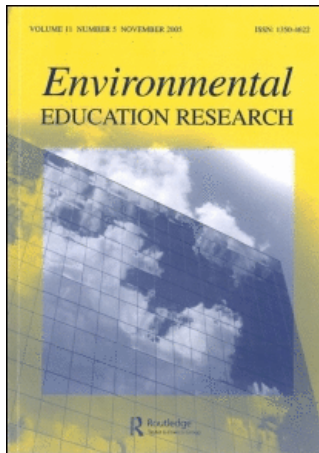


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Environmental service learning: outcomes of innovative pedagogy in Baja California Sur, Mexico

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This article reports on a longitudinal study of a two-semester middle school environmental learning course that departs from traditional Mexican expository pedagogies through the incorporation of experiential and service learning approaches. In the short term, course participants acquired a heightened awareness of environmental issues, augmented their environmental perceptions and consciousness, and complemented all this with environmentally responsible behaviours. Two years after completing the experiential course, students retained pro-environmental attitudes and behaviours and unexpectedly exhibited an expanded role in intergenerational learning. The research adds to the handful of studies in this cross-disciplinary field through qualitative methodologies that refine our understanding of the outcomes of experiential environmental learning.

Keywords: experimental environmental education; pro-environmental behaviour; environmental service learning; intergenerational learning; qualitative analysis

Introduction

Baja California Sur, Mexico (BCS) is blessed with a biologically diverse environment rich in both terrestrial and marine life. In the vicinity of the village of Pescadero, there is a narrow strip of peninsular land on the Tropic of Cancer that provides opportunities to study marine and desert environments and the environmental problems facing the region.

Pescadero is located about 10 km south of Todos Santos. According to the Mexican census of 2005, it has a population of 1634 (INEGI 2005), and is an agricultural community, home to Sueño Tropical, a major grower, packer, and distributor of organic produce to the United States and Mexico. In this study, classes of Telesecundaria¹ students participate in an environmental learning course in BCS that incorporates elements of experiential coursework and service learning. The parents of course participants work predominantly in lower economic rungs: (1) agriculture (50%); (2) construction (21%); (3) retail (5%); (4) textiles (24%).

In order to better understand the environmental context within which the course operates (Serow 1997; Yin 2003) we interviewed various influential members of the community working for environmental protection in Pescadero.

The director of a health centre² who conducts projects (with student assistance) to remove trash and educate community members about proper trash and toxics disposal commented on the major environmental issues facing Pescadero:

The major problem is the garbage, the landfill location, and the locations of the clandestine dumps. 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.

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We also talked to a former president of a Pescadero *ejido* (communally owned land group) and he expressed similar concerns:

What is lacking is education. Pipes are left on the ground in the *arroyo* and 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!

One of the local non-profit research organisations provides education and consulting regarding natural resources. Among other community projects, the group works in Pescadero to educate the public about solid waste issues and supports households and the Telesecundaria with their recycling efforts. According to the head of the organisation, Pescadero is currently facing serious environmental changes:

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. Development ... the *ejidos* are selling everything! For us it's a terrible environmental threat. The thing is that it's like Los Cabos development, which means a real environmental threat from our point of view. The people don't value the land, water, or any other resources. We have a really terrible cultural problem. We are not used to being aware of, or taking care of our resources. I say 'we' meaning the Mexicans ... a very, very low consciousness about natural resources all over the country.

Finally, a local sea-turtle conservation organisation works in Pescadero to relocate sea-turtle eggs to safe *viveros* (nurserys) where biologists, volunteers, and students manage the eggs until they are ready to hatch. The organisation facilitates educational opportunities for students to learn about sea-turtle protection efforts, sea-turtle biology, and threats to their survival. Students from the Telesecundaria visit the *vivero* when sea turtles hatch, and release them to the ocean. A biologist from the organisation explained why people in Pescadero are concerned with protecting endangered species:

It's the indiscriminate fishing; this is the area where people consume more sea turtles than anywhere else in Baja. It's also that the politicians are eating sea turtle too and are not doing anything about the problem. The contamination that's getting to the sea, like the garbage, is also affecting the turtles. One example, the plastic bags that look like jellyfish, the sea 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. The government needs to help the fishermen find other things to take the place of the sea turtle.

Increasingly, off-road vehicles, resource extraction, unsustainable farming and fishing practices, endangered sea-turtle poaching, and demanding pressures from local and foreign land developers are threatening the region's water supply and species habitat, and are contributing to the endangerment of the species themselves.

In response to the sparse amount of environmental learning in the schools and the widespread consumption of endangered sea-turtle products in the region, United States expatriate Patricia Baum designed and implemented an experiential environmental learning course in Pescadero's Telesecundaria. The course met more or less weekly, on campus, and many times in the field, for the duration of the school year. The course was designed to address the causes behind bioregional environmental problems, explore the physical environment, and promote the practice of personal pro-environmental behaviours and public outreach. Although course projects and topics fluctuated yearly, the programme always

complemented existing community and municipal efforts aimed at public education and environmental protection. While Baum has implemented the course for the last six years (2001–2006), no evaluation of its outcomes on students has taken place. The curriculum presented an opportunity to decipher if and how an experiential environmental learning course instigates changes in the attitudes and behaviours of Mexican student participants that could benefit the bioregion and its human and non-human inhabitants. The purpose of this research was to: (1) contribute to the growing body of research that addresses the outcomes of experiential and environmental service learning on various attributes of participants; and (2) contribute to the documentation and outcomes of innovative environmental learning pedagogies that depart from traditional Mexican teaching styles. We addressed this by answering four questions:

- (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 participating in (school-based) experiential environmental learning become more aware of, and involved in, environmental issues facing their community?
- (3) What is the cultural, political, educational, and economic atmosphere in student homes and the community of Pescadero?
- (4) What specific aspects of the environmental learning course do students find most influential in affecting their experience?

The longitudinal nature of the study allowed us to better understand the sustainability of attitudes and behaviours following student exposure to the course. The article, furthermore, contributes to the sparse literature (Barraza 2001) regarding teacher practice and the effects of creative pedagogical approaches with Mexican learners.

Literature review

This research documented the outcomes of a course designed to immerse Telesecundaria students in bioregional environmental issues while facilitating their participation in community conservation actions. The impetus for this research emanated from interest in an environmental learning course unique in its geographical location, content matter, pedagogical style, and duration. The literature review recognises the usefulness of experiential learning for the advancement of environmental learning (in Mexico and elsewhere); examines theoretical underpinnings; and synthesises the literature for conducting research on experiential pedagogies. We first explore the research on environmental learning in Mexico.

Environmental learning in Mexico

The majority of Mexican schoolteachers employ a top-down teaching style whereby teachers, '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 and Walford 2002, 179). Barraza (2001) 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 environmentally responsible behaviours. Additionally, Barraza (1996) found that Mexican students participating in practical activities in addition to classroom

learning were more likely to retain information and develop positive attitudes towards the environment.

Mexico's Secretary of Environment and Natural Resources (Secretaría de Medio Ambiente y Recursos Naturales [SEMARNAT]) recognises 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 promotes the creation of an environmentally literate culture through: (1) consolidating environmental education for sustainability as a public policy; (2) allocating financial resources; and (3) training teachers and environmentalists to respond to the demands of sustainability. For the purposes of middle school education, the agency highlights the environmental subject areas of personal responsibility; consequences of human activity; biology; civic and ethical responsibility; loss of biodiversity; and environmental conservation.

After documenting the experience of teachers who implemented an environmental learning course on the wetlands of Sonora, Mexico, de la Garza Treviño (2006) concluded that the Mexican education system lacks a strategy for facilitating environmental education in the schools. De la Garza Treviño (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' (15). To address this, non-profit organisations have provided resources for designing and implementing environmental learning in schools and communities.

Conducting educational research on environmental service learning

According to Dewey (1938), educators should provide for collateral learning: a meaningful experience for participants that results in desirable future experiences and behaviours. Dewey describes this philosophy as encompassing the experiential continuum, whereby educators evaluate which activities complement continued capacity for growth. The words 'service learning' are more recent and do not exist in any of Dewey's writings. The phrase was coined by the Southern Regional Education Board and William R. Ramsay in the late 1960s (Eberly 1997), and can be described as pedagogy, curriculum, activities, and programmes that embrace organised, hands-on community service and volunteerism to enhance student learning and the schooling experience. Dewey's Theory of Experience is often used to underpin the practice of service learning with interventions being deemed more educative when they relate to the real-life experiences of students.

Despite noting that environmental service learning is in an early stage of development, international research in both the developed and developing worlds reports positive results for both the students and communities they serve (Silcox 1993; Bogner 1999; Powers 2004; Johnson-Pynn and Johnson 2005). In particular, researchers have found that service learning courses can increase awareness of environmental issues and community awareness; locus of control; environmental consciousness; conservation knowledge; personal and social development; bonds between community members, students, and schools; student motivation and engagement in school; personal environmental actions; and enjoyment of nature.

Sobel (1996) advocates for the inclusion of service learning in the curriculum and argues 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' (33). Teaching with an experiential pedagogy involves working with a unique learning philosophy and encompasses a set of logistical particulars that traditional modes of education have never dealt with, and do not deal with on a regular basis. Experiential pedagogy requires that

educators 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).

Given that 'service is not a uni-dimensional, easily identifiable task with uniform objectives, as many classroom lessons are' (Arenas, Bosworth, and Kwandayi 2006, 28), when compared with the mainstream, educational research on environmental learning with service learning components often evaluates students against bespoke criteria and generates atypical findings about learning. Arenas, Bosworth, and Kwandayi (2006) write that effects can be identified in the realms of 'personal and social growth, academic and intellectual performance and civic and political involvement' (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' (5). The more elusive and holistic outcomes achieved through authentic activities have challenged the way researchers evaluate programmes.

Waterman (1997) proposes that the focus of educational research on service learning is to discover whether programmes are effective in enhancing learning through action, promote personal development, foster civic responsibility, and contribute to the community. Evaluation of outcomes could include measurement of direct effects on students, or possibly the longer term and broader effects on the community and the environment, and potential for building social capital.

Buchen and Fertman (1994) and Serow (1997) point out that anecdotal evidence dominates the field due to a lack of hard evidence of outcomes. While Waterman (1997) argues that research on service learning is likely to yield more generalisable findings if programme and curriculum designers more closely match their specific goals to programmes previously under investigation in the research literature, Serow (1997) warns that relying solely on the quantification of programme effects on students excludes detailed holistic information. Moreover, as recent research on service learning is also concerned with the long-term benefits of service learning for building social capital, the more descriptive components associated with qualitative methodologies can be of benefit. Serow endorses life-history techniques (Bertaux 1981) whereby researchers interview students to elicit the details of their lives before, during, and after participation, in order to judge the extent to which the programme affects the life of the learner. Of additional importance is taking into account a variety of data in scoping and documenting potential and actual outcomes (triangulation) (Glaser and Strauss 1967). Thus, with life-history methods, interviewers must be competent at asking pertinent questions if they are to draw warrantable conclusions about outcomes (Serow 1997).

Methods

The evaluation in this project built upon contributions to the field by Hamilton (1981), Silcox (1993), Lipka (1997), Shumer (1997), Powers (2004), and Johnson-Pynn and Johnson (2005) in focusing on the outcomes of a service learning course on participants. It was hypothesised that students exposed to environmental knowledge, coupled with student/community involvement, and environmentally based hands-on projects and personal experiences, would engage in further and more complex personal and community pro-environmental behaviours, and would be positively impacted emotionally, socially and intellectually. The research questions were designed to address these student outcomes. The data scrutinised in this article were generated as part of a broader mixed-methods study. The

design incorporated treatment and control group surveys for quantitative analysis of environmental knowledge, perceptions, and actions, while simultaneously using qualitative data to refine our understanding of the course outcomes on students and others collaterally impacted by the course. This article focuses exclusively on the qualitative aspects of the research; the quantitative aspects of the study are analysed and disseminated elsewhere.

The sample population of Telesecundaria students included a group of 15 students (mean age 15.2) who voluntarily participated in the course during the 2004/2005 school year. With these students only post-course data were available.

We interviewed one group of 23 students (mean age 12.5) from the 2006/2007 school year; this group was chosen by the head of the school to participate in the course. We collected both pre- and post-course data from this group.

The 2004/2005 group (15 students) was interviewed in the spring of 2007. With the 2006/2007 group, we conducted 23 interviews before the course and (due to attrition) 21 interviews after participation. The interviews during the 2006/2007 school year were conducted in September 2006 (before the programme commenced), and in June 2007, three to four weeks after the course ended. The interviews allowed us to understand student experiences and provided us with comparison data that revealed changes in cohorts over a two-year time span (Menard 1991; Marshall and Rossman 1999). The research strategy then was 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, 29).

In addition to student interviews, we interviewed the director of the Telesecundaria, teachers, course designer Baum, and a convenience sample of seven parents of students who completed the environmental learning course. Parental interviews added insight to our knowledge of course effects on students and we were able to uncover if, and how, these students were impacting the family (Serow 1997). As presented in the introduction, we also interviewed influential members of the community for triangulation purposes and to understand the environmental and social/political context in Pescadero (Serow 1997; Yin 2003).

Instrumentation and content validity

A semi-structured interview instrument was created from a pool of questions written by the researchers, faculty at the University of Arizona, course designer Baum, a Pescadero-based interpreter, and a teacher at the Telesecundaria. The instrument was designed to incorporate life-history techniques (Bertaux 1981) to judge the extent to which the programme affected and/or changed the life of the learner. The instrument was designed to explore the research questions, address the curriculum, and be sensitive to the regional dialect of BCS. After pilot testing interviews with control group participants we made further instrument revisions (Creswell 2003).

Students were interviewed by the researcher and a Spanish-speaking interpreter using a semi-structured interview style.³ Interviews took place at the Telesecundaria, student homes, and the work places of community members. All interviews were audio-recorded and coded for thematic trends (Creswell 2003).

Reliability and validity

We triangulated various data sources from students, families of students, teachers, and the community. We observed field activities at the research setting in order to confirm

interview responses and to better understand the community context in which the course operated (Creswell 2003).

Qualitative descriptive narratives have been used to present the interview data, and representative participant quotes are detailed in relation to the four qualitative research questions (Creswell 2003). Descriptive narratives were useful for understanding participant and course phenomena and conveying the multiple research findings.

Validity of the 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 variations in responses while allowing for a more contextualised and descriptive participant response framework. The prevalence or lack of discrepant information therefore allowed for greater insights into the credibility of perceived patterns of phenomena identified by this research.

The qualitative analysis employed type 1 and 2 tabulations as prescribed by Silverman (2006). More precisely, we calculated response percentages from the interview data to more accurately display prevalence of phenomena.

Our research compared immediate course outcomes with course outcomes two years after completion. This is more precisely described as the constant comparative method whereby two different groups of student participants from the two different time periods are analysed (Silverman 2006). This cross-case analysis of participant responses proved useful as a tool for comparing and analysing the 2004/2005 and 2006/2007 participant responses and for the identification of common and disparate themes.

Results

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

The analysis of the qualitative portion of the research addressed the student and parent interviews. The analysis is structured according to the four broader guiding concepts of: (1) experiences of students; (2) course propensity to instigate issue awareness and involvement; (3) social factors and environmental traits; and (4) influential course components. Interview questions that satisfy the four concepts above are presented with representative participant responses.

Experiences of students

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

Students from the course participated in a campout and cleanup of a beach. During the week of *Semana Santa* (Easter), hundreds of people camp at Los Cerritos Beach. The impact of the event is detrimental to the dune, beach, and desert environments; people drive off road and leave copious amounts of garbage and waste. We asked students to describe their experiences and they showed enthusiasm that they were able to participate in the rehabilitation of an impacted natural area that is utilised by endangered species and enjoyed by their community (and foreign and domestic tourists alike). During this project students also

conducted a visitor census; studied native plants; and participated in a recycled art project. Some students from the 2004/2005 group spoke with the public about environmental issues and described their experiences.

2004/2005 students

- 01 Pasha: 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.
- 02 Pasha: 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.
- 01 Myra: 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.

While five of the students from the 2004/2005 group explained that the public was receptive to the student efforts, four discussed the public's disinterest in the students' environmental outreach efforts. Of importance, however, is the internalisation of environmental issues and student interest in communicating with others about environmentally responsible behaviours.

We next explored 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 participants' environmental consciousness. We first asked participants: *Do you think the course experiences augmented your environmental consciousness? If yes, how so?*

2004/2005 students

- 01 Lino: I don't throw the garbage everywhere. 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.
- 01 Ana: I have learned to be careful with the garbage and paper. This has changed my awareness in that if I see advertisements on the TV about the environment I pay attention.
- 01 Vikki: 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 students

- 01 Crespin: Before the class sometimes we would see an animal and we would kill it. After the class with Paty, we learned about them, and now we don't kill them.
- 01 Yolanda: 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 behaviours affect the whole world.

We found that 6/15 (40%) of the students from the 2004/2005 group now spend more time in nature as a result of taking the course two years earlier. We asked students if they had more interest in environmental themes since they took the course. Almost all of the student responses were affirmative. Moreover, despite the fact that the course covered myriad topics over the school year, students named sea-turtle protection and environmental contamination as their favourites.

2004/2005 students

- 01 Suze: Before I took the class I would not hang out in nature and it was not interesting to me. Then I took the class and we went to Cabo Pulmo and Isla Espiritu and I started to understand. Paty explained to us about the environment and the things in the ocean and stuff and I started to have more interest in it.

2006/2007 students

- 01 Yolanda: 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.

We asked students if they thought they made a positive impact on their community. Although two of the students were sceptical, most disclosed that they were excited to see first-hand how their service efforts were immediately effective in improving heavily impacted areas.

2004/2005 students

- 01 Lino: 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.
- 01 Aura: We told people not to be piggish about their garbage and about the sea turtles, and this makes them think. When we made signs about and garbage, the people learned from the signs.

2006/2007 students

- 01 Linda: People are more informed and are doing things that they didn't know to do before. People are not throwing so much garbage in the arroyo.
- 01 Joel: 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!
- 01 Graciela: Many more people no longer eat the sea turtles. And we learned how to liberate the turtles. And there's more opportunity for the turtles.

Propensity to instigate issue awareness and involvement

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

We asked students to discuss with us their awareness of the environmental issues facing Pescadero. At post-interview the majority of students in the 2004/2005 group could identify two to three issues. During pre-interview the majority of the 2006/2007 group could identify between zero and two environmental issues, while during post-interview the students could identify between two and four issues.

We scrutinised the interviews and tabulated the prevalence of responses to various expressions of environmental practice. It should be stated that the young students living

in the community of Pescadero have limited opportunities to address environmental issues facing their community - that is, practising pro-environmental behaviours to address environmental issues were conducted on a personal, household, or advocacy level. For instance, concerning sea turtles, students were able to decide to not eat sea turtles themselves, and talked to their families about the issue. Some students reported that their family members stopped eating sea turtles, and the family members corroborated this fact. As a group, students released baby sea turtles with non-governmental organisation (NGO) biologists, made signs at the beach warning about the dangers of beach driving to sea-turtle nests, and cleaned garbage from sea-turtle habitat. The voluntary involvement in environmental actions is organised below through four increasing degrees of commitment:

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

1. Taking a personal/lifestyle changing action to address an environmental issue

During the interview process we asked students from the 2004/2005 group if they behave differently in regards to what they learned in the course. We found that students from 2004/2005 had changed their environmental behaviours as a result of the course, and continued to practise pro-environmental behaviours two years later; most students were practising between one and two pro-environmental behaviours such as recycling, composting, water conservation, not littering, not eating sea turtles, and not burning trash.

During pre-course interviews with the 2006/2007 group we found that 18/23 (78%) of the students were practising at least one pro-environmental behaviour. Since completing the course, we found that all 21 students were practising pro-environmental behaviours, with the majority practising between one and two behaviours. About one half of the class (10/21) began practising one new pro-environmental behaviour, and about one quarter (5/21) began practising two new behaviours. Students who adopted new behaviours explained to us that they had done so as a result of taking the course.

2. Intergenerational learning

We addressed the various degrees to which there was participant involvement (beyond school-based projects) with environmental actions. We asked students to discuss efforts to educate their families 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 group had discussions with their family members with the intent of changing their environmental behaviours. 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 behaviours. Students disclosed that the family did not practise environmental behaviours before the student had participated in the course and subsequently shared the

information. Interviews with parents and the director of a health centre confirmed student interviews (also below):

2004/2005 respondents

- 01 Director: Students have brought their education to the rest of the community; inside the school, and to their houses and families.
- 01 Vikki: I talked to them [my family] about not killing the sea turtles.
- 02 Vikki: I think it made a difference because we haven't eaten sea turtles since.

Cecilia's mom discussed Cecilia's influence in regards to environmental behaviours:

- 01 Cecilia's mom: Cecilia spoke with me a lot about the sea 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.

In regards to composting behaviours:

- 02 Cecilia's mom: Oh you mean with the plant scraps? Yes, we never did it before and we started this when she started the class with Paty.

Juan and Juanita's mom discussed her children's efforts to reduce garbage burning at the house:

- 01 Juan and Juanita's mom: I used to burn garbage and now I don't do this anymore. And even when things are really messy 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 behaviours:

- 01 Porfirio's mom: The most important thing I noticed with him is that he was telling us not to burn the garbage.
- 02 Porfirio's mom: He taught us to separate the garbage, the plastic and the herbs, and we didn't do this before, and we do it now.
- 03 Porfirio's mom: We take all of our herbs and we put it in an area and I sell the compost!
- 04 Interviewer: So how much money do you make from the compost?
- 05 Porfirio's mom: \$200-\$300 US dollars [yearly].

During post-course interviews we found that 17/21 (81%) of students from the 2006/2007 group had discussions with their families, with the intent of changing their environmental behaviours. Of the students who disclosed that they talked with their families, 14/17 (82%) reported that their families successfully made efforts to change their behaviours. Two students reported that their family 'sometimes' makes efforts to practise these behaviours, and one student reported that their family has not changed at all. Illustrative comments include:

2006/2007 respondents

- 01 Linda: 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. I talked

- to them about reusing things that we formerly would throw away, and not buying over-packaged products, and things with preservatives.
- 01 Yolanda: I talked to them [my family] 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 behaviours and that Yolanda had a positive experience taking the course:

- 01 Yolanda's aunt: It has been positive because the things that she is learning in the class she is bringing home to us.
- 02 Yolanda's aunt: We started a compost area with the leaves, and we started separating the garbage, for example the aluminium cans and tin cans and glass bottles and leaves from the trees ... and we've started doing these things.
- 03 Yolanda's aunt: 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.

3. Peer group tutoring

Beyond familial intergenerational learning we asked students about their efforts to influence the environmental behaviours of classmates and friends (horizontal learning through peer tutoring). During post-interviews, 5/15 (33%) students from the 2004/2005 group disclosed they continue to advocate pro-environmental behaviours to their friends concerning solid waste issues. A mother of two students from the 2004/2005 group discussed behavioural changes with her son and daughter.

- 01 Juan and Juanita's mom: 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.'

During post-interviews with the 2006/2007 group, 10/21 (48%) of the students reported that they spoke with friends or other students about undertaking pro-environmental actions. Half of the 10 students who spoke with their friends reported success in changing their friends' behaviours, while three reported that their friends 'sometimes' practise pro-environmental behaviours; two students reported that their friends failed to practise pro-environmental behaviours after their discussion. We asked students about their efforts to influence their friends; the following are representative responses from the 2006/2007 cohort:

- 01 Andrea: I talked to them about separating the garbage, and when we go to the beach, not to leave our garbage on the beach.
- 01 Yolanda: 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 can't say their behaviour has changed totally.

4. Voluntary participation in an environmentally related community service project

We sought to uncover whether students from the 2004/2005 cohort had voluntarily participated in any environmentally related community service projects in the two years since the course ended. During post-interviews only one of the students reported volunteering for service projects. These projects included a community trash cleanup and a sea-turtle liberation; both projects were led by Baum outside of the school. Through interviews we found that although students were amenable and willing to participate in volunteer activities, they did not know how or where to get involved. Outside of Baum's community organising, and a handful of other community and environmental advocates, it is apparent that service opportunities in Pescadero are limited.

Social factors and environmental traits

Research Question 3: What is the cultural, political, educational and economic atmosphere in student homes and the community of Pescadero?

In the introduction we presented interviews with influential members of the community concerning the social, cultural, political, educational and economic atmosphere in Pescadero. We uncovered that the pueblo and its inhabitants (human and non-human) face serious environmental challenges. The next generation in Pescadero is encountering the full brunt of hyper-consumerism. 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.

We found that culturally, the population in Pescadero encourages and values family-based nature experiences. Of all students interviewed, 37/38 (97%) visit nature at least once a year, while 28/38 (74%) visit nature more than once a year. We found that 16/38 (42%) of students go camping at least once each year, while 9/38 (24%) of students camp more than once a year.

Students from the 2006/2007 group were asked if their parents were influential in teaching them about the environment. Only 5/23 (22%) reported *no* parental influence concerning environmental responsibility.

In order to uncover the prevalence and nature of environmental learning in the Mexican educational system the participants were asked to describe the extent and nature of environmental learning outside of Baum's course. The interview data confirmed that students were exposed to week-long environmental units in elementary, middle, and high school, both from textbook and teacher sources. The data confirmed 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 or experiential learning activities.

Influential course components

Research Question 4: What specific aspects of the environmental learning course do students find most influential in affecting their experience?

Participants were asked during interviews to identify their favourite environmental learning projects; students were not prompted to discuss a particular subject or the nature of the learning (i.e. in-class, hands-on, etc.). All 15 students from 2004/2005 selected hands-on projects as their favourite. From the 2006/2007 group, 13/21 (62%) of the students identified hands-on projects as their favourite, 3/21 (14%) liked both the in-class and hands-on activities equally, while 5/21 (24%) preferred in-class activities.

2004/2005 students

- 01 Suze: 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. I really liked doing this with my classmates and also we all live here so it all affects the town.

We asked Juan about his favourite projects in the course:

- 01 Juan: Helping the sea turtles and cleaning Los Cerritos Beach because we helped the sea turtles and we helped improve the environment and collected the garbage at Los Cerritos Beach.
- 02 Interviewer: You mentioned two hands-on projects. Do you think you learn better with hands-on projects or in the classroom with books?
- 03 Juan: I learn from them both, the hands-on and the books. 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.

2006/2007 students

- 01 Yolanda: 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 also we found a lot of garbage that people threw in the arroyo. I don't like this and the garbage gets into the elements.
- 02 Interviewer: Do you think you learned better from the hands-on projects or the classroom lessons?
- 03 Yolanda: 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.
- 01 Interviewer: Do you think you learned better from the hands-on projects or the classroom lessons?
- 02 Graciela: Hands-on projects. Because when we do the hands-on we leave the classroom and we do the work, and I learn better when we do the work with our hands than in the classroom. We would come back and present to the classroom what we learned.

Conclusion

The purpose of this study was to explore the outcomes of an experiential environmental learning course on the behavioural, intellectual, and social attributes of Mexican participants. From a pedagogical standpoint this research has contributed to the field by helping us to better understand the practice of experiential education, specifically in relation to the multiplicity of outcomes, as well as the challenges students encounter with this methodology. Through interviews we were able to describe the current environmental climate in Pescadero, document community environmental attitudes and values, and establish a baseline of environmental learning outcomes for course participants and their families. While we quantified many student responses, descriptive narrative threads allowed us to understand the intangible benefits of participation in the course. Many of the respondents gave us insights into the affective domain: feelings, attitudes, perceptions, and concerns.

Students who took the course in both 2004/2005 and 2006/2007 were interviewed. The 2004/2005 students gave interview responses with similar emphases as the 2006/2007

students, suggesting that pro-environmental attributes were sustainable over a two-year time span. This sustainability of pro-environmental behaviours and attitudes could be attributed to the student experiences resulting from participation in the course, the pre-existing environmental disposition of these students, and/or the fact that during interviews, 80% of students from the 2004/2005 group reported that they discussed the environment and environmental issues in school (after the 2004/2005 school year).

Interviews provided us with responses detailing the positive feelings that students experienced when they engaged in environmental service learning. Their feelings emanated from: (1) taking personal action; (2) working in the natural environment for the community and endangered species; (3) setting an example for others to follow; (4) experiencing the immediate synergistic effects of their efforts; and (5) discovering the degree to which the environment of Pescadero is impacted and the complacency of some in the community towards environmental and species protection.

Our research attempted to establish patterns of outcomes for the pedagogy as well as transcend the positive findings of the international research of Silcox 1993 (Novgorod, Russia); Bogner 1999 (Swiss research); Powers 2004 (United States); and Johnson-Pynn and Johnson 2005 (Uganda, East Africa). Our results are distinct from these findings, yet not so unique that they fail to refine our understanding of the outcomes of the pedagogy. We found the course operated in a difficult social context that offered unique obstacles. The economic, social/political, and cultural atmosphere in Pescadero was hardly conducive to the goals, of course. Despite these hurdles we found evidence that both students and their families made advancements in the environmental attributes we examined. Furthermore, we gained a better understanding of the importance and social usefulness of designing and implementing experiential education for the facilitation of intergenerational learning, civic and environmental responsibility, and pro-environmental behaviours and attitudes.

This research uncovered unanticipated outcomes in terms of the high proportion of students instigating intergenerational learning. In terms of horizontal and vertical intergenerational learning, many students who took the course have been successful as initial vectors for the dispersal of pro-environmental information and behaviour modelling. Through our analysis of course participants and the interviews with parents and influential members of the community we found evidence of complex dispersion of environmental information: according to Arenas, '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). Among the 2004/2005 cohort, both student and familial pro-environmental behaviours and attitudes have been sustainable over the past two years as evinced by the student and parent interviews. Our future longitudinal research will work to uncover the existence of longer term outcomes.

Respondents recalled their exposure to environmental education in elementary, middle, and high school, both from textbook and teacher sources. Despite the unique nature of the course, our data confirmed research by Barraza and Cuaron (2004), who found that most Mexican environmental learning is textbook based, taking place in the classroom, and of short duration, with a fraction of the students reporting field trips or any form of hands-on or experiential learning activities. Our data was informed by and refined Barraza's (1996) work that highlighted the benefits of facilitating experiential pedagogies with Mexican students. That is, we detailed the specific outcomes of Mexican students participating in an experiential course with an environmental focus. Furthermore, we contributed to the research addressing the outcomes of service learning on the educational, environmental,

social, and affective attributes of Mexican participants through the documentation of an environmental learning pedagogy that was previously unexplored in Mexico.

We found that the experiential learning components of the course stood out significantly in these students' minds. The majority of the students enjoyed working outside the confines of the classroom and thought this novel component to be useful, meaningful, and engaging. During interviews students reported that the experiential components inspired them, and as a result, they paid better attention. For instance, students noted that they enjoyed classroom-based learning that addressed sea-turtle biology and human actions contributing to the endangerment of sea turtles, and then taking this knowledge to the action level by working directly with sea-turtle liberations and habitat improvement projects with community organisations. For students who had never camped, travelled, or spent time in natural areas, the experiential course components had significant impacts. While it is impossible to say that *all* of the experiential components created meaningful events that positively contributed towards student education, environmental perceptions, the community, or the environment, our findings, and the findings of Silcox (1993), Bogner (1999), Powers (2004), and Johnson-Pynn and Johnson (2005), are encouraging.

Notes

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).
2. For confidentiality we omitted the names of the organisations and the individuals we interviewed.
3. For confidentiality the student names presented are fictional, representing the real participants of the research.

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