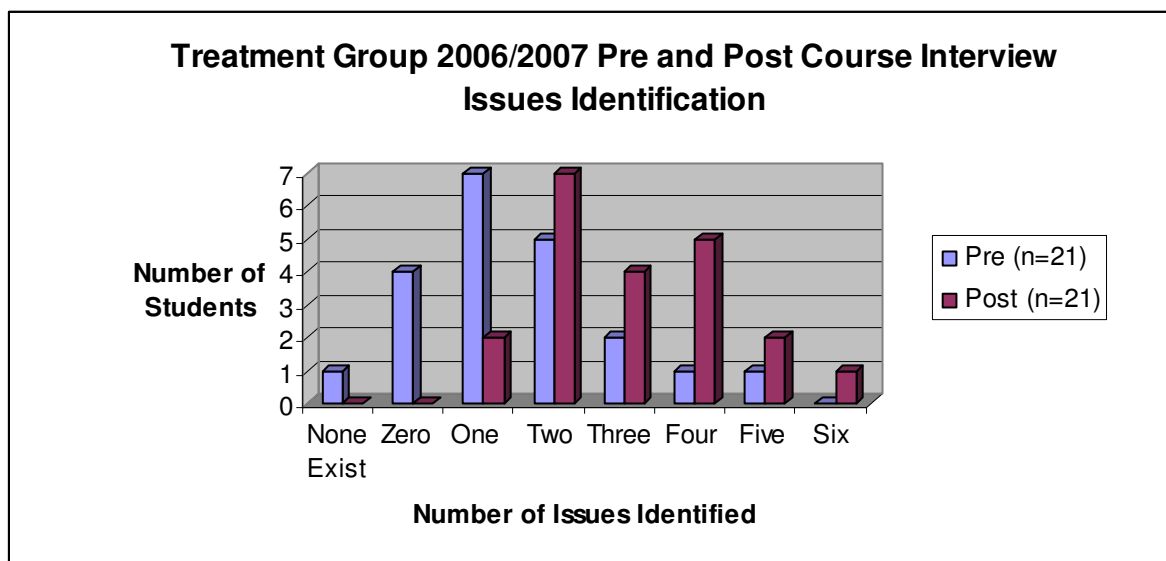
Knowledge of Environmental Issues 2004/2005 Groups



During pre-interview the majority of the treatment group from 2006/2007 could identify between zero and two environmental issues, while during post-interview, the majority of the students increased their knowledge of environmental issues, and could identify between two and four issues (Figure 2).

Figure 2:

Knowledge of Environmental Issues 2006/2007 Treatment Group

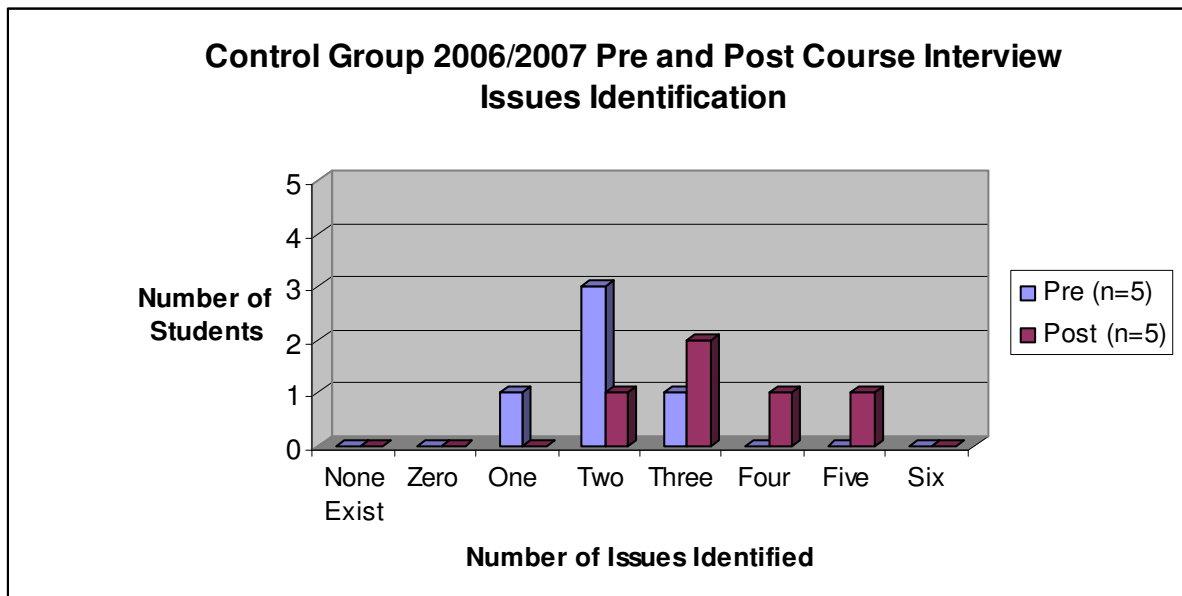


We also found that the control group from 2006/2007 increased their knowledge of environmental issues over the course of the year (Figure 3). While the students did not participate in Baum's year-long environmental learning course, they did in fact participate in a week-long environmental learning unit with their teacher, complete with a litter mitigation project in the pueblo. Furthermore, two of the students in the control group disclosed to us during post-interviews that they had discussions with students in the treatment group concerning environmental problems in the pueblo due to littering, and about air contamination from burning garbage. One student from the control group disclosed to us that a student from the treatment group had asked him to change his environmental behaviors. Furthermore, we must also take into consideration any maturation effects that the control group students may have experienced over the course of the year. However, it is difficult to fully assess the extent to which changes within the control group were due to maturation effects since the control group too, was exposed

to a lesser level of environmental learning. No group of students with a complete absence of environmental learning was available.

Figure 3:

Knowledge of Environmental Issues 2006/2007 Control Group



Serow's (1997) guiding sentiments – converting service experiences into other outcomes such as “competence, participation, understanding, and relationships” (p. 22) – are also addressed by Research Question 2. It must be stated that the young students living in the community of Pescadero have somewhat-limited opportunities to address environmental issues facing their community – that is, practicing pro-environmental behaviors to address environmental issues is conducted on a personal, household, or advocacy level. This personal voluntary involvement in environmental actions is organized below through four degrees of commitment:

1. Taking a personal/lifestyle changing action to address an issue;
2. Intergenerational learning - taking action to discuss environmental issues with parents and other family members in order for those individuals to become aware of issues and to takes actions to address an environmental issue;
3. Peer group tutoring – taking action to discuss environmental issues with personal friends or students at the school in order for those individuals to become aware of issues and to take actions to address an environmental issue;
4. Voluntary participation in an environmentally related community service project (outside of the course).

In regards to point one above: “taking a personal/lifestyle changing action to address an issue,” it should be noted that there are discrepancies between the self reporting section of the written survey where students rated the prevalence of their environmental behaviors, and the interviews, where students verbally explained what environmental behaviors they were undertaking. This discrepancy is probably related to students not remembering or knowing during an interview what we (as interviewers) considered to be pro-environmental behavior. For instance, in the self-reporting survey most of the students marked that they conserve water by taking shorter showers. However, none of the students during interviews reported to us that taking shorter showers was one of their currently practiced environmental behaviors. This phenomenon was prevalent in regards to most media specific sections of the written survey: solid waste; conservation of water; energy conservation; and food. For the purposes of this section, only personal environmental actions that were mentioned by the students during the interview process will be presented.

During the interview process we asked students from the 2004/2005 treatment group: *Now in your life do you do anything different in regards to what you learned in Senora Baum's course?* We found that 13/15 (87%) of the students from the 2004/2005 treatment group had changed their environmental behaviors as a result of the course, with no reported recidivism two years later. Among the treatment group, 8/15 (53%) practiced at least one action, while 5/15 (33%) practiced two actions (Table 6). As indicated by students these actions include:

- Cessation of littering
- Cessation of burning of garbage
- Cessation of eating endangered sea turtles
- Recycling solid waste
- Composting organic waste
- Ameliorating garbage from the street and in nature
- Conservation of water

This sustainability of pro-environmental behaviors could be attributed to the student experiences resulting from participation in Baum's course, the pre-existing environmental disposition of these students, and/or the fact that during interviews, 12/15 (80%) of students from the 2004/2005 treatment reported that they discussed the environment and environmental issues in school (after the 2004/2005 school year). One of these students reported that they participated in hands-on learning during school. Classes that included environmental lessons after the 2004/2005 school-year included: Spanish, Natural Science, Technical Science and Societal Values, and Biology. Some of the students confirmed that the textbooks from these classes addressed these lessons, but most of the students could not remember the names of the books. Although none of the school-based courses after Baum's were as involved, it is possible that this follow-up information (at school) bolstered student environmental consciousness and their subsequent sustainable commitment to pro-environmental behaviors.

During interviews we found that 4/5 (80%) students from the 2004/2005 control group were practicing at least one environmental behavior in 2007 (Table 4). These actions include:

- Cessation of littering
- Water conservation
- Recycling of solid waste
- Composting of organic waste

TABLE 4:

Environmental Actions of 2004/2005 Groups

Post-interviews	2004/2005 Treatment*	2004/2005 Control**
Number of actions practiced	Number of students	Number of students
0	2 (13%)	1 (20%)
1	8 (53%)	1 (20%)
2	5 (33%)	2 (40%)
3	0	1 (20%)

*n = 15

**n = 5

During pre-course interviews with the 2006/2007 treatment group we found that 18/23 (78%) of the students were practicing at least one environmental action (Table 5). Since completing the course, at interviews we found that all 21 of the treatment group students were practicing pro-environmental actions, with the majority taking between one or two actions. During post-course interviews we found that about one quarter of the class (5/21) were not practicing any new environmental behaviors, about one half of the class (10/21) began practicing one new environmental behavior, and about one quarter (5/21) began practicing two new behaviors. Students who adopted new environmental behaviors explained to us that they had done so as a result of taking Baum's course.

The juxtaposition of the treatment and control group in this instance is difficult as the sample sizes are different. At post-interview we experienced attrition of one student in the control group, bringing the number of interviewed students down to five. It must however be noted that students in the control group are practicing environmental behaviors. During pre-interviews with the control group we found that 4/6 (67%) of the students were practicing at least one environmental behavior. At post-interview we found that 4/5 (80%) were practicing at least one environmental behavior. Three students adopted no new environmental behaviors, one student adopted one new environmental behavior, and one student adopted two new environmental behaviors. Environmental actions taken by the 2006/2007 treatment and control groups in order of frequency include:

- Cessation of littering
- Water conservation
- Solid waste recycling
- Picking-up trash in public
- Cessation of burning household garbage
- Composting of organic waste
- Cessation of eating sea turtles
- Cessation of eating processed and over-packaged “junk” foods

TABLE 5:

Environmental Actions of 2006/2007 Groups

Pre-interviews	2006/2007 Treatment*	2006/2007 Control**
Number of actions practiced	Number of students	Number of students
0 actions	5 (22%)	2 (33%)
1 action	8 (35%)	1 (17%)
2 actions	6 (26%)	2 (33%)
3 actions	3 (13%)	1 (17%)
4 actions	1 (4%)	0
Post-interviews	2006/2007 Treatment***	2006/2007 Control****
0 actions	0	1 (20%)
1 action	3 (14%)	1 (20%)
2 actions	8 (38%)	1 (20%)
3 actions	6 (29%)	0
4 actions	3 (14%)	2 (40%)
5 actions	0	0
6 actions	1 (5%)	0
Practicing 0 new after class	5 (24%)	3 (60%)
Practicing 1 new after class	10 (48%)	1 (20%)
Practicing 2 new after class	5 (24%)	1 (20%)
Practicing 3 new after class	1 (4%)	0

* n = 23

** n = 6

*** n = 21

**** n = 5

In answering Research Question 2 we sought to address the various degrees to which there was participant involvement (beyond school-based projects) with environmental actions. We asked students to discuss their efforts to educate their families (siblings, parents, and other household members) about the environment, with the intent of instigating intergenerational

learning (horizontally and vertically). During interviews we found that 11/15 (73%) students from the 2004/2005 treatment group had discussions with their family members with the intent of changing their environmental behaviors. Of the students who told us that they talked to their families, 10/11 (91%) reported that their families successfully made efforts to change their behaviors. Within the 2004/2005 control group we found that 9/15 (60%) of the student's immediate household practice pro-environmental behaviors (in 2007). Students in the treatment group disclosed that the family did not practice environmental behaviors before the student had participated in the course and subsequently shared the information. An interview with the Director of the Pescadero Health Center confirmed student interviews:

Have you seen a change in the environmental perceptions or mentality of the students working with Paty?

In the form that students have brought their education to the rest of the community; inside the school and to their houses and families.

Are the kids now more environmentally aware, or are they interested more in the environment?

Yes, the education that they receive in the schools is not enough. So what Paty does, specific educational workshops, gives them more knowledge and makes them more aware.

During interview students voluntarily listed the following behaviors that they and their families adopted in 2005:

- Cessation of littering
- Cessation of burning of garbage
- Cessation of eating endangered sea turtles
- Recycling solid waste
- Composting organic waste
- Removing garbage from the street and in nature
- Conservation of water

Specifically, we asked students: *Did you talk with your family about changing any of their environmental behaviors? If so, what did you discuss, and who changed their behaviors (parents, siblings, grandparents, etc.)?* We also interviewed six parents of students in the 2004/2005 treatment group in order to corroborate student claims that their families are still practicing pro-environmental behaviors; their responses are also included below.

Did you talk with your family about changing any of their environmental behaviors? If so, what did you discuss, and who changed their behaviors (parents, siblings, grandparents, etc.)?

Vikki 04/05: I talked with them about the turtles.

And what did you say about the turtles?

Vikki 04/05: I talked to them about not killing the turtles.

Did they listen to you or not much?

Vikki 04/05: I only talked with my family about it, I didn't talk with anyone else, but I did tell my family not to kill the turtles

Did it make a difference?

Vikki 04/05: I think it made a difference because we haven't eaten turtle since.

Is this the truth?

Vikki 04/05: Before we sometimes would have turtle soup, but we haven't had it since I talked to them.

Did you talk with your family about changing any of their environmental behaviors? If so, what did you discuss, and who changed their behaviors (parents, siblings, grandparents, etc.)?

Maria 04/05: Yes [I spoke to them]. No they have not changed.

What are they doing you'd like to see changed?

Maria 04/05: That when we go somewhere, that if they see garbage, they will pick it up. And when we go to the beach, that they do not drive on the sand.

Cecilia's Mom discussed Cecilia's influence in regards to environmental behaviors:

Have you seen any changes with Cecilia around the house after the class with Paty?

Cecilia's Mom 04/05: Yes, she spoke with me a lot about the turtles and how it's important that we don't hurt them because they have the right to live too. And also that we need to watch the beach and be careful as they come out of the water. And we need to take care and not ruin the beach.

Did she discuss with the family recycling or composting?

Cecilia's Mom 04/05: Oh you mean with the plant scraps?

Yes, or with recycling.

Cecilia's Mom 04/05: Yes, we never did it before and we started this when she started the class with Paty.

Are you still doing these things now?

Cecilia's Mom 04/05: Yes.

Juan and Juanita's Mom discussed her children's' influence over the family:

Have your kids discussed with the family about changing their environmental behaviors?

Juan and Juanita's Mom 04/05: Yes, not to burn garbage. I used to burn garbage and now I don't do this anymore. And even when things are really messy, like right now when my husband hasn't had time, I still don't burn the garbage and we put it in the right place.

Porfirio's Mom discussed his influence over the family's environmental behaviors:

Has Porfirio discussed with the family changing environmental behaviors?

Porfirio's Mom 04/05: The most important thing I noticed with him is that he was telling us not to burn the garbage.

And before, you used to burn the garbage, but now not any more?

Porfirio's Mom 04/05: No we don't do that anymore.

Anything else you changed that he explained to you?

Porfirio's Mom 04/05: He taught us to separate the garbage, the plastic and the herbs, and we didn't do this before, and we do it now?

And how do you recycle?

Porfirio's Mom 04/05: We take all of our herbs and we put it in an area and I sell the compost!

How else do you separate the garbage?

Porfirio's Mom 04/05: We take out the plastic and throw it away.

Do you recycle aluminum?

Porfirio's Mom 04/05: Yes, we recycle and we sell it also.

Did you do this before the class?

Porfirio's Mom 04/05: Before the class we never did these things.

Did you recycle plastic in the past?

Porfirio's Mom 04/05: No, we never recycled plastic.

So how much money do you make from the compost?

Porfirio's Mom 04/05: \$200-\$300 US dollars.

In terms of horizontal and vertical intergenerational learning, more than half of the students who participated in the class in 2004/2005 have been successful as initial vectors for the dispersal of pro-environmental information and advocacy of pro-environmental behaviors. More importantly, both student and subsequent familial pro-environmental behaviors have been sustainable over the past two years since taking the course as uncovered through the student and parent interviews.

During post-course interviews we found that 17/21 (81%) of students from the 2006/2007 treatment group had discussions with their family members, with the intent of advocating pro-environmental behaviors; below are various interview responses. Of the students who disclosed that they talked with their families, 14/17 (82%) reported that their families successfully made efforts to change their behaviors. Two students reported that their family "sometimes" makes efforts to practice these behaviors, and one student reported that their family has not changed at all; these interview responses are also included below.

Students in Pescadero advocated to their families the adoption of the following behaviors (in order of frequency):

- Refrain from littering
- Refrain from burning garbage
- Water conservation
- Recycling solid waste
- Composting
- Reduction of purchasing items with excessive packaging
- Reusing items

Did you talk with your family about changing any of their environmental behaviors? If so, what did you discuss and who changed their behaviors?

Yolanda 06/07: I talked to them about not littering, and I also spoke with them about composting and using these materials another time. I talked to them about separating garbage, the compost and the recycling, and making the least amount of garbage as possible. And about closing the water faucet when they are not using it, and using containers to use the water again. My Mom changed and my aunt changed, and all seven people...they are all still doing these things.

Yolanda's Aunt corroborated that the household has adopted these pro-environmental behaviors:

Do you think that Yolanda has had a positive or negative experience in Senora Baum's course

Yolanda's aunt: It has been positive because the things that she is learning in the class she is bringing home to us.

Can you give us an example?

Yolanda's aunt: Well we started a compost area with the leaves, and we started separating the garbage, for example the aluminum cans and tin cans and glass bottles and leaves from the trees...and we've started doing these things.

So who changed their environmental behaviors?

Yolanda's aunt: All of us changed our behaviors; Yolanda, her mom and dad, the three kids, and me.

Was it difficult to change your behaviors?

Yolanda's aunt: No.

Did you think this was strange?

Yolanda's aunt: No, not really strange because for us it's about nature. For me the fact that Yolanda was taking the class was not strange, but for her mother, it was a little bit more difficult to understand why she was taking the class and what they were doing.

Was Yolanda influential over her mother and siblings?

Yolanda's aunt: Yes, she was forthright, and with our support too it has made a difference in the household. We're trying hard not to waste water and to be more conscientious. That is a problem; people here are not conscientious about the water.

Did you talk with your family about changing any of their environmental behaviors? If so, what did you discuss and who changed their behaviors?

Linda 06/07: Yes, well, the majority I did was to talk with my grandparents because they have the custom of eating the sea turtles, and now they don't eat them.

Did you talk to others in your family?

Linda 06/07: I talked to them about reusing things that we formerly would throw away, and not buying over-packaged products, and things without preservatives.

And your parents changed?

Linda 06/07: Yes

So your grandparents stopped eating turtles because you talked to them?

Linda 06/07: Yes.

Are you practicing any new environmental behaviors at your house or in your life that you learned in Paty's class? List all.

Felix 06/07: We recycle the garbage and we don't burn the garbage [this is new since Sept].

Did you talk with your family about changing any of their environmental behaviors? If so, what did you discuss and who changed their behaviors?

Felix 06/07: That they don't burn the garbage and that they don't use a lot of water.

Did they change?

Felix 06/07: Yes, all...Mom and Grandparents and my brother. I explained the consequences of what we learned in Paty's class and they recycle and are careful with the water and don't cut trees. They changed their behaviors because I explained the consequences.

Are you practicing any new environmental behaviors at your house or in your life that you learned in Paty's class? List all.

Cruz 06/07: Yes I am practicing these behaviors. I told my family that they shouldn't litter or burn garbage because it's very bad for the air.

Is burning garbage another environmental problem?

Cruz 06/07: Yes.

So have they stopped burning it?

Cruz 06/07: Yes.

Did you talk with your family about changing any of their environmental behaviors? If so, what did you discuss and who changed their behaviors (parents and/or siblings)?

Thalia 06/07: Yes, not to litter or waste water.

Did they listen to you?

Thalia 06/07: No.

In terms of horizontal and vertical intergenerational learning, more than half of the students who took the class in 2006/2007 have been successful as initial vectors for the dispersal of pro-environmental information and behavior modeling. It is interesting to note that the student's advocacy was conducted under their own free will. Baum reported that she did not coerce students into talking with their families about changing their environmental behaviors. From the student interview data it is clear participants are genuinely concerned about the state of the environment and community, and have taken ownership of certain environmental issues to the point where they have found it necessary to inform others about improving their environmental behaviors. It remains to be seen whether student and familial pro-environmental behaviors will be sustainable over time for the 2006/2007 cohort. We have plans to return to Pescadero over the course of the next five years in order to collect longitudinal data from course participants.

Some of the most unexpected outcomes in this research effort were obtained through asking students about their intergenerational advocacy efforts. Through the interviews we discovered that course participants in Pescadero displayed a much higher tendency to engage in intergenerational learning than was reported by Ballantyne, Fien, and Packer (2001) who noted that among 284 students (in six different environmental learning programs located in the first world), 28% reported that they had discussed issues and advocated for pro-environmental actions the family could undertake to conserve resources. The authors concluded that the key course components necessary for instigating intergenerational learning include (among other components) experiential pedagogies and longer course lengths. In their research the authors did not unpack the occurrence of intergenerational learning by course type, and as such, might have

found that courses of a similar nature to Baums' (if included in the study), may have produced higher instances of intergenerational learning.

Beyond familial intergenerational learning we asked students about their efforts to influence the environmental behaviors of classmates and friends with the intent for these individuals to change their environmental behaviors (horizontal learning through peer tutoring). During post-interviews 5/15 (33%) students from the 2004/2005 treatment group disclosed that they have continued to advocate pro-environmental behaviors to their friends concerning solid waste issues. For the 2004/2005 treatment group we discovered far less frequency of peer tutoring than seen with intergenerational learning within the immediate household, which appears to be more robust, complex, and sustainable. A mother of two students from the 2004/2005 treatment group briefly discussed how her son and daughter continue to advocate environmental behaviors among friends:

Have you noticed behavioral changes with your children since the class ended?

Juan and Juanita's Mom 04/05: Yes, for example before when there was garbage on the ground they wouldn't think anything of it but now if they see garbage on the ground they will pick it up and throw it in the garbage [can] even if they did not throw it on the ground. And also, they will say to their friends "Don't litter, here's the garbage can."

Students also discussed their advocacy efforts during our interviews:

What does the word environmentalist mean to you?

Pasha 04/05: It's when I see a person throwing garbage in the wrong place and I say to them "Put the garbage in the right place!"

Do you have more appreciation for nature since taking the class?

Vikki 04/05: Yes, well now I have more appreciation, when we go on trips, me and my friends, we always take our garbage with us and put it in bags which we didn't do before.

During interviews with the 2006/2007 treatment group 10/21 (48%) of the students reported that they spoke with friends or other students about undertaking pro-environmental

actions. Five of the 10 students from the 2006/2007 treatment group who spoke with their friends reported success in changing their friend's behaviors, while three reported that their friends "sometimes" practice pro-environmental behaviors; three students reported that their friends failed to practice pro-environmental behaviors after their discussion. Two of the students in the 2006/2007 control group reported that students from the treatment group spoke with them about environmental issues and behaviors. The behavioral topics discussed among friends include (in order of frequency):

- Littering
- Recycling of solid waste
- Burning garbage
- Composting organic waste

Included below are interview responses from the 2006/2007 treatment group regarding peer group environmental advocacy:

Did you speak with any of your friends outside of the class about changing their environmental behaviors? What behaviors, and were you successful?

Andrea 06/07: Yes, I talked to them about separating the garbage, and when we go to the beach, and not to leave our garbage on the beach.

And they changed?

Andrea 06/07: Yes! When we went to the beach I said "Don't leave your garbage! Pick up all this garbage!" And they did! Hahhahahaaa.

Did you speak with any of your friends outside of the class about changing their environmental behaviors? What behaviors/were you successful?

Yolanda 06/07: In truth I talked to my friends about not littering because sometimes they'll throw their garbage on the ground even when there's a garbage can right next to them. And I think, "How lazy!" So I tell them to pick it up, and they do it. But honestly, I can't say they do it all the time because they are lazy and they litter...so I cant say their behavior has changed totally.

Did you speak with any of your friends outside of the class about changing their environmental behaviors? What behaviors/were you successful?

Yadid 06/07: Yes, I talked to my friends about what we learned in Paty's class on Thursdays. That we shouldn't litter around the school, and that we should throw it in the right place. We should put the glass together, and the cans together, and that we can do composting also.

Did you speak with any of your friends outside of the class about changing their environmental behaviors? What behaviors/were you successful?

Felix 06/07: Yes but they didn't change their behaviors [with emphasis]!

What did you ask them to change?

Felix 06/07: I told them about throwing garbage in the right places and they still throw it on the ground, and they aren't paying attention to the consequences.

Did you speak with any of your friends outside of the class about changing their environmental behaviors? What behaviors/were you successful?

Cruz 06/07: I told my friends they shouldn't burn garbage and they shouldn't litter.

Have they changed their behaviors?

Cruz 06/07: Not yet.

The interview responses above point to similar outcomes as reported by Silcox (1993) who found that service learning pedagogies (water testing and river monitoring) with American and Russian youth effectively increased student concern about environmental issues, changed perceptions concerning locus of control, and augmented environmental consciousness.

To the seasoned environmental advocate it may appear that littering and solid waste in general are fairly parochial issues; for Mexico, and for middle school students in general, this is far from the truth. Considering Mexico, unfortunately, littering and the burning of garbage is a deeply ingrained cultural norm in the country. While it may be rare to witness a family of four in the United States or Europe leaving behind large amounts of garbage while visiting the beach or leaving piles of garbage on the side of the road, it is a daily occurrence in Baja Sur. For students to show understanding of the consequences of this behavior, and to cease this behavior, is an accomplishment both on the part of the instructor and the student. For the student to go one step further and advocate to friends, family members, and the public for the cessation of this behavior, is nothing short of courageous.

Considering middle school students, solid waste issues are highly manageable and accessible for the age group. For instance, students can easily see and understand the problem being discussed; littering, burning garbage, and illegal dumping is ubiquitous in Pescadero. Furthermore, students can easily take action to cease this behavior, advocate for the cessation of this behavior, as well as offer services to remedy the environmental ills associated with solid waste (trash removal, habitat improvement, construction and distribution of trash receptacles, etc.). Solid waste issues therefore offer the opportunity to become the gateway to environmental concern and behavior change. That is, students who are initially inspired by their understanding and success with the issue, and are able to recognize the intricacies and potential consequences of man/environment interactions, may be more open in the future to undertake more complex environmental learning scenarios.

We went one step further to uncover if students from the 2004/2005 treatment group had voluntarily participated in any environmentally related community service projects in the two years since the course ended. During post-interviews 1/15 (7%) of the students from the 2004/2005 treatment group reported volunteering for service projects (after finishing Baum's course). These projects included a community trash cleanup and a sea turtle liberation; both projects were led by Baum. Through interviews we discovered that students from both the treatment and control group were amenable and willing to participate in service activities yet did not know how or where to get involved. Also during interviews with students from the 2004/2005 control group we found that 4/5 (80%) had voluntarily participated in an environmentally related community service project outside of school once in their lives. These activities included a community trash cleanup (in town and/or at the beach), and turtle liberations; two of the students volunteered with Baum outside of school and the other two with

the Pescadero Health Center. The Pescadero Health Center yearly recruits students from the school and the community to participate in litter removal and health related projects in Pescadero. Outside of Baum's course and a handful of other community and environmental advocates it is apparent that service opportunities in the Pueblo are limited.

During pre-interviews 17/23 (74%) of the students from the 2006/2007 treatment group disclosed that before starting Baum's course they had volunteered for an environmentally related community project outside of school. From the control group from 2006/2007, 5/6 (83%) of the student disclosed during interviews that they had previously volunteered for an environmentally related community project. During post-interviews we found that 4/5 (80%) of the students from the 2006/2007 control group participated in a community cleanup project during the 2006/2007 school year, all of which were done with their classmates during school hours and with the assistance of the Pescadero Health Center. Students in the 2006/2007 treatment group did not volunteer outside of Baum's course. In later interviews with students our longitudinal study will work to uncover whether these same students have continued participating in service to their community.

In regards to the interviews above with the two treatment and control groups from both years we can conclude that the youth community of Pescadero is actively involved in, or habituated to, service to the community, both with Baum and other community service entities. It is entirely possible that the existence of service opportunities in the pueblo, and/or the high percentage of prior years' community participation, contributed to the phenomenon that students entering Baum's course (and those in the control group) exhibited high and low scores (respectively) on environmental preservation and utilization scales. Furthermore, we can conclude that socially, the population in Pescadero values and condones a culture of service.

Finally, in regards to Research Question 2, all of the students in all of the groups were asked to describe their ideas about the meaning of the word “environmentalist” or “ecologist,” and asked if they consider themselves to be an “environmentalist” or “ecologist.”

2004/2005 Groups

Treatment

- At post-interview, 13/15 (87%) students in the 2004/2005 treatment group could define the word “environmentalist” or “ecologist.” Of those students, 12 believe themselves to be environmentalists or ecologists now, while one student does not believe she is an environmentalist or ecologist now. Of these 12 students that now consider themselves environmentalists or ecologists, 9/12 (75%) of the students did not ascribe to this label before the class began, whereas 3/12 (25%) did.

Control

- At post-interview, 2/5 (40%) students in the 2004/2005 control group could define the word “environmentalist” or “ecologist,” both of these students considers themselves environmentalists or ecologists.

2006/2007 Groups

Treatment

- At pre-interview, 10/23 (43%) of the students in the 2006/2007 treatment group could define the word “environmentalist” or “ecologist,” and all 10 of those students believed themselves either to be environmentalists or ecologists.

- At post-interview 18/21 (85%) students in the 2006/2007 treatment group could define the word “environmentalist” or “ecologist,” and 17/18 (94%) of those students believe themselves to be environmentalists or ecologists, one student did not. Of these 17 students, 7/17 (41%) of the students stated that they did not consider themselves to be environmentalists or ecologists before the course, but do now (after completing the course); 10/17 (59%) of the students stated that they believed that they were already environmentalists or ecologists before the course began.

Control

- At pre-interview, all six of the students in the 2006/2007 control group could define the word “environmentalist” or “ecologist,” and all of them already believed themselves to be environmentalists or ecologists.
- At post-interview 4/5 (80%) of the students in the 2006/2007 control group could define the word “environmentalist” or “ecologist,” and 3/5 (60%) believed themselves to be environmentalists or ecologists.

In relation to Research Question 2 can we propose that students whom have completed the course have breached an inchoate state of environmental awareness? Has their course experience affected their perceptions and propensity for action on a personal, familial, or community level?

After we assay written student surveys and interview data we find outcomes that are indicative of the attributes Serow (1997) finds important. Students have indeed garnered a heightened awareness of environmental issues, augmented their environmental perceptions and

consciousness, and compounded this sentiment (at times) with environmentally responsible behaviors. Almost all of the students in the 2004/2005 treatment group could define the word environmentalist and all but three believed themselves to be environmentalists. This is of importance because (as discovered during interviews) two-thirds of the students explained that they did not believe themselves to be environmentalists before taking the course, thus attributing the label and sentiment to the course experience. And despite any further experiential environmental learning in later years, students from the 2004/2005 treatment group retained strong environmental sentiments two years after taking the course. While two years is not exactly “persistent, long-range effects on behavior, attitudes, and predispositions” (Lipka, 1997, p. 56), the data is thus far encouraging. The majority of students reported during interview that the course increased their environmental consciousness and appreciation for nature, traits that remain today. These attitudes that they foster, two years later, also guide their environmental actions and have in some instances resulted in environmental advocacy through intergenerational learning; this was evident in multiple statements from students and parents. The advent of experiential environmental learning with Mexican middle schoolers has in this instance lead in some degree to more than momentary benefits in regards to pro-environmental actions, and the course experience has thus far instilled a more lasting attitudinal effect.

Effects of social factors on environmental traits

Research Question 3: How does the cultural, political, educational, and economic atmosphere in student homes and the community of Pescadero affect students?

This research would not have been complete without a comprehensive understanding of the social, cultural, political, educational, and economic atmosphere in student homes and the

community of Pescadero, and the effects of these attributes on students in regards to environmental knowledge, perceptions, and actions. It goes without saying that this study and the environmental learning course itself would not have existed if there were not a need for environmental learning in Pescadero. As such, interviews with parents, teachers, the Directora of the Telesecundaria (principal), the local organic farm owner/employer (Sueño Tropical), an ejidero, the director of the local health center, a sea turtle biologist from a local NGO, and the Director of an environmental/solid waste NGO, provided rich information that helped us to understand the context within which students in this course base their experience. Through interview and four month's time spent in Pescadero, we uncovered that the pueblo and its inhabitants (human and non-human) face serious environmental challenges. We found Pescadero to be a community undergoing rapid changes due to an influx of foreign funds and development. Ejideros are pressured by the government and the lure of quick wealth to sell their communal properties to foreign developers. Families that in the past lived with little income are in some instances making large profits from the sale of their family land. Some families are using their newfound income to purchase satellite television. With this advent they are exposed to a universe of information and propaganda selling environmentally harmful lifestyles and consumer choices. Families are purchasing trendy clothing, unhealthy foodstuffs, and expensive sports cars; products over-packaged in disposable plastic containers and plastic bags are ubiquitous. The next generation of Pescadero is encountering the full brunt of hyper-consumerism and hyper-individualism. Additionally, political factions from Pescadero and nearby Todos Santos, La Paz, and Cabo San Lucas are encouraging destructive foreign development of sensitive natural areas for tourism, business, and resource development. Community influentials continue to consume endangered sea turtles and support the black

market; this knowledge is public and has been confirmed through first hand accounts from our interviewees. Many of the other environmentally harmful situations are described in depth in Chapter 1 of this research; however, what is abundantly clear, is that Pescadero's youth will soon encounter (and potentially be affected by) more environmental changes than any of their predecessors.

While the influx of wealth in Pescadero is changing consumer habits in some families it was not yet evident with the students we interviewed as there was minimal mention of disposable income. The majority of students we interviewed discussed parents who work in the agricultural or construction industries. As such, the major consumer choices that the students currently face concern food packaging, manner of processing, and transportation costs. However, there is a possibility in the near future that some of the student families could encounter newfound wealth due to the sale of their ejido land. Therefore, the need for environmental learning concerning pro-environmental consumer behaviors is of immediacy.

Looking to the interview questions that addressed the cultural attributes concerning appreciation for nature, we found that students and their families are spending time visiting, and camping in nature (Table 6). We explored the extent to which students spent time in natural areas and uncovered culturally that the population in Pescadero does (to a certain extent) encourage, value, practice, and appreciate familial nature experiences. The high percentage of students who spent time in nature with their friends and families (prior to, and outside of Baum's course) could have contributed to the success of the service programs that worked to improve the environment and natural habitats. During the outdoor service activities students readily adapted to working in nature and performed tasks with interest and efficiency. We did not encounter students who were "freaked out" by insects, heat, or simply by being outside of the confines of

the human built environment. Similarly, for students who rarely or never spent time in nature, the opportunity to camp, hike, and work outdoors was greatly appreciated.

Of all students interviewed, 13/49 (27%) visit nature at least once a year, while 35/49 (71%) visit nature more than once a year. We found that 18/49 (37%) of students go camping at least once each year, while 13/49 (27%) of students camp more than once a year. All of the students who replied during interviews that they “never go camping with their family” answered affirmatively, when asked: “*Would you like to go camping?*” Of the students who replied that they visit nature and/or go camping, they listed local beaches and mountain ranges as the most frequented sites, including: the Sierra de la Laguna National Park, San Pedrito Beach, Los Cerritos Beach, and the Rio Aguaje. Almost all of the students who reported that they go camping once a year said that they do so at Los Cerritos Beach during Semana Santa in April.

TABLE 6:
Frequency of Outdoor Activity 2004/2005

2004/2005 Treatment		2004/2005 Control	
Nature visits	Number of students	Nature visits	Number of students
0 times/yr.	1/15	0 times/yr.	0/5
At least 1/yr.	5/15	At least 1/yr	1/5
> 1/yr.	9/15	> 1/yr.	4/5
Camping		Camping	
0/yr.	6/15	0/yr.	1/5
1/yr.	7/15	1/yr.	2/5
> 1/yr.	2/15	> 1/yr.	1/5
2006/2007 Treatment		2006/2007 Control	
Nature visits		Nature visits	
At least 1/yr.	4/23	At least 1/yr.	3/6
> 1/yr.	19/23	> 1/yr.	3/6
Camping		Camping	
0/yr.	7/23	0/yr.	3/6
1/yr.	9/23	1/yr.	0/6
> 1/yr.	7/23	> once/yr.	3/6

During pre-interviews with students from the 2006/2007 treatment and control groups were asked about the existence of parentally induced environmental lessons and if their parents were influential in teaching them about the environment. Only 1/6 (16%) students from the 2006/2007 control group reported that their parents did *not* discuss the environment with them, while only 5/23 (22%) students from the treatment group

reported *no* parental influence. Thus, though student interview, there is in fact evidence of parents in Pescadero openly and actively discussing environmental topics with the family.

The prevalence of parentally induced environmental lessons contradicts some of the comments made by community influentials who alluded to the fact that there is a low level of environmental consciousness in the community, and Mexico in general. Of course, consciousness alone, without action, is not as effective as consciousness coupled with action. The fact that these families possess moderate levels of environmental consciousness could have contributed to the overall success that students reported (during interview) when they advocated for pro-environmental behavioral change within the family. Additionally, the high occurrence of familial environmental discussions could have also contributed to the high environmental preservation and low environmental utilization perception scores as obtained during pre-tests (results presented in the quantitative section below).

The following is a short excerpt of the typical interview conversation:

Did your parents teach you about the environment when you were growing up?
Miguel 06/07: Yes.

What did they teach you?
Miguel 06/07: It's especially important to protect the sierras, the mountains. It's important to take care of that ecosystem.

Any other things they taught you about the environment?
Miguel 06/07: They taught me how to take care of the trees.

At your house?
Miguel 06/07: Yes, at my house.

Other representative quotes from the 2006/2007 treatment and control groups:

- My parents teach me to take care of the environment by not littering.
- They teach me to take care of the plants and animals.
- To take care of the animals and to put litter in the appropriate place.
- Yes my father read many books and he talked to me about them. He said that there's a type of snake, a Cascabel. And he said if I don't bother it, it won't bother me and not to kill it. Many other things that I don't remember.
- Of the plants and about how not to harm them.
- Not to contaminate the water and also not to throw garbage in the street, to put it in the garbage can.
- Yes they taught me about not letting the plants get dry because this damages them and this is also bad for the environment. They told me not to litter the ocean because this not only bad for us and the future, but the ocean as well.
- Yes, protect the water, and put garbage in the garbage can. Take care of the rivers in Veracruz.
- About the turtles...to take care of them.
- Yes, it's bad to rob animals from nature...turtles. If plants don't get water then we can't breath. To take care of the animals, to keep my dogs clean.
- Many things. I was taught to throw the garbage in the garbage can, to recycle, to take care of the beaches so there's no damage to the turtles. And don't drive cars on the beach, as this will damage the turtles.
- They told me to take care of the environment, don't litter because if you do it can contaminate the town.

In order to uncover the prevalence and nature of environmental learning in the Mexican educational system the interviewees were asked to describe the extent and nature of environmental learning outside of Baum's course. Students from the 2004/2005 treatment and control groups were asked about environmental learning they encountered after Baum's course. Students from the 2006/2007 treatment and control groups were asked about environmental learning they may have encountered before entering the Telesecundaria (in elementary school). Some of these students are in their final year of at the Telesecundaria while others have already moved onto high school in Todos Santos. Additionally, not all of the students whom entered the Telesecundaria in 2006 attended elementary school in Pescadero. Some of these students recently moved to Pescadero from other parts of the Baja and even mainland Mexico. The interview data overwhelmingly confirms that these students were exposed to environmental topics in elementary, middle, and high school, both from textbook and teacher sources, and outside of Baum's course. The data also confirms that most of the environmental learning is taking place in the classroom, with a fraction of the students reporting field trips or any form of hands-on, place based, or applied learning activities. The following interview segments are representative of the majority of the discussions.

2004/2005

You're studying eco-tourism, so do they talk about the environment?

Lino 04/05: In fact they talk about the environment and the social environment in school.

What types of things?

Lino 04/05: We discuss the environment and how to keep the beaches clean; and littering the streets and the rivers.

After Paty's class did your teachers ever discuss the environment or conservation?

Michelle 04/05: Yes, in science and technology and in biology. I am in high school now.

Do you go on field trips?

Michelle 04/05: Until now no, but in biology class we talked about contamination, and in the upcoming semester we're going to look at the sea turtles.

What books did you use?

Michelle 04/05: In the technical science class we learned about taking care of the organic garbage and that was the textbook.

Do you have any teachers or classes in school that discuss the environment?

Myra 04/05: The only class in school where we talk about the environment is in science class. There we talk about the environment and we talk about other things. One of the things we do on Friday is clean the school with him [the teacher].

Do any of your books discuss the environment or conservation?

Myra 04/05: Yes, we have lessons in the book about the environment with our science teacher, and we had a test on this: how to take care of the environment and how to keep it clean, and what to do. And there are those things in the textbook as well.

Did you do any field trips?

Myra 04/05: No

Out of the 20 students interviewed from the 2004/2005 treatment and control groups 14/20 (70%) reported that teachers discussed the environment in school (after the 2004/2005 school year). Only 1/20 (5%) of these students reported that they participated in hands-on learning during school hours. Classes that included environmental lessons included: Spanish, Natural Science, Technical Science and Societal Values, and Biology. Some of the students confirmed that the textbooks from these classes addressed these lessons, but most of the students could not remember the names of the books. Lessons taught in these classes included:

- Sea turtle conservation
- Water and air pollution/contamination issues
- Water conservation
- Recycling
- Littering and burning garbage
- Composting
- Protected natural areas
- Eco-tourism

2006/2007

Have any of your teachers discussed the environment or conservation issues in school?

Yolanda 06/07: Yes, they did a lot about it.

How often?

Yolanda 06/07: Just about every year they gave us these types of talks. It was part of the curriculum but also ecologists came and give us talks. They told us to take care of the environment. Not to hunt or farm animals that are in extinction. And also how we can positively impact the environment.

Have any of your teachers discussed the environment or conservation issues in school?

Emelio 06/07: When I lived in Ensenada the teachers taught us about the land and how to take care of the trees and animals. Some field trips were involved.

Did she use a book or use her head?

Emelio 06/07: We had books but also she used her head. The book was...I don't remember...it was the book from the school. There were games also.

Have any of your teachers discussed the environment or conservation issues in school?

Andrea 06/07: Yes.

Do you remember any themes they taught you?

Andrea 06/07: About what kinds of animals there are, the environment and the ecosystems, and the habitat of the animals.

Have any of your textbooks ever included lessons concerning the environment or conservation issues?

Andrea 06/07: In books and the computer. I looked for information on the computer and also it's in the books we studied at school. The book was natural science and biology.

How long did these lessons last?

Andrea 06/07: All year, for half of an hour each day.

Have any of your teachers discussed the environment or conservation issues in school?

Imelda 06/07: All years

Have any of your textbooks ever included lessons concerning the environment or conservation issues?

Imelda 06/07: Yes, the book of natural science.

Is this one time each year, or an ongoing class?

Imelda 06/07: It's a natural science class that goes on all year long.

Do you remember any of the lessons?

Imelda 06/07: The slaughter of wild animals in Mexico that are in danger of extinction, and also the devastation of the trees.

Did you ever take field trip or were these lessons in the classroom?

Imelda 06/07: In the class with the encyclopedias, computers, and the text.

Of the entire panel of interviewed students from the 2006/2007 treatment and control groups, 26/29 (90%) disclosed that they had previously discussed environmental topics in elementary school; 3/29 (10%) of these students reported that they participated in field trips during school. Some of the students confirmed that the textbooks from their school addressed environmental lessons and indicated that the textbook was named *Natural Sciences*. Lessons taught in elementary school included:

- Sea turtle conservation
- Endangered species and habitats
- Water and air pollution/contamination issues
- Water conservation
- Recycling of solid waste
- Littering and burning garbage
- Deforestation

Additionally, at post-interview with the 2006/2007 control group, all five of the students reported that their teacher discussed environmental issues with the students for the duration of one week. We also found that 4/5 (80%) of the students from the 2006/2007 control group participated in a community cleanup project, all of which were completed with their classmates and teacher during school hours, and with the assistance of the Pescadero Health Center. The topics covered in-class included:

- Environmental contamination
- Littering
- Animal welfare
- Burning garbage and air pollution
- Population issues
- The ozone hole

Influential Course Components

Research Question 4: What specific aspects of the environmental learning course have been most influential in affecting student's learning and environmental experience?

Qualitative Research Question 4 addressed the student preferences and influential components of the environmental learning program. During the interviews below we found that the hands-on components of the course stood out significantly in these students' minds. Students spoke proudly and intelligently of their service learning experiences and raised some important themes worthy of note. As mentioned above, students mentioned the importance of, and comradery they felt while working in groups of peers, and how their work was a collective effort to assist the pueblo, the natural environment, and endangered species. The majority of the students enjoyed working outside the confines of the classroom and thought this component to be a positive experience that was interesting, useful, meaningful, and engaging. Many students expressed the monotony of the classroom and how they appreciated the opportunity to go outside. The experiential components gave some students inspiration, and as a result, students reported during interview that they paid better attention. For some students whom had never camped, traveled, or spent much time in natural areas, the experiential course components had a significant impact.

Students mentioned that although the classroom (in-class) opportunities with Baum were interesting and important, they enjoyed having the opportunity to operationalize these in-class lessons and bring their service plans and education to fruition. This practical application of the classroom-based materials was exciting for the majority of the students as the pedagogy was a new and novel advent. For instance, some students noted that they enjoyed classroom-based

learning concerning the biology and threats to endangered sea turtles, then taking this knowledge to the action level by working directly with sea turtle liberations and habitat improvement projects. Many students discussed the enjoyment and satisfaction they felt when they were able to see the results of their labor, both for the environment and their own enjoyment in seeing recovery of a previously impacted area. Additionally, the time students spent away from the classroom allowed for first-hand study of the environment involving plants and animals in situ.

Through observations and interviews with students, parents, and Baum we ascertained that some students who worked directly with endangered sea turtles and habitat improvement projects were positively influenced by the experience. The influence of the experience for some students resulted in positive outcomes, such as contributing to pro-environmental attitudes towards species protection, and the pro-environmental behavior modification of some students who eventually returned home and promoted sea turtle protection efforts to their families. During interviews, both students and parents described the student efforts to inform the family about not driving on sea turtle nesting beaches, while students alone told us that they had returned home and asked certain family members to stop eating sea turtles.

Bogner (1988) pointed out the necessity of including affective experiences in environmental programs where shifts in perception and attitudes are sought. Bogner wrote that positive attitude change requires more than just educating for cognitive learning advancements. As mentioned in the literature review, Bogner employed sensual, hands-on, and cooperative experiences such as barefoot walks in the forest, simulation games that emphasized emotion approaches and sensory awareness, as well as all-day hikes. Similarly, Baum utilized nature experiences such as hiking, snorkeling, camping, visits to national parks, as well as implemented hands-on service experiences involving endangered species and the local flora and fauna. Both

practitioners (the former, professional, and the later, informal) in these instances facilitated pedagogical experiences that involved students leaving the classroom where they encountered situations that fostered and instigated positive affective outcomes.

Treatment group students from both 2004/2005 and 2006/2007 were asked during interviews to identify their favorite environmental learning projects; students were not prompted to discuss a particular subject or the nature of the learning (IE: in-class, hands-on, etc.). Of the 15 students interviewed from the 2004/2005 treatment group we found that all 15 of the students selected hands-on projects as their favorites. From the 2006/2007 treatment group, 13/21 (62%) of the students identified hands-on projects as their favorites, 3/21 (14%) liked both the in-class and hands-on activities equally, while 5/21 (24%) preferred in-class activities. Their activity preferences can be further divided (in order of popularity) between the activities as seen below in Tables 7 and 8

When we interviewed the 2004/2005 treatment group we found that about half (53%) of the students identified the ongoing Los Cerritos Beach cleanup as their favorite project. When we interviewed 2006/2007 treatment group we found that about half (57%) of the students identified the local arroyo mitigation project as their favorite project. Students practiced documenting their work on film media, and during interview explained that the cleanup, recycling, and plant and animal identification aspects of the arroyo project were highly influential in augmenting their environmental consciousness and personal pro-environmental behaviors.

TABLE 7:

Preferred Projects as Identified by 2004/2005 Treatment Group

Activity Preferences	2004/2005 Treatment Group
Los Cerritos cleanup	8
Turtle liberations	3
Composting	2
Camping	1
Pueblo cleanup	1

TABLE 8:

Preferred Projects as Identified by 2006/2007 Treatment Group

Activity	2006/2007 Treatment Group
Arroyo Rehabilitation	12
School wide recycling	3
Turtle Liberations	3
Los Cerritos cleanup w/camping	2
In-class turtle study	1
Composting	0

The following interview discussions took place with the treatment group students from both groups:

2004/2005

What were your favorite projects in Paty's class and why?

Suze 04/05: What I liked the most was leaving the classroom with the group to do things, for example to go to the beach and collect garbage and things that we did together. Paty

gave us a CD with pictures of all the things that we did, and the activities. I really liked doing this with my classmates and also we all live here so it all affects the town.

Did you like the hands-on projects you did away from the class?

Suze 04/05: I liked it very much. I enjoyed the activities very much outside the class because it made me feel good. For example, if I am with my father and he litters, and then I explain to him not to litter, then he knows.

Do you believe there were sufficient projects away from the class? Would you want more or less?

Suze 04/05: I wish there were more because when we are in class and Paty is talking, we're learning and listening. But when we go out of the class, we're doing the things that we're talking about and I like that.

What were your favorite projects in Paty's class and why?

Vikki 04/05: Well, the things we learned about the sea turtles, how to take care of them, how we shouldn't kill them, things like this.

Did you like the hands-on projects you did away from the class?

Vikki 04/05: Well yes, we went to the beach and collected garbage and liberated turtles. I like working with the turtles but there's a lot of dust and I did not like that.

Do you believe there were sufficient projects away from the class? Would you want more or less?

Vikki 04/05: When I am outside the class I learn more. And I like learning outside the class, and I wish there were more things outside the class instead of staying inside and writing... which is boring.

What were your favorite projects in Paty's class and why?

Ana 04/05: On Fridays when we went to clean the beach at Los Cerritos

Did you like the hands-on projects you did away from the class?

Ana 04/05: Yes, because I like to do it [Hands-on activities].

Did you learn more with the hands-on activities or did you learn more in the classroom lessons?

Ana 04/05: More in the hands-on projects because when we're in the class the doors are closed and it's hard to pay attention and it's not interesting. But outside the class it's different and more interesting.

What were your favorite projects in Paty's class and why?

Porfirio 04/05: The conservation of the areas, the land and the water.

Did you have a project in class or away from class that was your favorite?

Porfirio 04/05: The cleaning of the beach.

Why was this your favorite?

Porfirio 04/05: This was the place that we visit a lot and if we don't clean it then we won't want to visit it in the future.

Did you like the hands-on projects away from the classroom?

Porfirio 04/05: Yes, because we learned the concepts in the class and then we actually went outside and developed them. And we actually did the things that we said we were going to do and learned about.

Did you want more or less classes away from the classroom or were there enough?

Porfirio 04/05: I wish there were more projects outside of the class.

What were your favorite projects in Paty's class and why?

Juan 04/05: Helping the turtles and cleaning Los Cerritos because we helped the sea turtles and we helped improve the environment and collected the garbage at Los Cerritos.

You mentioned two hands-on projects. Do you think you learn better with hands-on projects or in the classroom with books?

Juan 04/05: I learn from them both, the hands-on and the books.

Which do you prefer?

Juan 04/05: I prefer the hands-on projects because the classroom learning is just writing and understanding the beliefs, but the hands-on you are outside and you actually get to know the environment and the land.

If you had to choose more or less hands-on projects would you choose more or less?

Juan 04/05: I would choose more.

Did you prefer hands-on learning or learning in the classroom?

Cecilia 04/05: I liked both equally.

2006/2007

What were your favorite projects or activities in Paty's class, and why?

Yolanda 06/07: The project I liked a lot in Paty's class was when we went to collect garbage in the arroyo...there was enough already! And we collected it, and recycled it, and I enjoyed it a lot, separating the garbage. Whenever we found an animal or insect or plant we learned about it. And one day we found a yellow lizard and we identified it. And also we found a lot of garbage that people threw in the arroyo. I don't like this and garbage gets into the elements.

Do you think you learned better from the hands-on projects or the classroom lessons? Why?

Yolanda 06/07: The truth is I like both inside and outside because I pay attention wherever I am...so whether it's inside or outside, I like where I am.

Did you like the hands-on projects you did away from the class? Why?

Yolanda 06/07: Yes, because working outside I learn how not to damage the world and I learned about animals and plants and how not to damage them, and how to take away the bad things in the environment.

Do you believe that there were sufficient projects away from the class? Would you want more or less?

Yolanda 06/07: I believe that there were enough hands-on projects in the class. I like the dynamic of learning outside, it was very fun, but being inside is fun too...I like both of them.

What were your favorite projects or activities in Paty's class, and why?

Angelca 06/07: It would have to be going to collect garbage in the arroyo and collecting garbage in the school, and also going to the arroyo and learning about plants...Paty telling us about all the different kinds of plants we saw.

Do you think you learned better from the hands-on projects or the classroom lessons? Why?

Angelca 06/07: Going with Paty, because in class we learn all the things but don't actually do them or practice doing them.

Did you like the hands-on projects you did away from the class? Why?

Angelca 06/07: Yes, because we separated the garbage and had a chance to talk with Paty about different things.

Do you believe that there were sufficient projects away from the class? Would you want more or less?

Angelca 06/07: More.

What were your favorite projects or activities in Paty's class, and why?

Antonio 06/07: When we recycled what we got from the arroyo.

Do you think you learned better from the hands-on projects or the classroom lessons? Why?

Antonio 06/07: With my hands. Because in the books I usually don't understand, but outside of class, I understand when we're doing it.

Did you like the hands-on projects you did away from the class? Why?

Antonio 06/07: Yes, because we were outside, and we were learning outside.

Do you believe that there were sufficient projects away from the class? Would you want more or less?

Antonio 06/07: More.

What were your favorite projects or activities in Paty's class, and why?

Crespin 06/07: Going to Los Cerritos and liberating the turtles.

Are there many issues with the turtles here in the pueblo?

Crespin 06/07: That people kill them sometimes to sell them, and take advantage of them.

Do you think you learned better from the hands-on projects or the classroom lessons?

Why?

Crespin 06/07: Away from the classroom, because when we're outside we actually do it, and when we're inside we're just listening and reading.

Did you like the hands-on projects you did away from the class? Why?

Crespin 06/07: Yes, I liked them a lot because we separated garbage, and we brought things to the dump, and also because we made compost.

Do you believe that there were sufficient projects away from the class? Would you want more or less?

Crespin 06/07: More.

What were your favorite projects or activities in Paty's class, and why?

Felix 06/07: Learning how to recycle the garbage and learning how to take care of the trees...oh but I really liked the turtles, the turtles were my favorite!

You liberated the sea turtles?

Felix 06/07: Yes I helped with the liberations one time.

Do you think you learned better from the hands-on projects or the classroom lessons?

Why?

Felix 06/07: I learn more with Paty working with my hands. Because we learned what things contaminate the environment and what things don't contaminate the environment.

Do you believe that there were sufficient projects away from the class? Would you want more or less?

Felix 06/07: More.

What were your favorite projects or activities in Paty's class, and why?

Joel 06/07: I liked the project going to the arroyo with Paty. We saw some insects and we looked up what the insects were, and we learned about their story. I liked the interviews. [With the research personnel].

Do you think you learned better from the hands-on projects or the classroom lessons?

Why?

Joel 06/07: I learned in both the hands-on projects and the in-class projects.

Is there one in which you learned better? Why?

Joel 06/07: Outside the classroom, because we saw many animals and plants and we had games, like who collected the most garbage...won.

Do you believe that there were sufficient projects away from the class? Would you want more or less?

Joel 06/07: I would have wanted more.

What were your favorite projects or activities in Paty's class, and why?

Thalia 06/07: Recycling the plastic and the glass at the school.

Do you think you learned better from the hands-on projects or the classroom lessons?

Why?

Thalia 06/07: Here in the class, because we are in a group and we learn more.

Did you like the hands-on projects you did away from the class? Why?

Thalia 06/07: Yes, because we recycled garbage and cleaned the school.

Do you believe that there were sufficient projects away from the class? Would you want more or less?

Thalia 06/07: Less, because when we left less we were distracted less.

What were your favorite projects or activities in Paty's class, and why?

Jaime 06/07: Recycling the garbage in the arroyo and in the school.

Do you think you learned better from the hands-on projects or the classroom lessons?

Why?

Jaime 06/07: In the class. Because I understand the things better in class.

Did you like the hands-on projects you did away from the class? Why?

Jaime 06/07: Yes, because they were fun.

Do you believe that there were sufficient projects away from the class? Would you want more or less?

Jaime 06/07: More.

Many of the students exhibited dismay about the human impacts to Pescadero's environment and discussed how their environmental mitigation efforts were effective, meaningful, fun, and educational. This project was a real "eye opener" for students concerning the extent to which their community and the environment can be affected by human induced pollution and contamination. During interviews students mentioned that their in-class

experiences before and during the arroyo project allowed them to learn about the environmental effects of contamination. Students then discussed how their additional direct exposure to the contamination and their experiences with the mitigation effort helped them to crystallize their understandings, which gave them insights and the dedication to advocate and practice pro-environmental behaviors at their homes and amongst their peer group.

The meaningfulness of these hands-on activities was accomplished through community, and ultimately, through social group participation. The resulting heightened understandings, as mentioned by the students above, highlight the potential for positive outcomes with novel tasks steeped in situated authenticity. As reported by Doyle (2000), such novel tasks facilitate situations that sometimes result in enhanced understandings. That is, the authentic and experiential tasks here had the ability to contextualize learning experiences (through physical and social participation) for greater meaning and knowledge transfer, and hopefully, more mature environmentally responsible behaviors. Lave and Wenger (1991) would probably describe this as legitimate peripheral participation.

Quantitative Data Analysis

The Statistical Package for the Social Sciences (2007) was used to analyze participant survey data. We conducted the following analysis to measure potential changes in participant environmental knowledge, perceptions, and actions:

- Independent sample T-test: To determine whether the mean pre-treatment survey scores for environmental knowledge, perceptions, and actions from the 2006/2007 treatment and control groups were significantly different (between groups).

- Independent sample T-test: To determine whether the mean post-treatment survey scores for environmental knowledge, perceptions, and actions from the 2004/2005 and 2006/2007 treatment and control groups were significantly different (between groups).
- Paired samples T-test: To determine if the pre to post-treatment survey scores within the 2006/2007 control and treatment groups were significantly different.
- Checked results with Wilcoxon Matched-Pair Signed Ranks Test: To check the validity of our parametric statistical analysis we compared pre and post-treatment survey scores within the 2006/2007 groups using non-parametric methods.

Environmental Knowledge

2006/2007 Pre-treatment

Using pre-treatment survey data we conducted an independent sample T-test to find if there was a statistically significant difference in the means of the 2006/2007 treatment and control group for environmental knowledge. The portion of the pre-treatment survey that addressed environmental knowledge contained 19 items for a total of 35 total possible points; 11 of the questions were multiple choice worth one point each, while eight of the questions were open-ended, worth three points each. The control group mean score on the environmental knowledge portion of the survey was 11.41 (33%), while the treatment group scored on average 11.18 (32%) (see Table 9). There was no significant difference in the mean environmental knowledge scores, $t(32) = .181, p \leq .05$, (two-tailed).

Table 9

Environmental knowledge independent sample t-test (two-tailed)

		n	M	SD	t	sig.
Control group	Pre	12	11.41	2.937	.181	0.858
Treatment group	Pre	22	11.18	3.935		

2006/2007 Post-treatment

Using post-treatment survey data we conducted a paired samples T-test to uncover if there was a statistically significant mean knowledge score difference from pre-test to post-test for both the 2006/2007 treatment and control group (Table 10). The portion of the post-treatment survey that addressed environmental knowledge contained the same 19 items as the pre-treatment survey for a total of 35 total possible points; 11 of the questions were multiple choice worth one point each, while eight of the questions were open-ended, worth three points each. At post-test the control group improved on average 3.33 points (9%), while the treatment group improved on average 5.1 points (15%). We conducted a paired samples T-test and found that the differences in means between the pre-test and post-test knowledge scores were statistically significant for the control group $t(9) = -6.128, p \leq .05$, (two-tailed) (see Table 14). We conducted a paired samples T-test and found that the differences in means between the pre-test and post-test knowledge scores were statistically significant for the treatment group $t(19) = -5.425, p \leq .05$, (two-tailed). After an independent sample T-test we found there to be no significant difference between the means of the control and treatment group post-test scores $t(33) = -1.218, p \leq .05$.

Table 10

Environmental knowledge paired samples t-test (two-tailed) and independent sample t-test (two-tailed)

		n	M	SD	t	sig.	r
Paired samples							
Control group	Pre	10	11.20	2.740	-6.128	0.000	0.898
	Post	10	14.50	2.758			
Treatment group	Pre	20	11.30	3.628	-5.425	0.000	0.779
	Post	20	16.40	4.51			
Independent samples at post-test							
Control group	Post	15	14.53	4.454	-1.218	.232	
Treatment group	Post	20	16.40	4.511			

2004/2005 Post-treatment

Using post-treatment survey data we conducted an independent sample T-test to uncover if there was a statistically significant difference in the mean scores of the 2004/2005 treatment and control group for environmental knowledge (Table 11). The portion of the post-treatment survey for the 2004/2005 groups that addressed environmental knowledge was identical to the version discussed above for the 2006/2007 groups. The control group mean score on the environmental knowledge portion of the survey was 13.8 (39%), while the treatment group

scored on average 15 (43%). For the environmental knowledge component we found no statistical difference in the mean scores of the two groups $t(28) = 1.042, p \leq .05$.

Table 11

Environmental knowledge independent sample t-test (two-tailed)

		n	M	SD	t	sig.
Control group	Post	15	15.0	3.964	1.042	.306
Treatment group	Post	15	13.8	2.042		

Environmental Perceptions

2006/2007 Pre-treatment

For the preservation component of the Model of Ecological Values (Wiseman & Bogner, 2003) dealing with environmental perceptions, the 2006/2007 groups were measured on a scale of 1-5. Both groups scored relatively high on environmental perceptions dealing with preservation components (see Table 12). Using this pre-treatment survey data in an independent sample T-test we found there to be no significant difference between the mean environmental perception scores for preservation, $t(32) = .380, p \leq .05$, (two-tailed)

Table 12

Environmental perceptions (preservation) independent sample t-test (two-tailed)

		n	M	SD	t	sig.
Control group	Pre	12	4.18	.4338	.380	0.706
Treatment group	Pre	22	4.23	.4038		

For the utilization component of the Model of Ecological Values (Wiseman & Bogner, 2003) dealing with environmental perceptions, both the treatment and control groups had relatively low utilization mean scores, indicating a low preference for human induced environmental manipulation (see Table 13). Using this pre-treatment survey data in an independent sample T-test we found that the means of the two groups were not significantly different, $t(32) = .789, p \leq .05$, (two-tailed).

Table 13

Environmental perceptions (utilization) independent sample t-test (two-tailed)

		n	M	SD	t	sig.
Control group	Pre	12	2.69	.4828	.789	0.436
Treatment group	Pre	22	2.91	.8930		

2006/2007 Post-treatment

For the preservation component of the Model of Ecological Values (Wiseman & Bogner, 2003) dealing with environmental perceptions, the control group scores mean improvement was .18 while the treatment group mean improvement was .29. Using a paired samples T-test we found that the preservation perception improvements had not significantly improved for the control group $t(9) = 1.780, p \leq .05.$, but had significantly improved for the treatment group $t(19) = 3.172, p \leq .05$ (see Table 14). Using an independent sample T-test we found there to be no statistically significant difference in the post-test means of the control and treatment group $t(33) = -.841, p \leq .05.$

Table 14

Environmental perceptions (preservation) paired samples t-test (two-tailed) and independent sample t-test (two-tailed)

		n	M	SD	t	sig.	r
Paired samples							
Control group	Pre	10	4.19	.4660	1.780	.109	
	Post	10	4.49	.3241			
Treatment group	Pre	20	4.21	.4128	3.172	.005	0.588
	Post	20	4.50	.4084			
Independent samples at post-test							
Control group	Post	15	4.37	.4865	-.841	.406	
Treatment group	Post	20	4.50	.4084			

For the utilization component of the Model of Ecological Values (Wiseman & Bogner, 2003) dealing with environmental perceptions, the control group mean scores overall decreased (improved) by .27 while the treatment group decreased by .31. Both groups scored relatively low on utilization perceptions, indicating a low preference for human induced environmental manipulation. Using a paired samples T-test we found that the utilization perception mean scores had not significantly improved for the control group $t(9) = .823, p \leq .05$, but had significantly improved for the treatment group $t(19) = 2.341, p \leq .05$ (see Table 15). Note that the sample size for the treatment group ($n = 20$) was twice as large as the sample size of the control group ($n = 10$). With this in mind, finding statistically significant improvement in the mean utilization scores of the treatment group would lead us to recognize a robust effect. Using an independent sample T-test, there was not found to be a statistically significant difference between the mean utilization post-test scores of the control and treatment groups $t(33) = -.899, p \leq .05$.

Table 15

Environmental perceptions (utilization) paired samples t-test (two-tailed) and independent sample t-test (two-tailed)

		n	M	SD	t	sig.	r
Paired samples							
Control group	Pre	10	2.62	.4970	.823	.432	
	Post	10	2.46	.6080			
Treatment group	Pre	20	2.91	.9385	2.341	.030	0.473
	Post	20	2.60	.6651			
Independent samples at post-test							
Control group	Post	15	2.42	.5160	-.899	.375	
Treatment group	Post	20	2.60	.6651			

2004/2005 Post-treatment

For the preservation component of the Model of Ecological Values (Wiseman & Bogner, 2003) dealing with environmental perceptions, both 2004/2005 groups scored relatively high (see Table 16). Using post-treatment survey data in an independent sample T-test we found that the mean scores of the two groups were not significantly different in regards to the preservation component of environmental perceptions $t(28) = -1.240, p \leq .05$.

Table 16

Environmental perceptions (preservation) independent sample t-test (two-tailed)

		n	M	SD	t	sig.
Control group	Post	15	4.46	.3797	-1.240	.225
Treatment group	Post	15	4.29	.3413		

For the utilization component of the Model of Ecological Values (Wiseman & Bogner, 2003) dealing with environmental perceptions, both 2004/2005 groups scored relatively low on the utilization components, indicating a low preference for human induced environmental manipulation (see Table 17). Using this post-test survey data in an independent sample T-test we found that both group's mean scores were not significantly different in regards to the utilization component of environmental perceptions $t(28) = -.931, p \leq .05$.

Table 17

Environmental perceptions (utilization) independent sample t-test (two-tailed)

		n	M	SD	t	sig.
Control group	Post	15	2.79	.5115	-.931	.360
Treatment group	Post	15	2.56	.8115		

Environmental Actions

2006/2007 Pre-treatment

Using pre-treatment survey data we conducted an independent sample T-test to uncover if there was a statistical difference in the means of the 2006/2007 treatment and control group for pro-environmental actions. The portion of the written survey that addressed environmental actions was split into two categories: 17 pro-environmental action items and six anti-environmental action items (Appendix A). If a person were to consistently practice pro-environmental behaviors on all items they would have answered, “I always do this” for all items, and they would attain a score of 3. A person who consistently answers, “Sometimes I do this” would attain a score of 2. A person who consistently answers, “I almost never do this” would attain a score of 1. A person who consistently answers, “I never do this” would attain a score of 0. For pro-environmental actions both groups scored moderately, with the average pro-environmental action response of: “Sometimes I do this.” For pro-environmental actions we found no statistical difference between the means of the two groups , $t(32) = -1.335, p \leq .05$, (two-tailed) (see Table 18).

Table 18

Environmental actions (positive) independent sample t-test (two-tailed)

		n	M	SD	t	sig.
Control group	Pre	12	2.064	.4882	-1.335	0.191
Treatment group	Pre	22	1.829	.4903		

With pre-treatment survey data we conducted an independent sample T-test to uncover statistical significance in the means of the 2006 treatment and control group for anti-environmental actions. The portion of the written survey dealing with anti-environmental actions contained seven questions with the same responses as the pro-environmental actions: “I always do this,” etc. If a person were to consistently practice anti-environmental behaviors on all items they would have answered, “I always do this” for all items, and they would attain a score of 3. A person who consistently answers, “Sometimes I do this” would attain a score of 2. A person who consistently answers, “I almost never do this” would attain a score of 1. A person who consistently answers, “I never do this” would attain a score of 0. For anti-environmental actions both groups scored moderately low. The results indicate that both groups scored low on anti-environmental actions, indicating a low prevalence of anti-environmental actions. The average anti-environmental action response for the treatment group was closer to: “I almost never do this,” while for the control group, the responses were closer to: “I never do this.” For anti-environmental actions we found statistically significant differences between the means of the two groups $t(31.31) = 2.556, p \leq .05$, (two-tailed) (see Table 19). Although the effect size is not large, several students in the control group scored very low, while several students in the treatment group scored fairly high on anti-environmental actions, which could account for the statistically significant difference in the means of the two groups.

Table 19

Environmental actions (negative) independent sample t-test (two-tailed)

		n	M	SD	t	sig.	r
Control group	Pre	12	.3300	.3238	2.556	.016	0.415
Treatment group	Pre	22	.7014	.5217			

2006/2007 Post-treatment

In regards to pro-environmental action scores we found that the control group mean scores declined .05 while the treatment group improved on average .17. For pro-environmental actions both groups still scored moderately, with the average pro-environmental action response of: "Sometimes I do this." We conducted a paired samples T-test and found that for pro-environmental actions there was neither a statistical change for the control group $t(9) = -.183, p \leq .05$ (see Table 20), nor for the treatment group $t(19) = -1.358, p \leq .05$. Using an independent sample T-test we found that there was not a statistically significant difference between the means of the control and treatment group post-test scores $t(33) = .097, p \leq .05$.

Table 20

Environmental actions (positive) paired samples t-test (two-tailed) and independent sample t-test (two-tailed)

		n	M	SD	t	sig.
Paired samples						
Control group	Pre	10	2.11	.4644	-.183	.859
	Post	10	2.13	.4393		
Treatment group	Pre	20	1.80	.5074	-1.358	.190
	Post	20	1.99	.3835		
Independent samples at post-test						
Control group	Post	15	2.01	.4588	.097	.923
Treatment group	Post	20	1.99	.3835		

In regards to anti-environmental action scores we found that the control group mean post-test scores worsened slightly by .27, while the treatment group scores improved by .21. The treatment group answers at post-test were closer to “I never do this,” while the control group answers were closer to “Sometimes I do this.” We conducted a paired samples T-test and found that for anti-environmental actions there was not a statistically significant difference in the means of the control group $t(9) = -.903, p \leq .05$ (see Table 21), likewise, there was not a statistically significant difference in the means of the treatment group $t(19) = 2.062, p \leq .05$. However, the significance of this test was 0.053, thus extremely close to showing a statistically

significant result. It is likely that with a slightly higher sample size the difference in the means of the treatment group would have been statistically significant. Using an independent sample T-test there was not found to be a statistically significant difference between the control and treatment group post-test mean scores $t(33) = .795, p \leq .05$.

Table 21

Environmental actions (negative) paired samples t-test (two-tailed) and independent sample t-test (two-tailed)

		n	M	SD	t	sig.
Paired samples						
Control group	Pre	10	.3300	.3579	-.903	.390
	Post	10	.4460	.4433		
Treatment group	Pre	20	.7385	.5337	2.062	.053
	Post	20	.4905	.4165		
Independent samples at post-test						
Control group	Post	15	.6067	.4425	.795	.432
Treatment group	Post	20	.4905	.4165		

2004/2005 Post-treatment

Using post-test survey data we conducted an independent sample T-test to uncover if there was statistical difference in the mean scores of the 2004/2005 control and treatment group

for pro-environmental actions. For pro-environmental actions both groups scored moderately, with the average pro-environmental action response of: “Sometimes I do this” (see Table 22). For pro-environmental actions we found no statistical difference between the mean scores of the two groups $t(28) = -1.854, p \leq .05$.

Table 22

Environmental actions (positive) independent sample t-test (two-tailed)

		n	M	SD	t	sig.
Control group	Post	15	2.01	.3403	-1.854	.074
Treatment group	Post	15	1.81	.2679		

With post-treatment survey data we conducted an independent sample T-test to uncover if there was statistical difference in the mean scores of the 2004/2005 control and treatment group for anti-environmental actions. For anti-environmental actions both groups scored moderately low (see Table 23). The average anti-environmental action response for both groups was: “I almost never do this.” For anti-environmental action mean scores we did not find statistically significant differences $t(28) = .373, p \leq .05$.

Table 23

Environmental actions (negative) independent sample t-test (two-tailed)

		n	M	SD	t	sig.
Control group	Post	15	.6747	.2988	.373	.712
Treatment group	Post	15	.7200	.3641		

Quantitatively we were able to document statistically significant results at post-test within the 2006/2007 treatment group in the areas of environmental knowledge, and both construct areas of environmental perceptions: preservation and utilization. Within the 2006/2007 control group we found statistically significant results in the area of environmental knowledge; however, control group knowledge score improvement (9%) was less pronounced than improvement in the treatment group (15%). Although we could not find statistically significant results for pro and anti-environmental actions, both the treatment and control groups scored relatively well.

For the 2004/2005 cohorts, quantitatively, we were unable to document any statistically significant results in the areas of environmental knowledge, perceptions, or actions. Both groups did however score well in both construct areas of environmental perceptions and actions.

When we juxtapose the qualitative and quantitative results between all groups we begin to see the importance of conducting a mixed methods design when trying to understand the outcomes of environmental learning programs with experiential and service learning components. The fact that most of the authors in the literature review advocate for this approach should not be taken lightly. For instance, the qualitative component alone would have been insufficient in

helping us to understand the long and short-term outcomes of the course on environmental knowledge. With the survey instrument we were able to document statistically significant changes in the 2006/2007 cohorts. Conversely, the quantitative instrument alone would have been entirely insufficient in understanding the course outcomes. Interviews with students, parents, and community influentials provided rich and detailed insights about the environment, community, and course participant outcomes. During interviews students described their efforts to adopt new personal pro-environmental behaviors, as well as their advocacy efforts among their families and peers. Although the quantitative assessment did not show statistically significant results in the environmental action construct areas, we ascertain through interviews that the course significantly instigated social and behavioral outcomes on various levels in regards to pro-environmental actions among students (and their families) from this year, as well as students from two years ago. The possibility that we failed to design a sufficiently sensitive survey mechanism exists; however, it would be extremely difficult (if not impossible) to design a survey instrument that, standing alone, would collect the complexity of data we acquired through interviews and observations. Again, a thoughtfully designed mixed methods approach is highly appropriate in these instances for deciphering the complexity of outcomes.

CHAPTER 5

CONCLUSION

Key Findings

From a pedagogical standpoint this research has contributed to the field and literature by helping us to better understand the theory and practice of experiential education, specifically in relation to the multiplicity of outcomes, as well as the challenges students and teachers encounter with this methodology in the formal curriculum, and ways of overcoming them. Our mixed methods design and analysis provided us with a calculus for assessing the value of the research for advancing knowledge of the pedagogy, as well as knowledge about experiential environmental learning benefits to communities, the environment, and more specifically, participant environmental knowledge, consciousness, attitude, and behavior.

Our research design incorporated and attempted to transcend prior research efforts (Bogner, 1999; Johnson-Pynn & Johnson, 2005; Powers, 2004; Silcox, 1993) that addressed experiential and service learning in both the first and third worlds, yet our results are not so unique that they fail to help us to better understand the immediate and longitudinal outcomes of the pedagogy. What we ultimately grasp from studying this unique situation in Baja Sur, Mexico surrounds the participant outcomes, which highlight the importance and social usefulness of designing and implementing experiential education for the facilitation of intergenerational learning, community environmental advocacy, pro-environmental behaviors, and environmental protection/recovery efforts. Through our analysis of course participants and the interviews with parents and community influentials we found unexpected evidence of complex cultural dispersion of environmental information: directly from teacher to student; horizontally (students

taught friends and siblings); vertically within the same genealogy (students relayed information to parents and grandparents); and in an oblique manner between genealogical lines (adults not related to the school instructed students, and students advocated environmental messages to foreign and domestic tourists and community members) (Arenas, 2007).

This complex dispersion and advocacy (via students) was met with some success. For instance, we found that 73% of students from the 2004/2005 treatment group had discussions with their family members with the intent of changing their environmental behaviors. Of the students who told us that they talked to their families, 91% reported that their families successfully made efforts to change their behaviors. During post-interviews 33% of students disclosed that they have continued to advocate pro-environmental behaviors to their friends concerning solid waste issues. In terms of horizontal and vertical intergenerational learning, many students who took the class in 2004/2005 have been successful as initial vectors for the dispersal of pro-environmental information and behavior modeling. Both student and subsequent familial pro-environmental behaviors have been sustainable over the past two years as evinced by the student and parent interviews.

In the shorter term, 81% of students from the 2006/2007 treatment group told us they had discussions with their family members with the intent of changing their environmental behaviors. Of the students who disclosed that they talked with their families, 82% reported that their families successfully made efforts to change their behaviors. During interviews 48% of the students reported that they spoke with friends or other students about undertaking pro-environmental actions. In terms of horizontal and vertical intergenerational learning in the short term, students have been successful as initial vectors for the dispersal of pro-environmental information and behavior modeling. Through longitudinal research we hope to uncover whether

student and familial pro-environmental behaviors are sustainable. Furthermore, our longitudinal efforts will work to uncover whether these same students have continued participating in service to their community.

It is implicit that this vein of research be continued, not only through our plans for longitudinal research in Baja, but by others in both the first and third worlds, in order to garner distinguishable patterns of outcomes in regards to experiential environmental learning. Some of the outcomes that we found as contributing to the field include looking at the quantitative survey score results from 2006/2007 respondents – for which we were able to collect both pre and post-treatment data – where we found direct effects over the short-term within groups. While we did not find any statistical significance *between* the mean survey scores of the control and treatment groups, we found that *within* the treatment group there was a statistically significant improvement of 15% in the area of environmental knowledge. It is possible that to a degree the in-class activities supplied sufficient attention to environmental knowledge components. It is additionally possible that the novel tasks encountered by the service learners were sufficiently steeped in situated authenticity, which may have had a partial influential role in knowledge score improvements. As mentioned in Chapter 3, and according to Doyle (2000), such situations have the potential to “Co-produce knowledge through activity” (p. 2).

There were also statistically significant improvements within the 2006/2007 treatment group in both the preservation and utilization component areas of the Model of Ecological Values scale. These results are consistent with Bogner’s 1998 research that noted the vital importance of incorporating affective experiences in environmental programs where shifts in perception are sought. And as seen in the Pescadero environmental learning experience, Baum

employed educational activities beyond cognitive learning advancements by utilizing sensual, hands-on, and cooperative experiences.

Absent of finding statistical significance in the areas of positive and negative environmental actions as garnered through the self-reporting questionnaire, we could be tempted to conclude that course participants did not improve upon the positive or negative aspects of their environmental actions. But coming to such a conclusion would be premature without giving closer attention to student interviews regarding their actual actions. With this in mind we recognize the potential inability of the quantitative instrument design (alone) to be sensitive enough to measure the changes as expressed in the qualitative findings. Therefore, it was extremely useful to conduct a mixed methods research effort, as the qualitative analysis provided us with a wealth of information that the quantitative analysis alone could not have captured.

We note the importance of the work of Arenas, Bosworth, and Kwandayi (2006) who accurately described our situation in that the effects of civil service are more likely to be identified through depictions of “personal and social growth, academic and intellectual performance and civic and political involvement” (p. 28). The qualitative data we gathered provided an in-depth description of the environmental psyche of the respondents. Here we garnered an array of student responses and reactions that provided us with a window to the outcomes of the course regarding their experiences. The responses captured the students’ own definitions of the learning experience. And while we quantified some of the responses through type 1 and 2 tabulations (Silverman, 2006), the students’ stories gave us an opportunity to understand the intangible benefits of the students’ participation working in their local environment and community. Through interviews and discussions, many of the respondents

gave us insights into their affective domain: student feelings, attitudes, perceptions, and concerns.

Concerning the affective domain, the 2004/2005 groups gave interview responses of a similar nature to those of the 2006/2007 group, one major difference being that affective attributes from the 2004/2005 treatment group were indeed sustainable over a two-year time span, as opposed to the 2006/2007 treatment group that was interviewed three weeks to one month after the end of their course. Interviews with the treatment groups provided us with responses detailing the positive feelings that students felt when they worked to mitigate environmental problems in their community. Through data analysis we found their feelings emanated from: (1) taking personal action; (2) the fact that they were working for the community and the environment; (3) setting an example for others to follow ; (4) seeing first hand the immediate synergistic effects of their individual and groups efforts; and (5) discovering the degree to which the environment of Pescadero is negatively impacted and the complacency of some in the community towards environmental and species protection.

Our research also sought to gain insights into the propensity of the course experiences to instigate collateral learning, inspire greater interest in environmental themes, increase/create a nascent appreciation for nature, and/or augment the participant's environmental consciousness. Interviews revealed that a large percentage of students enjoyed learning about their natural environment, have an augmented environmental consciousness, and now have a greater concern for endangered species and environmental quality. We also uncovered evidence of students changing their environmental behaviors as a result of understanding how their actions have a direct effect on human health and the quality of the environment. Students told us that they now have more interest in environmental topics and are amenable to future study regarding the

environment; some of the students even disclosed their intent to study environmental themes in higher education.

We asked students about the usefulness of their service activities to the community and/or the natural environment. Both treatment groups disclosed that they were excited to see first-hand the effects of their mitigation efforts. The 2004/2005 treatment group was notably excited to see how their public outreach at Los Cerritos Beach and in the community of Pescadero was important in changing detrimental public environmental behaviors, and students in both treatment groups developed issues awareness – the ability to identify two to three environmental issues.

Serow (1997) discussed the potential outcomes of service learning that embody attributes such as “Competence, participation, understanding, and relationships” (p. 22). The introduction to local and global environmental issues and service experiences related to these issues was a deliberate aspect of the environmental learning course in Pescadero. Some of the participation in the hands-on activities can be attributed to the subsequent student adoption of pro-environmental behaviors at the personal level. As noted in Chapter 4, the young students living in the community of Pescadero have somewhat limited opportunities to address environmental issues facing their community – that is, practicing pro-environmental behaviors to address environmental issues have been done on a personal, household, or advocacy level. The discussions with students allowed us to glimpse the potential for sustaining instances of self efficacy and locus of control. For designers of similar curriculum, here we note the implications of action related limitations of the specific targeted populations; courses should be designed realistically.

With such a young and underprivileged sample population we found it helpful to organize personal voluntary involvement in environmental actions through four degrees of commitment. We discovered that among the 2004/2005 treatment group, 87% of the students told us they had changed their environmental behaviors as a result of the course, with no reported recidivism two years later. This sustainability of pro-environmental behaviors could be attributed to the student experiences resulting from participation in Baum's course, the pre-existing environmental disposition of these students, and/or the fact that during interviews, 80% of students from the 2004/2005 treatment group reported that they discussed the environment and environmental issues in school (after the 2004/2005 school year). These findings contradict Ramsey, Hungerford, and Tomera's (1989) findings who documented declines in actions of 50% in a treatment group who received environmental action instruction where teachers encouraged student involvement in problem solving. Note here; however, the differences in course design.

Pescadero participants exhibited a heightened awareness of environmental issues, augmentation of their environmental perceptions and consciousness, and compounded this sentiment (at times) with environmentally responsible behaviors. The attitudes that they foster contribute to their environmental actions, and have in some instances resulted in their actions that resulted in intergenerational learning. These findings bolster Ballantyne, Fien, and Packer's (2001) findings that environmentally related homework assignments, participation in novelty and out of class environmental activities, and greater program length have an increased propensity for instigating intergenerational transfer of knowledge. We believe that the advent of experiential environmental learning with Mexican middle school students has in this instance resulted in more than momentary benefits in regards to pro-environmental actions, and the course experience has thus far instilled a more lasting attitudinal effect.

As mentioned in Chapter 4, Pescadero's youth lives in a community undergoing rapid environmental changes; thus, the need for continued environmental learning is of utmost importance. We found that students and their families in Pescadero are spending time visiting and camping in nature, which may have a latent function of exposing the population to environmental consciousness as part of a cultural norm. It also appears that the population in Pescadero does (to a certain extent) encourage, value, practice, and appreciate familial nature experiences. And in reflecting on their home life, students overwhelmingly reported that parents in Pescadero have openly and actively discussed environmental topics within the family. These were important attributes to explore when considering the many variables affecting the environmental traits of students, and as such, should not be excluded from future research efforts in Mexico and elsewhere.

The data successfully confirmed that students were exposed to environmental education in elementary, middle, and high school, both from textbook and teacher sources, and outside of Baum's course. The data also confirmed that most of the current environmental learning (outside of Baum's work) is taking place in the classroom, with a fraction of the students reporting field trips or any form of hands-on, place based, or experiential learning activities, as similarly reported by Barraza and Cuaron, (2004).

When we sought to uncover the student preferences for environmental learning we discovered that all of the students from the 2004/2005 treatment group preferred hands-on projects. From the 2006/2007 treatment group, 62% of the students identified hands-on projects as their favorites, 14% liked both the in-class and hands-on activities equally, while 24% preferred in-class activities. We note that the personal experiential components of the course stood out significantly in these student's minds. As mentioned above, students rejoiced in the

comradery they felt while working in groups of peers and how their work was a collective effort to assist the pueblo, the natural environment, and endangered species. These results bolster Silcox's (1993) research where he similarly reported advancement in Russian and US service learners' "Concerns about societal issues and in their perceptions of their own roles as agents of change. They expressed a greater understanding of the need for group action" (p. 707).

The majority of the students enjoyed working outside the confines of the classroom and thought this component was a positive experience that was useful, meaningful, and engaging. During interviews students reported that the experiential components inspired them, and as a result, they paid better attention. Students described their enjoyment in operationalizing in-class lessons and bringing their service plans to fruition (out of the classroom). Students also discussed how their direct exposure to environmental contamination and their contribution to mitigation efforts helped them to crystallize their understandings, which subsequently gave them insight and the dedication to advocate for, and practice pro-environmental behaviors in their homes and amongst their peer group.

The work of Waterman (1997) described service learning's potential for advancing personal development and noted the importance of identifying student populations most likely to benefit from various program components. For some of the low-income students of Pescadero whom had never camped, traveled, or spent extended time in natural areas, we note the importance of these specific experiential course components as they have the potential to contribute to significant positive impacts.

Recommendations

Experiential Education Design

Concerning classroom size and student interest, Baum reported that facilitation of the course with a greater number of students who coincidentally had no choice in their decision to participate, was not as successful as implementing the course with fewer students who elected to be present due to their interest in environmental studies. This dichotomy was evinced in Baum's experience with the treatment group from 2004/2005 (voluntary participation) and the treatment group from 2006/2007 (forced participation). Baum reports:

Fri, 27 Apr 2007

We did an analysis of the school's water usage yesterday. Everyone took the Spanish version of "my daily water usage" home. They were all filling them out in advance and I said: "it has to be done as you go along." I also started a diary of water use, which will go from student to student. I sent a team out into the school yard to find all the faucets and to see if any were dripping. They are not really concentrating and it's a little frustrating to work with them, but it makes me want to plan some really dynamic activities for the last month.

Mon, 7 May 2007

I have a lot of thoughts about how to make the course better next year. I will not teach 23 students ever again! I will find those who are interested and work with them in the lab, in the library, outside, or across the street in the public library.

Instrumentation

Although calling for more research that incorporates The Environment Questionnaire based on the Model of Ecological Values (Wiseman & Bogner, 2003), Johnson & Manoli (in press) found that "The Model of Ecological Values is a powerful perspective for examining environmental perceptions in children and for evaluating the effects of environmental learning programs on those perceptions" (p. 13). Prior to this research effort the model had not been used in Mexico to measure perception shifts in students participating in an environmental learning course with experiential components. As such, while we anticipate conducting future research in

relation to measuring environmental perceptions in Pescadero (and more generally Mexico), we will attempt to identify problems, improve upon the sensitivity of the model, and offer solutions.

The survey instrument that we designed to quantitatively measure changes in student environmental knowledge, perceptions, and actions was tested on a native Spanish speaking middle school student living in Arizona (not from the Baja Sur region of Mexico). Due to time constraints the survey instrument was only pilot tested at pre-treatment with the 2006/2007 control and treatment groups. The middle school teacher at the Telesecundaria, Baum, and the Pescadero based Spanish/English translator edited aspects of the survey to make it more comprehensible to the student population in Pescadero; however, more thorough analysis of the survey results through more extensive pilot testing could have resulted in further edits to the instrument.

Community Access

One of the major factors leading to the continued ongoing successes encountered in Pescadero surrounds issues of access and trust, and the ongoing logistical process necessary for acquiring these fundamental attributes. The instructor's good working relationship with the Directora (principal) of the school facility and the teachers themselves directly contributed to the positive outcomes. Due to six prior year's work at the school and continued student enthusiasm, the Directora and teachers were very flexible and receptive to having Baum take class time beyond what was agreed upon at the beginning of the school year. For instance, Baum was scheduled during the 2006/2007 school year to use about 1.5 hours of class time every Thursday morning. On several occasions Baum successfully approached the teachers about using 1.5 hours of class time on Wednesday, Thursday, and Friday, consecutively.

The increased access and trust within the school additionally aided in the planning of environmental projects that affected entire school functions. For instance, during the winter of 2007 Baum and the 2006/2007 treatment group established a school recycling and composting center. Initially, even after the treatment group students went class-to-class explaining the usefulness and logistics of the program, the program was unsuccessful; students and the school janitor were using the facility for non-recyclable garbage disposal. Baum approached the director with a new plan that eventually was met with success:

Mon, 19 Feb 2007

I wrote the agreement for the school wide recycling program and presented it to the staff last Thursday. They all responded positively and agreed that we all need to be on the same track for it to work. The Director is glad because the school grounds are cleaner thanks to our Thursday efforts.

Thu, 22 Feb 2007

I had a good day in Pescadero. The kids were separating and recycling when I arrived at 10:35. They had taken all the garbage boxes from each salon and were back in the "yard" recycling it all. Good news! Artemisia, director of the local waste reduction NGO and her crew will accept the school's plastic, we just have to crush it down and put it in bags. They are now officially including us as part of their recycling program (good for them, as they can claim a school and the health center as two participating institutions). We also got the agreement signed by almost all the teachers and the Director. Each classroom, including the lab, has an agreement posted next to our hand drawn "reciclar" poster. Three girls decided to take a copy of this agreement home; I'll make one for each student. I'm happy as I think the program may work, with constant supervision of course.

Dewey's (1938) ideas addressing the implementation of successful experiential pedagogy apply to resourceful educators such as Baum, who was constantly mindful of the local community, environmental concerns, historical, economic, political, social, and vocational influences on students. Understanding that changes in environmental behavior and attitudes could not be accomplished without the help of the community at large, Baum also enlisted the assistance of local municipalities, the Pescadero Health Center, and non-profit environmental

organizations (as mentioned in the transcript above). These entities were necessary for the implementation of the service learning projects and goals as students heard from guest speakers, visited local environmental facilities/projects, and participated in community environmental projects with these groups and individuals (and their broader institutional goals). The broader implication here is that as unorthodox as it may appear, to successfully implement experiential and/or environmental service learning programs, it is ultimately the instructor's responsibility to sustain a working relationship with the broader community (Barraza, 2001). Resourcefulness in this dynamic role will greatly enhance the breadth and depth of the environmental learning experience, and overall facilitate the greater scope and effectiveness of the community and environmental projects and goals. Retention of sustainable community relationships not only offers solid opportunities for future coordination on environmental service learning projects, but according to Sobel (1996), has the reciprocal beneficial effect of providing community organizations with "An injection of youthful energy" (p. 33).

Potential for Future Research

We earlier explored Hamilton (1981) who advised that longitudinal studies be employed to follow service learners into adulthood, look at career choices/achievements, and to assess propensity for service to community. We also noted the work of Lipka (1997) who questioned the supposed validity of the usefulness of service learning for creating lasting and long-term effects in learners. Lipka was interested in service learners, their "Adult life, particularly in terms of persistent, long-range effects on behavior, attitudes, and predispositions" (p. 56). Since we believe that these are important recommendations for assessment and verification of effects from participation in a service learning program, potential scenarios exist for satisfying

longitudinal assessment in the future. This initial research effort in Pescadero has provided an important baseline for continuing efforts to document the activities of former service learners who may graduate from the Telesecundaria and move onto high school in nearby Todos Santos. We have intentions to stay in touch with students from Pescadero who graduate from high school and go onto the university. Such students may return years later to become teachers, politicians, or environmental advocates who help to facilitate the goals of non-profit organizations working to protect Pescadero's environment through community partnerships. Other possible long-range research questions to be answered through longitudinal research address advancement of social capital and Shumer's (1997) specific ideas concerning service learning's benefit to communities and the ways in which they are manifested:

- In the long term, are graduates of the environmental learning program influencing community/environmental perceptions, attitudes and/or norms?
- Has the presence of environmental learning in Pescadero created sustainable or long-term community or partnerships or changes in environmental policy?
- Have former course participants become community leaders, instigators of change, and/or are they (and possibly their families) still behaving differently (environmentally or otherwise) as a result of their environmental learning experience?
- In the short and long-term, has the influx of wealth from sale of ejido lands affected the natural environment, environmental quality, consumption patterns, and community life in Pescadero?
- What is the future state of environmental learning in Pescadero? That is, has the program expanded to include new partners, schools, teachers, training programs, or conversely, has it contracted or even disappeared? What are the results of these changes?

Reflections

Of the 15 students in the treatment group from 2004/2005, 14 are lifelong residents of Pescadero. In comparison, only about half of the 23 students in the 2006/2007 treatment group are lifelong residents of Pescadero. This demographic data confirms the interviews we conducted with community influentials; Baja Sur's population is growing and changing as wages from the agricultural and construction sectors out-compete wages on mainland Mexico.

This demographic trend has environmental implications in a variety of contexts. On a positive note, we found that the newly arrived students at Pescadero's Telesecundaria have no less of an interest in the protection of Mexico's (and Pescadero's) environment than do the longer-term students and residents. Additionally, the schools and families from mainland Mexico have provided students with an environmental education. However, this finding points to the importance of sustaining quality environmental learning experiences in the schools that will bolster the already existing positive environmental perceptions, attitudes, and behaviors; foster intergenerational learning; and build social capital.

During the 2007/2008 school year in the Telesecundaria Baum continues to implement her environmental learning course to one group of first year students. During the 2007/2008 school year the course has been scaled back, and the focus (due to grant funding) is on waste reduction education. Her funding for the 2007/2008 school year was provided by a Pescadero based NGO. Additionally, Baum received grant funding through this NGO and from the Surf Industry Manufacturers Association (SIMA) Environmental Fund to informally teach field based environmental learning as well as surfing to a total of 12 Pescadero and Todos Santos

Telesecundaria students; surfing is a sport rarely practiced by Pescadero locals. In regards to the SIMA experience one student explained:

This week we learned how to get out of the current and that this beach has a shallow sandy bottom so the waves break further out which make it a good beach for learning to surf. We also learned about the various species of snails, shells and crustaceans that live in the sand and in the tide pools. We also learned something really important today: that we must take care of our fresh water supply, as it could run out or become contaminated if we don't use it wisely.

Outside of the Telesecundaria it is apparent that many of the students we interviewed have a strong desire to attend high school (prepa) and/or a university; some have expressed their desire to study environmental themes. Fortunately, the Pescadero based interpreter that we employed for this research is a board member of the Palapa Foundation. This organization offers financial support to outstanding students in Todos Santos and Pescadero so that they may attend high school and universities. It is likely that through this research the Palapa Foundation has been given the opportunity to identify Pescadero students who are entirely worthy of such educational support. These educated students may decide to return to Pescadero and remain there in the long-term and become the next generation of Pescadero community members and its work force. If so, then they – and the community and the environment – will surely benefit from sustained environmental learning.

As explored in the literature review, Lave and Wenger (1991) highlight the importance of *learning curriculums* which have the potential to offer opportunities for membership and the development of practice which “Is thus characteristic of a community” (p. 97). Therefore, if students receive continued exposure to environmental learning (beyond the Telesecundaria) they will have a better chance at undertaking active roles in educating their families and friends (including incoming Mexican mainlanders) about the environmental issues present in Pescadero, and the actions the collective community can take to remedy such issues. Furthermore, if the

financial wealth of this incoming population becomes substantially larger (than they were used to in the past), then ultimately, they will have greater flexibility with their earnings, coupled with a greater impact on natural resources. It is implicit therefore that continued environmental learning provides the public with an understanding of the environmental impacts of their consumptive behaviors.

Although Creswell (2003) suggests that generalizability and reliability play less important roles in qualitative research, it is important for this mixed-methods research effort to address potential implications for the employment of experiential environmental learning in Mexico. Waterman (1997) advises that service learning programs will operate better if program planners can appropriately match their goals and objectives to the programs under investigation in the research literature. Therefore, the positive *outcomes* documented in regards to this specific case study could possibly be generalized to similar courses in similar communities in Baja Sur and Norte, or even coastal communities in mainland Mexico. Such coastal communities would be small in size (in land area and population), less industrial and more agricultural, and dealing with similar social and environmental issues/concerns. However, as pointed out by Barraza (2001), one major factor potentially contributing to the successes of this type of program is the charisma, attitude, interest, dedication, community connections, and environmental background of the instructor. As such, it is probable that instructors who possess fewer (or more) of these qualities will meet with results that vary from the outcomes of this specific case study. Due to the above mentioned limitations there is no recipe for a pedagogical methodology or curriculum design that will lead to definite successes in experiential environmental learning.

Limitations

The experiential environmental learning course designed by Baum is an informal yearlong introduction for 12-year-olds to environmental studies. While Baum's course integrated curriculum with experience and service, it was not designed with the intent of specifically increasing student comprehension of environmental understandings as might be found in a Mexican textbook. The course was designed to introduce students to their local natural environment, to involve students in issues facing their local community, and to undertake specific action-oriented solutions to these localized problems. Therefore, it should be noted that the results of this research are specific to the efforts of a dedicated environmental educator and advocate, and the enthusiastic participation of the student body of Pescadero's Telesecundaria. Although aspects of this research are generalizable to the larger body of research addressing environmental learning, experiential education, and environmental service learning, any efforts to reproduce this course as a whole or specific elements therein, may be met with varying results. Additionally, the proximity of the pueblo of Pescadero to amazing natural environments, coupled with specific environmental threats, provided unique environmental learning opportunities for students. Courses and research conducted in areas outside of Pescadero will be subject to the environmental, educational, social, and economic complexities of that locality.

With that in mind, it should be noted that the Directora of the Telesecundaria as well as the homeroom teachers of both the treatment and control groups from 2006/2007 commented to us that the course was effective and thus an asset to the school's curriculum. Hypothetically, Baum could perform teacher training at the Telesecundaria to increase the instances of environmental learning. Despite the fact that these teachers lack the environmental commitment and specialized knowledge that Baum possesses, there is a possibility that with training, their

instruction – in addition to, or in Baum’s absence – could possibly result in the positive effects detailed in this research. For now, there is not a plan in place for Baum to train the teachers at the Telesecundaria.

Before we began researching the impact of the course on students we hypothesized that course participants would experience advancement in all areas of assessment when compared to a control group. As we soon found out, the control groups available to us were not in fact “pure,” as the 2006/2007 control group was exposed to a week long environmental learning unit at the Telesecundaria, environmental discussions in their households, and environmental learning at the elementary level. The 2004/2005 control group too was exposed to similar environmental learning scenarios. The control groups available for this research were chosen out of convenience and therefore were not truly random; rather, they resemble more of a quasi-experimental design. Perhaps the important lesson here is that the mounting interest in the environment within communities and through the media will make it increasingly difficult to disentangle the impact of any one program on individuals and their communities.

It is also clear from analyzing the quantitative results garnered from the written surveys from the 2004/2005 groups that the mean scores of the two groups did not differ significantly for any environmental attribute. Unfortunately, we cannot compare this group’s post-test scores to their pre-test scores, as no pre-test data exists. In short, we have no baseline data with which to decipher if the quantitative variables of the 2004/2005 groups have changed over time. As we continue to follow this group through our longitudinal efforts we will eventually collect data that may provide a better understanding of how the course (and time) affects the participants.

APPENDIX A: SPANISH STUDENT SURVEY



Queridos Estudiantes,

Gracias por su participación en este importante proyecto de investigación. Si tomaste o no tomaste el curso sobre el medio ambiente, eres de gran importancia a este estudio, ya que nos estas ayudando a determinar el conocimiento general sobre el medio ambiente, percepciones, y los comportamientos de los estudiantes de Pescadero. Por responder a las siguientes preguntas, nos estarás ayudando diseñar una experiencia significativa y mas efectiva con el medio ambiente para los estudiantes, para que ellos ayuden a proteger el medio ambiente. Ustedes son una parte muy importante y especial en este proceso educacional y le agradecemos su ayuda. Su participación y sus respuestas a esta encuesta son voluntariamente.

El Cuestionario sobre el Medio Ambiente-

MIDIENDO SUS PERCEPCIONES AL MEDIO AMBIENTE

Yo me aseguro que todas las luces esten apagadas cuando ya no las necesito.	<i>“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”</i>	<i>“Totalmente en desacuerdo”</i>
Las personas tienen el derecho de cambiar el medio ambiente (naturaleza).	<i>“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”</i>	<i>“Totalmente en desacuerdo”</i>
Me siento bien en el silencio de la naturaleza.	<i>“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”</i>	<i>“Totalmente en desacuerdo”</i>
Si algún tiempo tengo dinero de más, donare un poco para ayudar la naturaleza.	<i>“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”</i>	<i>“Totalmente en desacuerdo”</i>
Yo trato de caminar o usar mi bicicleta cuando salgo en vez de usar el carro.	<i>“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”</i>	<i>“Totalmente en desacuerdo”</i>
Construir nuevas carreteras es tan importante, que debemos de cortar los arboles y el cactus.	<i>“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”</i>	<i>“Totalmente en desacuerdo”</i>

Yo intento de decirles a otros que la naturaleza es importante.	“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”	“Totalmente en desacuerdo”
Yo trato de cuidar el agua por teniendo mis duchas mas cortas, o por cerrando la llave del agua cuando me lavo los dientes.	“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”	“Totalmente en desacuerdo”
Las personas deben de reinar sobre la naturaleza.	“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”	“Totalmente en desacuerdo”
Me encantaria visitar un oasis en el desierto para mirar pajaros volando.	“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”	“Totalmente en desacuerdo”
Mala hierba debe de ser cortada porque toman el espacio de las plantas que necesitamos.	“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”	“Totalmente en desacuerdo”
Las personas deben de comer huevos y carne de las tortugas del mar en ocaciones importantes, como quinceañeras y la navidad.	“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”	“Totalmente en desacuerdo”
Yo ayudaria recaudar fondos para proteger la naturaleza.	“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”	“Totalmente en desacuerdo”
Para alimentar a las personas, la naturaleza debe de ser apartada para poder cultivar comida.	“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”	“Totalmente en desacuerdo”
Porque los mosquitos viven en los areas humedas, seria mejor drenar las tierras para poder cultivar.	“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”	“Totalmente en desacuerdo”
Me gusta ir en paseos a la naturaleza, por ejemplo ir a la playa, las montañas o el desierto.	“Muy de acuerdo” “de acuerdo” “No estoy seguro” “No estoy de acuerdo”	“Totalmente en desacuerdo”

Midiendo el Conocimiento del Medio Ambiente

Pongan un círculo alrededor de la respuesta correcta:

1. Algunas de las tortugas marinas que viven en el océano pacífico cerca de Pescadero ponen:

(1 huevo cada año)

(2 huevos cada año)

(No más de 10 huevos al año)

(Hasta mil huevos cada año)

2. Algunas tortugas marinas pueden vivir hasta 80 años de edad.

(Cierto)

(Falso)

3. Cuando ponen huevos, la tortuga hembra (**raramente**) (**normalmente**) (**nunca**) pone sus huevos en el mismo pedazo de la playa de donde nacieron.

4. ¿Cual es el nombre del desierto que abarca todo Baja California Sur?

(Desierto Mojave)

(Desierto Sonorense)

(Desierto Chihuahuense)

Respuestas Cortas:

5. ¿Cómo se pueden dañar las tortugas marinas en la tierra o el mar?

6. Todos en Pescadero dependen de agua potable del área que lentamente escurre de las montañas hacia el pozo de agua. Por favor describe algunas de las cosas que los humanos han hecho que afectan negativamente al paisaje que es tan importante para el agua potable.

7. Lista algunas de las cosas que podemos hacer para reducir la cantidad de agua que usamos. Trata de listar algunos consejos para conservar agua.

8. Lista algunas de las cosas que podemos hacer para reducir la cantidad de basura que es quemada, es llevada al basurero, o es tirada al arroyo.

9. Lista los tipos de animales que usan el cactus Cardones para sus hogares.

10. Lista las maneras en que las plantas que no son nativas, afectan negativamente el desierto cerca de Pescadero.

11. Conoces algún parque nacional o áreas naturales protegidas? Cuales?"

12. Nombra algunas practicas de pescar que sean dañinas para los mamíferos marinos y pueden afectar negativamente la economía de Pescadero y los esfuerzos de conservación.

Circula la mejor definición a los siguientes términos

Ribera

- A) Un tipo de árbol que puede vivir por más de mil años.
- B) Comunidades de plantas y animales encontradas cerca de la orilla de agua corriente.
- C) El lado de una colina o montaña.

Ecosistema

- A) Un área pantanosa que contiene agua fresca y agua salada.
- B) Un ruido fuerte que reverbera causada por las voces de los humanos en un tipo de cañón.
- C) Una comunidad de animales, plantas y bacteria y la interrelación de los medio ambientes físico y químico.

Erosión

- A) El agotamiento de materiales debido al agua, partículas abrasivas, o la acción de descongelar.
- B) El grado de humedad en el aire.
- C) Microorganismos que pueden causar enfermedades a los animales y humanos.

Cuenca

- A) Un área pantanosa que contiene agua fresca y agua salada.
- B) Un edificio en donde el agua esta almacenada para que las personas puedan tomársela.
- C) Un área de tierra que drena a un río u otro masa de agua.

Composta/Abono

- A) Re-usando botes y botellas para salvar recursos naturales.
- B) El agotamiento de materiales debido al agua, partículas abrasivas, o la acción de descongelar.
- C) Juntando los desperdicios de la cocina y el jardín y poniéndolo en un montón para la descomposición natural que se convertirá en material que puede ser usado como fertilizante y mejorar la tierra.

Especie en peligro de extinción

- A) Animales con dieta que contiene solamente carne.
 B) Un animal capaz de usar un veneno toxico para usarlo contra su presa/o enemigos naturales picando o mordedura.
 C) Un animal o planta que esta en peligro de extinción (desaparecer para siempre).

Sustentabilidad

- A) Un modo especial de cultivar cosechas sin usar suelo.
 B) Gestionar los recursos naturales para nuestras necesidades presentes sin poner en juego la capacidad de las generaciones futuras de humanos y animales de cubrir sus necesidades más importantes.
 C) Un calentamiento gradual de la atmósfera terrestre causado por la combustión de fuentes de energía fósil y contaminantes industriales.

Midiendo las Acciones con el Medio Ambiente

Circula la respuesta que mas se aplica a tus acciones con el medio ambiente.

Desperdicio Solidó

- | | | | | |
|---|--------------------------|--------------------------------|-----------------------------|------------------------|
| 1. Yo reciclo cosas en mi casa. | <i>Siempre hago esto</i> | <i>Algunas veces hago esto</i> | <i>Casi nunca hago esto</i> | <i>Nunca hago esto</i> |
| 2. Tiro la basura en el basurero. | <i>Siempre hago esto</i> | <i>Algunas veces hago esto</i> | <i>Casi nunca hago esto</i> | <i>Nunca hago esto</i> |
| 3. Tiro la basura en el arroyo. | <i>Siempre hago esto</i> | <i>Algunas veces hago esto</i> | <i>Casi nunca hago esto</i> | <i>Nunca hago esto</i> |
| 4. Quemo la basura en mi casa. | <i>Siempre hago esto</i> | <i>Algunas veces hago esto</i> | <i>Casi nunca hago esto</i> | <i>Nunca hago esto</i> |
| 5. Yo convierto mi basura en composta/abono | <i>Siempre hago esto</i> | <i>Algunas veces hago esto</i> | <i>Casi nunca hago esto</i> | <i>Nunca hago esto</i> |
| 6. Yo evito compro paquetes grandes en la tienda. | <i>Siempre hago esto</i> | <i>Algunas veces hago esto</i> | <i>Casi nunca hago esto</i> | <i>Nunca hago esto</i> |
| 7. Trato de usar productos reutilizables en vez de desechables (por ejemplo, uso servilletas de tela en vez de papel, etc.) | <i>Siempre hago esto</i> | <i>Algunas veces hago esto</i> | <i>Casi nunca hago esto</i> | <i>Nunca hago esto</i> |
| 8. Tiro la basura en el suelo. | <i>Siempre hago esto</i> | <i>Algunas veces hago esto</i> | <i>Casi nunca hago esto</i> | <i>Nunca hago esto</i> |
| 9. Levanto la basura cuando la miro en la calle, en el desierto, o en la playa. | <i>Siempre hago esto</i> | <i>Algunas veces hago esto</i> | <i>Casi nunca hago esto</i> | <i>Nunca hago esto</i> |
| 10. Yo platico con mi familia sobre la importancia de reciclar. | <i>Siempre hago esto</i> | <i>Algunas veces hago esto</i> | <i>Casi nunca hago esto</i> | <i>Nunca hago esto</i> |

Conservación de Agua

1. Yo apago el agua cuando me estoy cepillando los dientes.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto
2. Dejo que corra el agua cuando me estoy lavando las manos.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto
3. Yo colecto agua de lluvia para regar mis plantas y jardín.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto
4. Yo platico con mi familia sobre la importancia de la conservación de agua.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto

Conservación de Energía

1. Me aseguro que apague todas las luces de mi casa cuando salimos.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto
2. Dejo la televisión prendida cuando salgo del cuarto.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto
3. Camino o uso mi bicicleta cuando salgo a un lado en vez de ir en carro.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto
4. Yo platico con mi familia sobre la importancia de la conservación de energía.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto

Comida

1. Trato de comer de lo mas bajo de la pirámide de nutrición (muchas frutas y vegetales).
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto
2. Trato de comer comida orgánica (comida sin pesticidas) cuando es posible.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto
3. Trato de comer comida natural que no son procesadas demasiado.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto
4. Yo como comida vegetariana.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto
5. Yo como la carne y huevos de las tortugas marinas.
Siempre hago esto Algunas veces hago esto Casi nunca hago esto Nunca hago esto

APPENDIX B: SAMPLE SPANISH STUDENT INTERVIEW QUESTIONS

Questions during interviews below were subject to change. Alternative questions raised during interviews are not listed below.

PREGUNTAS PARA LOS ESTUDIANTES

Preguntas con un asterisco (*) son para los que han completado el curso en el pasado.

¿Cuál es tu nombre?

¿Cuántos años tienes?

¿Qué tanto tiempo has vivido en Pescadero?

¿Has vivido en algún otro lugar que Pescadero?

¿Cuántos hermanos y hermanas tienes?

¿Vives con tu familia?

¿Qué tipo de trabajo tiene tu familia?

¿Tu familia tiene un automóvil, carro o motocicleta?

¿Tu familia tiene una computadora?

¿Tu familia tiene una televisión?

¿Tienes aire acondicionado o calefacción en tu casa?

¿Tiene electricidad tu casa?

¿Tienes agua corriendo en tu casa?

¿Tienes calefacción para calentar el agua en tu casa?

¿Tienes algún tipo de jardín en tu casa?

¿Crías algún tipo de animal en tu casa?

¿Cuántas veces te lleva tu familia en paseos de la naturaleza? (la playa, las montañas, el desierto, etc.)

¿Te vas acampar con tu familia?

¿Te enseñaron tus papas sobre el medio ambiente cuando estabas creciendo?

¿Cuántas veces sales a cazar o pescar?

¿Vas a tomar, has tomado o estas tomando el curso sobre el medio ambiente de la Señora Baum?

¿Algunas de tus otras maestras han discutido los temas sobre el medio ambiente y la conservación?

¿Alguno de tus libros incluían lecciones sobre el medio ambiente y la conservación?

¿Estas consiente de los temas sobre el medio ambiente de Pescadero y Baja California Sur?
¿Crees que algún problema es mas grave que los otros?

*¿Cuáles fueron tus proyectos favoritos en la clase de la Señora Baum, y porque?

*¿Te divertiste con los proyectos prácticos y los experimentos que hicieron? ¿Porque?

*¿Crees que tuvieron suficientes proyectos prácticos? ¿Quisieras mas o meno? ¿Porqué?

*Dime sobre las experiencias que has tenido cuando platicas sobre el medio ambiente con otras personas en la playa Los Cerritos. ¿Cómo te sentiste?

*En la playa Los Cerritos, ¿encontraste que las personas te estaban pegando atención sobre el medio ambiente?

*¿Piensas que los proyectos que hicieron ustedes han tenido una diferencia positiva en la comunidad y en el medio ambiente? Explícate.

¿Estas actualmente practicando alguno de los comportamientos en tu casa o en la escuela? *¿De los que aprendiste en la clase de la Señora Baum?

¿Has tratado de hablar con los miembros de tu familia acerca de cambiar sus comportamientos hacia el medio ambiente? *¿Qué hayas estudiado en la clase de la Señora Baum?

¿Tu familia ha cambiado su comportamiento hacia el medio ambiente? *¿Fue por que tu hablaste sobre los comportamientos que aprendiste en la clase o por que te miraron practicando un comportamiento particular?

*¿Piensas que esta clase te puede ayudar aumentar tu conciencia sobre el medio ambiente?

*¿Te has interesado mas en los temas sobre el medio ambiente desde que tomaste el curso? Si ese es el caso, ¿cual temas es los que más te interesan?

¿Te ofreces voluntariamente para cualquier proyecto sobre el medio ambiente fuera de la clase de la Señora Baum?

*¿Te encuentras teniendo mas apreciación hacia la naturaleza desde que tomaste el curso?

*¿Tomas mas tiempo con la naturaleza desde que tomaste el curso?

*¿En que otra forma o manera este curso ha afectado tu vida o tu trabajo de escuela?

¿Qué quiere decir para ti la palabra ambientalista/ecologista?

¿Te consideras un ecologista? *Si ese es el caso, ¿te consideraste un ecologista antes de tomar el curso?

*¿Crees que más adelante estarás interesado/a en tomar otras clases sobre el medio ambiente?
¿Porqué?

¿Planeas atender una universidad? Si ese es el caso, ¿qué piensas estudiar?

APPENDIX C: SAMPLE SPANISH PARENT INTERVIEW QUESTIONS

Questions during interviews below were subject to change. Alternative questions raised during interviews are not listed below.

PREGUNTAS DE ENTREVISTA PARA LOS PADRES

¿Usted cree que su hijo/a ha tenido una experiencia negativa o positiva durante/después de tomar el curso de la Señora Baum? Porque?

¿Su hijo/a le ha contado sobre el curso del medio ambiente?

¿Ha notado cambios en el comportamiento de su hijo/a desde que empezaron y terminaron el curso?

¿Ha notado cambios en su hijo/a y como realizan/realizaban sus trabajos en la escuela antes/después de terminar el curso?

¿Su hijo/a ha aproximado a su familia sobre cambiando los comportamientos hacia el medio ambiente?

¿Usted y su familia, han adoptado un comportamiento que su hijo/a están practicando o han practicado para cuidar el medio ambiente?

Su hijo/a han reportado X, X y X. ¿Puede verificar que esto es verdad? Por favor añide algo si se le olvido a su hijo/a.

¿Hay alguna otra cosa que le gustaria añadir en relacion con la experiencia de su hijo/a en el curso sobre el medio ambiente?

APPENDIX D: SAMPLE SPANISH COMMUNITY INFLUENTIAL INTERVIEW QUESTIONS

Questions during interviews below were subject to change. Alternative questions raised during interviews are not listed below.

PREGUNTAS/ENTREVISTA PARA LOS INFLUENTES DE LA COMUNIDAD

¿Cual es tu nombre?

¿Cuánto tiempo lleva viviendo en Pescadero?

¿Cuál es el titulo de su trabajo?

¿Cuál es su papel en la comunidad de Pescadero?

¿Cuánto tiempo lleva en esa posición?

¿En su opinión, cuales son los temas mas graves del medio ambiente de Pescadero?

¿Cuánto tiempo tiene Pescadero con ese problema?

¿Cuáles son los efectos de esos problemas en el medio ambiente?

¿Ud. siente que esos temas sobre el medio ambiente han sido dirigidos/remediados por alguien (una industria, un negocio, el gobierno, los dueños de las tierras, universidades, el público, etc.)? Si no, ¿porque no se han dirigido?

¿En su opinión, que se necesita hacer para remediar los temas de los que nos ha dicho?

¿Piensa Ud. que la comunidad de Pescadero tiene una voz fuerte en decidiendo como esos temas deben de ser remediados y negociados?

¿Le daría su apoyo a la comunidad de Pescadero para que puedan estar más involucrados en remediar los temas del medio ambiente y/o tener una voz más predominante durante debates?

¿Esta consciente del curso sobre el medio ambiente que la Señora Baum esta enseñando en la escuela intermediaria?

Si esta consciente, ¿Cuáles proyectos se ha dado cuenta que los estudiantes y la Señora Baum están trabajando en?

¿Puede hablar sobre lo que usted piensa sobre las historias de éxito que han ocurrido como resultado de los proyectos de los estudiantes del curso de la Señora Baum?

¿Cree que es apropiado que la juventud de Pescadero se envuelva en proyectos del medio ambiente y ofrecer servicio a la comunidad para ayudar con los problemas del medio ambiente?

¿Podría dar su apoyo y promover la importancia del servicio al medio ambiente a programas comunitarios que utilizan los estudiantes y residentes de Pescadero?

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