ENVIRONMENTAL AND SUSTAINABILITY EDUCATION
IN NATURAL WORLD HERITAGE SITES

A LITERATURE REVIEW

Report for the Galapagos Conservancy

Submitted by:

Nicole M. Ardoin, Project Lead, Stanford University
Sharon M. Ryan, Environmental Education Consultant

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Environmental and Sustainability Education in Natural World Heritage Sites: A Literature Review

Introduction

The world has 180 natural World Heritage sites considered to be of “outstanding natural importance to the common heritage of humanity.”\(^1\) Their value as harbors of biodiversity, ecosystem services, and relatively undisturbed habitat, combined with the human-induced threats facing many of the sites, suggest a need for effective education as a tool to help people become informed about and engaged in stewardship of these places. This summary describes a review of models of environmental education (EE), education for sustainable development (ESD)\(^2\) and other approaches used in K–12 settings in natural World Heritage Sites, with a particular focus on South America.\(^3\)

The study was undertaken by independent consultants and commissioned by the Galapagos Conservancy, a U.S.-based nonprofit organization working for conservation in the Galapagos Islands through partnerships with the Charles Darwin Foundation, the Galapagos National Park, and other local institutions. The review was prompted by a forthcoming opportunity in the renowned world heritage site of Galapagos: The Ecuadorian Ministry of Education has recently approved and will implement a new curriculum that integrates environmental themes, with a particular focus on the environment in Galapagos.

Research Methods

The study draws from three complementary resources: (1) peer-reviewed literature of leading academic journals related to EE, education for sustainability, and interpretation, (2) an online review of the gray literature, including UNESCO documents, unpublished theses and dissertations, reports, and international conservation and development projects; and, (3) consultation with an education representative of UNESCO World Heritage Sites on education programs being carried out in Biosphere Reserves.\(^4\)

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\(^1\) Source: Natural World Heritage Sites criteria, Wikipedia. Available from: http://en.wikipedia.org/wiki/World_Heritage_Site#Natural_criteria

\(^2\) Our study focuses in part on research and program activities that specifically use the term Education for Sustainable Development (ESD) as defined by United Nations Educational Cultural and Scientific Organization (UNESCO), which administers the World Heritage list under the World Heritage Convention. Where appropriate, we distinguish ESD activities and research from those that go under the labels of “environmental education” or “education for sustainability”. Although there is overlap between the three labels, we do not use them synonymously.

\(^3\) The Latin American and Caribbean region includes 5 of the world’s 10 most bio-diverse countries (Brazil, Colombia, Ecuador, Mexico and Peru) as well as the single most biologically diverse area in the world (the eastern slope of the Andes). Today, Latin American biodiversity is under severe threat, as these 5 countries are also among the 15 countries in the world whose fauna is most threatened by potential extinction. Source: Review of Context and Structures for Education for Sustainable Development. (2009). United Nations Decade of Education for Sustainable Development. UNESCO.

\(^4\) Established under UNESCO's Man and the Biosphere (MAB) Programme, biosphere reserves are a series of protected areas linked through a global network, intended to demonstrate the relationship between conservation and development. Source: Global Biodiversity Assessment. ec.europa.eu/research/biosociety/library/glossarylist_en.cfm
The intent of this inquiry is to address the following guiding questions:

1) In Latin America and elsewhere, what models of EE / ESD / place-based education or other approaches are being used in K–12 schools located within or near natural World Heritage Sites?

2) What are the goals, background and core features of these programs? Do these programs identify best practices or factors critical to successful implementation? What are the barriers to implementation? What research or evaluation has been conducted on these programs?

3) What are the guiding educational philosophies and methods that could be used with the new curriculum in Galapagos? What key outcomes could be sought with the implementation of this new curriculum?

Definitions: Environmental Education / Education for Sustainable Development

Environmental education (EE) encompasses a wide range of goals and definitions. For the purposes of this paper, we define EE as any educational activity that fosters the development of environmentally literate citizens. Environmental literacy involves an understanding of environmental issues, how human decisions impact environmental quality, and how to use this knowledge to make well-informed choices that also take into account social and political considerations (North American Association for Environmental Education, 2004).

According to UNESCO (2005), Education for Sustainable Development (ESD) involves “learning how to make decisions that balance and integrate the long-term future of the economy, the natural environment and the well-being of all communities, near and far, now and in the future” (p.1). ESD has four major foci: (1) improving the quality of and access to basic education, (2) reorienting existing education to address sustainability, (3) improving public awareness, and (4) providing training for business, industry, and government (McKeown & Hopkins, 2005, p. 223).

Overview of Findings
This study found a striking dearth of research findings and evaluation in the academic literature that address EE / ESD implementation in the formal educational system in natural World Heritage Sites. A search of leading journals related to EE, ESD and natural history interpretation found no prior studies on the implementation of EE or ESD programs in K–12 settings in natural World Heritage Sites (see Appendix A for a full list of journals included in the search). A review of the online gray literature likewise yielded limited results in this specific area of inquiry.

As a result, we expanded the study to include examples of EE or ESD implemented in areas of South America other than natural World Heritage Sites that have particular relevance—for example, those that take place in protected areas in Latin America and illustrate best practices identified in the academic literature on effective EE / ESD. Finally, we found several articles related to ESD / EE more generally in Latin America; many of those articles focus on the status of countrywide initiatives, barriers to implementation, and strategies for moving forward on these initiatives. At the end of this paper, we summarize these results, which provide a broader context in which EE / ESD initiatives are occurring in Latin America.
EE Programs in Natural World Heritage Sites

Program Structure and Implementers
Among the EE programs targeting K–12 students in natural World Heritage Sites found in the gray literature, many were offered outside school settings by nongovernmental organizations and structured as add-on, activity-based programs linked to local school curricula. Some programs were implemented in coordination with local and municipal authorities, and state education departments. The goals of these programs ranged from building awareness of the local environment and inspiring students to take responsibility for their environment, to engaging communities in preservation of their cultural and natural heritage, in line with the World Heritage Convention’s stated mission.

Evaluation Metrics and Best Practice
The majority of the information and reports available focus on reporting the number of participants, describing activities implemented, and outlining products developed. They do not describe evaluation metrics related to environmental attitudes, knowledge, or behavior, of teachers, students, or community members as a result of program efforts, nor do they explicitly describe elements of successful implementation or best practices. Nonetheless, from the programs’ descriptions, a number of best practices found in the peer-reviewed literature can be identified:

1) Hands-on, minds-on or active learning
2) Focus on content knowledge
3) Development of action skills
4) Modeling of teaching methods
5) Links to local school curriculum
6) Place-based learning
7) Support for teachers, for example, professional development experiences, and the provision of teaching and educational materials
**SAMPLES OF EE PROGRAMS IN NATURAL WORLD HERITAGE SITES**

**Belize Barrier Reef Reserve System:** The Southern Environmental Association (SEA) provides hands-on learning experiences for students that complement existing EE programs in local schools of the Southern Marine Protected Areas within the Belize Barrier Reef Reserve System. Additionally, SEA has trained teachers as field directors capable of leading experiential trips to parts of the barrier reef reserve. The program’s goal is to build awareness of marine protected areas among teachers and students. Eight communities with a total of 13 schools (representing a total of about 400 students and adults) participated in the program, which is funded for two years by the Community Management of Protected Areas Conservation Programme (COMPACT). For more information: www.seabelize.org/field_trip.html

**Seaflower Bisosphere Reserve, Southwest Caribbean:** A report on the first five years of the implementation of the Seaflower Bisosphere Reserve in the Southwest Caribbean describes a number of EE initiatives—both formal and informal—that have been implemented (Howard, 2005). In formal education, programs have been designed to incorporate biosphere education into curriculum, including the development and introduction of a marine resources curriculum and/or a mangrove curriculum in some schools, as well as professional development courses for teachers on curriculum implementation. A variety of educational materials have also been produced and provided to schools throughout the archipelago (Howard, 2005). The program is run by CORALINA, the archipelago’s environment authority. For more information: www.unesco.org/csi/smis/siv/Caribbean/San_actEnvEd_Seaflower2000-2005%20.pdf

**Sierra Gorda Biosphere Reserve, Mexico:** In the Sierra Gorda Biosphere Reserve in Mexico, an EE program has been underway for 16 years. The program targets primary and secondary school students, in addition to the general population (Grupo Ecologico Sierra Gorda, n.d.). EE coordinators conduct monthly visits to 161 schools in 112 communities of the 5 counties that comprise the reserve and in buffer areas surrounding the reserve. Environmental educators offer training in teaching methods and materials on a variety of location-specific environmental themes. The program is implemented in coordination with state education department and local and municipal authorities. For more information: www.sierragorda.net/educacion/index~.htm

**Cape Town, South Africa:** Beyond South America, other groups have developed EE programs in World Heritage Sites. In South Africa, for example, the extensive education for sustainability program in Kirstenbosch National Botanical Garden (the first garden to be recognized as a natural World Heritage Site) works mainly with youth from “disadvantaged areas and under-resourced” schools though all learners are welcome. It focuses on four key areas: (1) a Garden-based education program in which up to 11,000 learners from grades R–12 participate annually in hands-on activities; (2) Outreach Greening Programme: a program for creating indigenous gardens in local schools and communities – 46 indigenous gardens have been developed to date; (3) teacher professional development; (4) resource and curriculum development. For more information: www.bgci.org/education/article/0234/
ESD Implementation: Pedagogies and Tools

Although there is a paucity of on-the-ground examples of ESD in K–12 settings, many researchers do view ESD as an opportunity to renew or reform “old education systems founded on competitive principles and values” (Gadotti, 2010, p. 203). To this end, Gadotti (2010) calls for an “ecopedagogy” or holistic pedagogy guided by the concept of sustainability, which can contribute to the transformation of school life at all levels, by reformulating learning content and methods, and enhancing the quality of education. Other researchers argue that in order for ESD principles to be successfully implemented in schools, the education system must be transformed into a resource center that initiates and supports students’ inclusion into sustainable development processes in their own communities (Savelava, Savelau & Cary, 2010). Two important elements of this change are teachers’ self-definition as co-learners in the educational process, and the integration of nonformal learning initiatives that are led by youth with formal educational activities. Studies have suggested that this kind of integration can facilitate an effective and sustainable transition to ESD (Savelava, Savelau & Cary, 2010).

Pedagogical frameworks for the implementation of ESD within formal education settings have been developed based on accumulated theory and practice. Eilam and Trop (2011) suggest four basic principles, presented as steps or layers, which comprise the basic and essential components for achieving the goals of ESD. They note that, “while the components are not exclusive, all four components must be implemented together in order to achieve ESD goals” (Eilam & Trop, 2011, p 46). They define the first step as “non-natural learning”, while they consider the final three be more “natural learning” approaches.

1) traditional modes of learning and non-natural learning;\(^5\)
2) interdisciplinary and/or cross-disciplinary teaching and learning, which fosters systemic thinking and an understanding of connections between cause and effect within systems;
3) multi-dimensional learning, which facilitates contextual ways of thinking, skills for thinking outside the box and skills for looking at systems in relations to other systems, spaces and times; and,
4) emotional learning, which facilitates values and ethics clarification, which “form a central part in any educational effort towards sustainable development” (Eilam & Trop, 2011, p.49).

When promoting and implementing ESD, Vare and Scott (2007) recommend the use of two complementary approaches: (1) the promotion of informed, skilled behaviors and ways of thinking, and (2) building capacity of learners to think critically about sustainability, and to test ideas, exploring the inherent predicaments and contradictions of sustainable living. Vare and Scott (2007) promote the use of both approaches simultaneously in order to make learning experiences meaningful, and to allow learners to develop the necessary skills and knowledge for managing change themselves. When assessing the effectiveness of schools

\(^5\) Traditional or non-natural learning is characterized by Orion (2003) as: “Taking place in a closed space that has no relation to any learnt subject; only rarely includes real life concrete experiences with the subject to be learnt; has no immediate relation between the subject to be learnt and learner’s relevant world; verbal communication replaces the experience through description of imaginative situations; the learning is carried out among a large group; and it is very difficult to adjust the learning for individuals (p.58).” Source: Eilam, E. & Trop, T. (2011). ESD Pedagogy: A Guide for the Perplexed. *The Journal of Environmental Education, 42*(1), 43-64.
that implement ESD, Scott (2009) cautions that the outcomes should be focused primarily on what students are learning, rather than on modifying their behaviors.

Practical tools for implementing ESD in schools have also been developed. One in particular, the ESD toolkit, aims to help schools and communities develop a process for creating locally relevant and culturally appropriate education that integrates the efforts of the educational system and local communities (McKeown, 2002). The toolkit provides an overview of sustainability; challenges to ESD implementation; successful case studies; methods for initiating and managing change in schools, and engaging communities; exercises and teaching tools; and links to other relevant resources.

**EE / ESD Models Elsewhere in Latin America**

Throughout other areas of South America, various models of EE have been developed and implemented; samples applicable to natural World Heritage sites are described below.

*Place-based Education*

A pedagogy of place argues that it is critical to cultivate in youth a well-grounded knowledge of their own places (Gruenewald, 2003). The place where one lives can teach about the interdependence of social and natural systems, and thereby facilitate development of “competence, care and appreciation in political, environmental aesthetic areas” (Arenas, 1999, n.p.). Two public secondary schools in Columbia that serve economically disadvantaged students are promoting a pedagogy of place: one uses an interdisciplinary approach in which each grade focuses on a locally relevant theme and a social or ecological project; the other engages students in organic agriculture and animal husbandry projects related to sustainable community development. Through these location-specific programs, the schools develop students’ social, political and environmental awareness while preparing students for national standardized tests (Arenas, 1999). In Ecuador, place-conscious education is also emphasized as a potentially unifying conceptual framework that speaks to the concerns voiced by indigenous educators related to the need to defend against fears of various kinds of economic and cultural encroachment (Schroder, 2006).

*Ecology Education*

A model of ecology education in southern Argentina employs inquiry-based processes for active science learning, including first-hand investigations and reflections on implications of the results (Feinsinger, Margutti & Oviedo, 1997). Targeted to school-age children, teachers and naturalists / interpreters, this approach helps create a foundation for critical thinking skills, an essential component of ecological literacy. The model, which involved partnerships between ecologists and educators, showed promise in several South American settings, including San Carlos de Bariloche in the Patagonia Lake District of southern Argentina.

*Action Research and EE Implementation*

Since 2003, researchers, faculty, graduate and undergraduate students from the Brazil’s State University of Maringá have been working alongside teachers from the state and local schools in the municipality of Porto Rico (Paraná State), located on the banks of the Paraná River. The consortium’s objective is to outline actions and strategies with the purpose of building paths to integrate EE into the school curriculum (Obara et al., 2009). Based on an action-
research pedagogy, the group has developed the following programs: (a) the Continuing Education Program in Environmental Education; b) the Development of Interdisciplinary Projects; (c) the Insertion of Information and Communication Technologies (ICTs); and (d) the Production of Teaching Materials. Program evaluations indicate that teachers have been able to build a theoretical and methodological basis for EE while simultaneously growing into the role of teacher-researchers as they create the conditions to investigate and reflect on their pedagogical practices, share experiences, innovate, and make the teaching-learning process more significant. Students and teachers have developed a better understanding of the ecological, cultural, social, and economic value of the floodplain through advances in educational practices with the aid of ICTs and activities developed in the classroom, the field, and the lab—all of which involve natural and cultural aspects of the region. Consequently, they have also learned of the importance of preservation and management in order to maintain local biodiversity.

**EE, Natural Resources Management and Poverty Alleviation**

To preserve the vicuña of the Pano altiplano in Latin America, researchers have argued for an EE program that is a component of a larger natural resources management and poverty-alleviation strategy (Bibiana, Garcia Gomez & Wawrzyk, 2009).

**ESD and Professional Development**

Following an official commitment by the Costa Rican government to implement the UN Decade of Education for Sustainable Development, an initiative called Peace with Nature (Iniciativa Paz con la Naturaleza–IPN), under which a teacher professional development course called Education for Sustainable Development Regional Course (CREADS) was implemented (Jiménez-Elizondo, 2010). A coalition of governmental and nongovernmental organizations, coordinated by the Ministry of Education and IPN, was put in place to deliver the course using the Earth Charter as the course framework. The course was delivered to more than 200 teachers and administrators, and many participants proceeded to develop ESD projects at their respective schools, and plan for continuous professional development in ESD (Jiménez-Elizondo, 2010).

**International Whole-School Approaches to Sustainability**

A number of schools around the world have adopted whole-school approaches to sustainability (Henderson & Tilbury, 2004), which may have particular relevance for EE/ESD in natural World Heritage Sites. A study by the Australian Research Institute in Education for Sustainability (ARIES) provides an overview of several international whole-school sustainability initiatives (Henderson & Tilbury, 2004). Although the authors acknowledge a lack of evaluation and research findings that answer questions related to implementation and effectiveness conclusively, their review suggests some key success factors critical for whole-school sustainability programs. These include:

1) alignment with national government priorities

2) access to expertise in EE and or Education for Sustainability during program design and implementation

3) significant and continuous funding
4) alignment with Education for Sustainability approaches
5) investment in professional development of program team as well as school partners
6) linking with EE initiatives already in place, and
7) establishment of multi-stakeholder partnerships.

Thus, whole-school approaches to sustainability have an important role to play in moving communities towards sustainability. Moreover, national policy and initiatives that support these approaches at the state and local level enhance engagement and quality of practice (Henderson & Tilbury, 2004).

**General Trends in ESD / EE in Latin America**

In assessing models of EE / ESD in Latin America, it is important to understand the broader context affecting their successful implementation. Prior studies have highlighted significant barriers to EE / ESD implementation in Latin America schools. For example, a report on the status of EE in private American and international middle and high schools in Latin American and the Caribbean found that EE implementation is impeded by a lack of quality EE curriculum materials and access to teaching materials, as well as prevalent misconceptions about EE infusion and the definition of EE among teachers (Cronin-Jones et al., 2003). Similar results were found for private American and international elementary schools in Central and Latin America (Penwell et al., 2002). The findings from both studies indicate a need for the development of quality regional EE materials and effective teacher preparation in Latin American schools.

Several researchers have described significant obstacles to the development and implementation of EE and ESD in various Latin American or Caribbean countries (Carvahlo, Leal Hale & William, 1999; Koury, 2005; Skanavis & Sarri, 2004). Other articles and reports have examined the current status of ESD / EE in Latin America and outlined strategies for moving toward the widespread adoption of ESD / EE (Andelman, 2005; Gonzalez-Gaudiano, 2005; Malhadas, 2005; Republic of Argentina, 2001).

Malhades (2005) stresses the need for a clear action plan for the Latin American implementation of the Decade of Education for Sustainable Development given the unique challenges of this region. For example, in Brazil, a "deficient educational system" characterized by diminishing resources devoted to education and research, low salaries and poor working conditions, makes ESD implementation particularly challenging. In federally protected areas in Brazil, specific barriers to EE implementation include: a lack of financial and materials resources; a lack of training; and absence of policy on EE (Carvahlo, Leal

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Hale & William, 1999). Malhades (2005) recommends that Brazil's government agencies and national associations facilitate the DESD success by supporting and empowering formal and nonformal educators, and encouraging them to develop and implement efficient educational curricula and programs, and to integrate transdisciplinary strategies of ESD in all courses and schools.

In Argentina, Andelman (2005) suggests that only a few groups recognize the value of ESD: environmental education activists who are connected to environmental issues and organizations, teachers providing environmental education at different levels, and researchers / scholars within some university circles. Moreover, the Decade of Education for Sustainable Development carries little weight in governmental and nongovernmental circles, and does not appear in any agenda, recommendations for policy-making, proposals for decision-making, nor in any public or private sector or area. Andelman (2005) suggests Argentina could take advantage of opportunities offered by the Decade by promoting public recognition of ESD’s strategic value in achieving the successful implementation of sustainable social, environmental, and economic policies as well as by defining what sustainable development means for Argentina. Additionally, there is a need for an inclusive national policy that ensures a just and equitable society. A just and equitable society would adopt an alternative concept of development; consider the needs and aspirations of all people; understand pluralism and the balance between humans and the environment; create alternatives for addressing the root causes of poverty, hunger, illiteracy, pollution, exploitation, and domination; and deal with crucial issues in a holistic manner.

In Mexico, the Ministry of Public Education has integrated environmental and sustainability issues in the design of its National “Education for All” Programme (Gonzalez-Gaudiano, 2005). It has also developed an internal group comprised of 14 directors of the Ministry’s different agencies. This task group will develop an institutional plan of action that may integrate with the plans drawn up by other sectors. Moreover, all local governments, principal business organizations, churches, academic institutions, and civil society organizations have signed a commitment to the Decade of Education for Sustainable Development. Gonzalez-Gaudiano (2005) indicates that much remains to be done, with financial barriers continuing to pose a significant obstacle, despite the importance given to the rhetoric of ESD by international bodies such as UNESCO and the United Nations Environmental Programme.

The above studies and reports highlight some of the major hurdles and broader societal issues—such as poverty, illiteracy, social inequality and women’s rights, among others—that must be considered and addressed to ensure the successful development and implementation of ESD / EE approaches in formal educational systems in Latin America.

Conclusions and Limitations

As our study suggests, few K–12 EE / ESD programs are underway in natural World Heritage Sites and, of those that are occurring, limited research has been conducted on their design and efficacy. To further understand the scope, structure, and effectiveness of these types of programs in World Heritage Sites, additional studies may be pursued to directly contact schools in these sites. Contacting the schools would allow examination of the written and enacted curriculum, with a focus on incorporation of EE or ESD principles as well as outcomes of interest, such as sustainability and stewardship behaviors.

Our research suggests the need not only for further exploration of whether these programs exist but, perhaps more importantly, to develop and evaluate these kinds of programs in
World Heritage Sites. Education is an essential component of creating a literate, engaged, and committed citizenry, poised and motivated to take action on important environmental issues. Incorporating EE and ESD in meaningful ways into K–12 systems in these sites is essential to engaging local communities in decision-making and direct action that affects their natural resources and environment, as well as the world’s patrimony in World Heritage Sites.
References


Southern Environmental Association (SEA). 2009. “Providing Hands-on Learning Experiences for Students of the Southern Marine Protected Areas within the Belize


APPENDIX A: List of Academic Journals Included in Literature Review

- Australian Journal of Environmental Education
- Canadian Journal of Environmental Education
- Environmental Education Research
- George Wright Forum (George Wright Society Publication)
- International Journal of Environmental & Science Education
- International Research in Geographical & Environmental Education
- International Electronic Journal of Environmental Education
- Journal of Education for Sustainable Development
- Journal of Environmental Education
- Journal of Interpretation
- Journal of Interpretation Research
- Parks & Recreation
- South African Journal of Environmental Education
- Visitor Studies

Keyword Searches

- Environmental education (EE) and world heritage sites (WHS)
- EE and NWHS
- EE and Latin America / South America / Americas
- Education for Sustainable Development (ESD) and WHS
- ESD and NWHS
- ESD and Latin America / South America
- NWHS and Latin America / South America
- EE NWHS and Latin America / South America
- Place-based education and Latin America / South America
- Place-based education and WHS
- Place-based education and NWHS
- Education for Sustainability