

# In Darwin's Footsteps: An On and Off-Campus Approach to Teaching Evolutionary Theory and Animal Behavior

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**Abstract:** The study of evolutionary theory and fieldwork in animal behavior is enriched when students leave the classroom so they may test their abilities to think and act like scientists. This article describes a course on evolutionary theory and animal behavior that blended on campus learning with field experience in the United States and in Ecuador and the Galápagos Islands. The on-campus portion of the course covered Darwin's life and travels, evolutionary theory, natural history of the Galápagos Islands, and field ecology techniques. The travel component was a two-week excursion where the students studied the ecology of the islands directly. Unlike other courses described in the literature, this one was offered to science and non-science majors alike, demonstrating the benefits of offering these kinds of learning experiences to a wide variety of undergraduates. Logistics with regard to planning for the course are discussed in detail, as are important elements to consider when taking students to South America. Considering the many benefits to students and faculty alike, this is an innovative and highly stimulating way to teach science.

**Key words:** Galápagos Islands, travel course, field biology, evolution, student research

## INTRODUCTION

The year 2009 was a banner year for all things related to Charles Darwin. It was a celebration of the 200<sup>th</sup> anniversary of his birth and the 150<sup>th</sup> anniversary of the publication of *On Origin of Species*. Academic institutions worldwide honored these two events in a variety of ways, one of which was to emphasize courses on Charles Darwin and evolutionary theory. At Elmira College, a course was developed for science majors and non-majors on evolution and field biology that went beyond the classroom to include study in the place that inspired Darwin's masterwork. This article describes this learning experience and offers insight into developing similar courses. We begin by examining the overall benefits of designing and implementing travel courses; later, we discuss the specific details that went into our course, demonstrating its feasibility.

Courses in the biological sciences involving travel impart far more information to students than those that offer only classroom instruction (Bodycott and Walker, 2000; Drummond, 2001; McLaughlin and Johnson, 2006; Stanitski and Fuelhart, 2006; Zervanos and McLaughlin, 2003). This seems to be especially true when one takes a constructivist approach to learning about science. It is imperative for learners to interpret information, which requires making meaningful connections between concepts and ideas (Wubbels and Girgus, 1997). However, traditional classroom experiences in the biological sciences often provide few opportunities for such interpretation and concomitant deeper scientific insight (McLaughlin and Johnson, 2006). In contrast, direct experience with different cultures and biomes

enables students to contextualize concepts in a meaningful, "hands-on/minds-on" way (McLaughlin and Johnson, 2006). This may be of particular importance for non-science majors who may otherwise shy away from science coursework. Moreover, these experiences do not need to involve protracted stays abroad. Rather, shorter-term travel courses (i.e., six or fewer weeks) can be highly effective in promoting scientific knowledge (McLaughlin and Johnson, 2006; Zervanos and McLaughlin, 2003).

Generally speaking, there are additional benefits to extending instruction to foreign nations. Adults and students alike find the ability to learn abroad to be highly valuable (Marcum and Roochnik, 2001). These experiences expose individuals to different cultures, which broaden their horizons. Moreover, such experiences may help students build their resumés while enabling them to develop and hone interpersonal and intrapersonal skills that are crucial in our increasingly global society (Ornstein and Nelson, 2006). Thus, travel courses may assist students to become more cognizant of the world at large, which is one overarching goal of undergraduate education (Stanitski and Fuelhart, 2003). As for the instructors, a travel course that is carefully planned and delivered can be very enriching and invigorating (Bodycott and Walker, 2000; Drummond, 2001). Teaching in another part of the world can be inspiring to your own teaching and scholarship.

Considering the benefits of travel courses to students and faculty alike, and more specifically with regard to teaching in the sciences, going to the Galápagos Islands and retracing part of Darwin's

journey is an excellent way to inspire one to learn about Darwin's life, evolutionary theory, and the natural world. In the archipelago's extraordinary mix of geology, ecology, and animal life, students are able to observe, ask questions, and apply the scientific method in an authentic fashion. However, this optimal learning experience poses particular challenges in its design and implementation. The sections that follow review these challenges and how they were overcome.

### COURSE DESCRIPTION AND PLANNING

"In Darwin's Footsteps: Evolutionary Theory in the Galápagos Islands and Ecuador" was a 6-week, 6-credit course for science majors as well as non-science majors offered in April-May 2009. There were no prerequisites for this course, so non-science majors were evaluated in the same way the science majors were. Elmira College has a unique academic calendar into which is built a 6-week semester that is devoted to interdisciplinary and travel courses. Faculty are responsible for teaching six credit hours during this term, either alone or through team-teaching a travel course, and students take a total of six credits of coursework. For students, taking a single 6-credit course occupies all their time, especially when travel is involved; the same is true for faculty. For this course, we met in a combined lecture/lab for three hours per day for 16 days while on campus, and approximately 12 hours per day for the 14 days we were off campus. This justifies making such travel courses six credits. The formal objectives of the course are found in Table 1. In terms of instruction, the first three weeks were spent on campus, followed by two weeks abroad, primarily in the Galápagos Islands. The final week was spent back on campus. Despite the fact that this course was only six weeks long, nine months were spent in its development. During that time three major facets had to be managed simultaneously: curriculum planning, trip logistics, and student recruitment and preparation.

*Curriculum planning and student evaluation:* As with all new course offerings at an undergraduate institution, it is important to receive administrative

support for your plans. Therefore, a month was spent honing the curriculum in concert with the travel plans to present to faculty and administrators for their approval. Because this course was taught by faculty from two different departments, course approval had to be obtained from both departments and divisions. Documentation included the syllabus, learning objectives, method of evaluation, topics covered, justification for off-campus offering and 6-credit course designation, and preliminary itinerary. Final approval came from the Faculty Course Approval Committee. Afterward, the Office of the Associate Dean of Academic Affairs was instrumental in coordinating submission of required student paperwork for travel. Once approval was obtained, we finalized activities and materials for three weeks of on-campus instruction, which laid the foundation for what was to come in the Galápagos Islands and the manner in which student learning would be evaluated.

Each course meeting whether on campus or abroad was a combination of lecture and laboratory. The first week of class was devoted to studying Darwin, evolution, and Galápagos Islands geology and ecology. Texts used were *The Voyage of the Beagle* (Darwin, 1887) and *The Beak of the Finch* (Weiner, 1995). Week two began with an exam based on the first week's instruction (Table 1). What followed was practice proposing hypotheses, designing experiments, and testing questions in animal behavior using the scientific method. During this period of instruction we used *Measuring Behaviour* (Martin and Bateson, 2007) as our primary source. In addition, we spent time observing local fauna to practice essential data collection skills. The week culminated with student presentations about the geology and ecology of the Galápagos Islands. Content and delivery of presentations were evaluated. Students spent the third week on campus investigating the literature for animals they had the possibility of observing in the Galápagos Islands. They then chose one aspect of behavior for a particular species and wrote and revised research proposals. Their final research paper was 25% of

**Table 1.** Learning objectives and their evaluation: "In Darwin's Footsteps."

Learning Objective	Description	Evaluation
Evolutionary Theory	Identify and explain the main tenets of evolutionary theory and its value as a foundation for biology.	In-class multiple-choice and short answer exam
Darwin and Evolution	Describe Darwin's development of evolutionary theory through his work in the Galápagos Islands.	In-class multiple-choice and short answer exam
Natural History of the Galápagos Islands	Describe the natural history of the Galápagos Islands and the major flora and fauna.	Two presentations and daily field journal entries
The Scientific Method	Apply the scientific method in designing and implementing experiments in animal behavior, including a small-scale field observation in the Galápagos Islands.	Daily field journal entries and final research paper with presentation
Professional Presentation Skills	Present results of research in a professional manner.	Three in-class oral presentations

**Table 2.** Considerations for finding the right tour.

The Role of the Travel Agency	<ul style="list-style-type: none"><li>• Length of time in operation</li><li>• Length of time providing tours to the area in which you are interested</li><li>• Variety of tours with all costs indicated</li><li>• Flexibility with regard to time that deposit for the tour must be in</li><li>• Pictures of accommodations</li><li>• Customer feedback available</li></ul>
The Role of the Travel Agent	<ul style="list-style-type: none"><li>• Attention to your academic needs</li><li>• Familiarity with the vicissitudes of travel from USA to Ecuador/Galápagos Islands</li><li>• Ability to help you plan a careful budget for the travel with different numbers of students</li><li>• Willingness to explore a variety of options for accommodations, flights and in-country tours.</li><li>• Knowledge of all fees (e.g., tips and gratuities, park admissions, etc.)</li><li>• Ability to find guides that are able to work with students</li></ul>

their course grade. Once abroad, students each kept a journal of field notes and were instructed to record information on all animals they came across, especially those that they had chosen as their final project's focus. Because these notes were vital to complete their project and were graded, daily feedback was provided to help them hone their observation and data collection skills. Finally, upon our return to campus, students completed a paper modeled after scholarly articles based on their hypotheses and the data they collected. Each section of this paper (Introduction, Method, Results, Discussion, Literature Cited) was evaluated for its content and clarity.

*Trip logistics:* Neither of the instructors had been to South America. Therefore, it was necessary to work with a highly experienced travel agency in Quito, which enabled us to create the best possible tour for our educational purposes. Additionally, it made it much easier to negotiate the pitfalls of travel. The Internet was an invaluable search tool. However, it is easy to become overwhelmed with the seemingly endless amounts of information to sift through to find an agency that is trustworthy. Table 2 provides a list of questions that are important to consider when evaluating travel agencies and their services. A key factor for us was flexibility with regard to making a deposit for the trip; many companies require that the money be ready within 48 hours of booking a tour. For students, this may not be enough time to settle one's finances and provide the down payment.

The most important asset in planning the tour of the Galápagos Islands was having an experienced travel agent who understood that we were not planning a vacation; rather, this was an academic experience. Our travel agent described key details about weather, flight schedules, national park fees, traveling from Ecuador to the Galápagos Islands, securing guides, personal budgeting for the trip, and currency issues. A travel agent's help with choosing the options for accommodations is extremely important, as where you stay directly affects what and how much can be done and seen. Hotels are

available on some of the islands, but this limits access to the diversity of field sites and research experiences. To maximize the opportunities for observing flora and fauna on a variety of islands, staying on a boat is the best choice. A seasoned travel agent will be able to suggest the best quality boat in your price range for your group. Our agent found us a cost-effective, budget-class boat that served us very well for the eight days we toured the archipelago.

*Student recruitment and preparation:*

Recruitment for this course began at the earliest point during the fall semester of the academic year in which we offered the course; it was limited to the undergraduates at our institution. Registration was open to all matriculated students; however, we had mostly juniors, with a few seniors and sophomores. Of these 14 students, only four were non-science majors. Given the expense of this kind of trip, it was important to advertise it at this time to give interested students ample time to work out their finances and place a deposit for the course. Because of the small size of the boat we chose, only 14 students could be accommodated. This definitely worked in our favor, as it created a sense of urgency for students to act before it was too late.

Enrollment in the course was contingent upon submission of a completed application packet, a copy of a valid passport, a deposit for the course (and, eventually, full payment for it), and participation in an interview with both instructors. The pre-class interview was vital as a screening mechanism; field-work in an isolated area requires good health, judgment, positive attitude, flexibility, and independence. In other words, field courses demand emotional intelligence (Ornstein and Nelson, 2006), and it behooves instructors planning on taking students abroad to evaluate the students on factors such as experience with foreign travel, managing stress, coping with adversity, etc. A list of questions that were posed to students can be found in Table 3. The interview also gave us an opportunity to convey information about course requirements and expectations so that students did not equate this

**Table 3.** Questions to ask students in a pre-trip interview.

Travel History	<ul style="list-style-type: none"> <li>• What is your travel experience to date?</li> <li>• In terms of foreign travel, what countries have you visited and for how long?</li> <li>• What's the longest flight you've ever been on and what was that like for you?</li> <li>• What is flying like for you? Do you have any fear of it?</li> <li>• Have you ever lived in tight quarters? What has that been like?</li> </ul>
Motivation to Try New Things	<ul style="list-style-type: none"> <li>• How well do you like sleeping in unfamiliar places?</li> <li>• How well do you like eating different foods?</li> </ul>
Self-Awareness	<ul style="list-style-type: none"> <li>• How would you describe yourself as a student? How would others like your friends and professors describe you?</li> <li>• How would you describe yourself as a person? How would your friends describe you as a person?</li> <li>• What would you say is your "comfort zone?" How willing are you to leave it?</li> <li>• What kinds of things about others irritate you?</li> <li>• What sorts of things stress you out?</li> <li>• What kind of a roommate would you say you are? What kind of a roommate are you when you travel?</li> <li>• What kinds of roommates would you travel best with?</li> </ul>
Coping	<ul style="list-style-type: none"> <li>• What do you do to cope with stress?</li> <li>• How do you help others cope with stress?</li> <li>• What do you do when someone has done something to offend you?</li> <li>• What do you when you have roommate problems?</li> <li>• How do you function when you have not had enough sleep?</li> <li>• How do you cope when you are separated from friends and family?</li> <li>• How do you cope with feelings of loneliness?</li> </ul>
Health History	<ul style="list-style-type: none"> <li>• What are the recent immunizations you have had?</li> <li>• What special health concerns do you have?</li> <li>• What dietary restrictions do you have?</li> <li>• Do you have any problems with regard to breathing?</li> <li>• What medications are you taking and for which conditions?</li> <li>• What allergies do you have?</li> <li>• Are you prone to sunburn or sun poisoning?</li> <li>• Do you get seasick?</li> <li>• Do you have any problems with stamina, heat, or walking distances for periods of time?</li> </ul>

experience with a vacation, but rather expected a rigorous science course. Fortunately, all students successfully met basic requirements for this course. However, severe physical and behavioral health issues would have precluded students from participating in this course. The Office of Academic Affairs requires a health screening to be completed at the campus Health Center before students receive travel clearance.

### **EXCURSION AND FIELD WORK ABROAD**

We arrived in Quito very late during the first day of the trip. It was the start of the rainy season. Therefore, rather than depart for the Galápagos Islands immediately and run the risk of being stuck at the airport due to weather related delays, a full day touring Quito and the western Andes was recommended by our travel agent. This was an excellent idea; it gave students the opportunity to experience the culture and ecology of part of Ecuador, allowing a comparison with the Galápagos Islands. Highlights of the day tour included standing on the equator, visiting one of only two inhabited calderas in the world, touring beautiful cathedrals and churches, and sampling the local delicacy, cuy (guinea pig).

The following day, we departed for the Galápagos Islands. The National Park services oversee all tours to the islands, but this does not mean that all itineraries are identical. Our port of arrival in the Galápagos Islands was Baltra; however, we soon took the ferry across to the central island Santa Cruz where we boarded a bus for the southern town of Puerto Ayora. This ride is an excellent way to facilitate a discussion of the vegetation zones of the islands, as it takes individuals through most of them. As soon as the luggage was loaded onto the boat and introductions were exchanged between our group, the boat's crew, and the guide, we immediately embarked on an excursion during which we scrambled through a lava tube, and observed giant tortoises and a variety of finch species.

Every day on the islands felt like three: multiple activities and excursions were planned from sunup to sundown. A typical day started with a pre-breakfast hike, followed by another hike or snorkel. Often the boat would move to another location while we had lunch, and the afternoon was spent either on land or snorkeling once again. Evenings were spent writing up field notes and planning for the next day. Given this pace, we now understand why most of the tours offered were only eight days long.

It did not seem possible, but each day on the islands was more extraordinary than the previous one. This is because the opportunity to observe animals in close proximity is unparalleled, despite the constraint of needing to stay on a well-defined path with a naturalist guide present at all times. Mating and nesting behavior of seabirds were easily observed on many islands and included blue-footed boobies, waved albatross, and frigate birds. Land and marine iguanas were abundant, as well as the smaller lava lizards. The diversity of finch species was outstanding, but required a more careful eye to observe at times. In the water, highlights included snorkeling with penguins, sea lions, green sea turtles, hawksbill sea turtles, large stingrays, and countless, colorful reef fish. We are grateful for seeing all of this magnificent wildlife; however, the giant tortoises, which are emblematic of the islands, truly brought us back to the time of Darwin's journey. The tortoises were mainly found in places like the Giant Tortoise Breeding Center on Isla Isabella or the Charles Darwin Research Center on Santa Cruz. The students learned a great deal about natural history of tortoises at these sites, and the conservation efforts that surround the preservation of these magnificent animals.

Field guides and, to a greater extent, our naturalist gave us a good idea of what flora and fauna we would be seeing with each excursion. Even so, field observations of animals tended to be serendipitous. Despite having to stay on predetermined trails and having limited time at any one site, students were successful during data collection because they had designed their research proposals with this in mind. Moreover, these circumstances helped our students cultivate the skills of field researchers, instilling in them the need to be

resourceful and flexible, which they were. Student project topics for the 2009 class are in Table 4. As can be seen, science majors' projects were very similar to those designed by non-science majors.

Species that were not chosen for observation but were observable and abundant enough to have made good study subjects included: Nazca boobies (*Sula granti*), Galápagos mockingbirds (*Nesomimus parvulus*), magnificent frigatebirds (*Fregata magnificens*), great frigatebirds (*F. minor*), brown pelicans (*Pelecanus occidentalis*), large-ground finch (*Geospiza magnirostris*), and the cactus finch, (*Geospiza scandens*). Tropical fish species also are excellent possible research subjects.

After our 8-day tour of the Galápagos Islands, we returned to Quito, stayed the night, and returned to campus the following day. Students spent the final week writing and revising their research papers and presenting their results to the class. As a group, they also created a Power Point and video presentation that was open to the campus community that highlighted their adventure and shared their research.

#### COURSE OUTCOMES

By the end of the course all students completed an original research study based on a testable hypothesis that involved fieldwork. Science majors and non-science majors alike developed and demonstrated skills in field biology and critical thinking. Moreover, they were able to integrate elements of evolutionary theory in a meaningful way into their projects, thereby demonstrating an understanding of and an appreciation for Darwin's contributions to science.

Every student who participated in this course found it necessary to modify his or her original research proposal in some way. For example, an

**Table 4.** Projects conducted during the course, "In Darwin's Footsteps" in the Galápagos Islands, spring 2009.

Project Title	Student major
Galápagos sea lion ( <i>Zalophus wollebacki</i> ) colony size on rocky vs. sandy shores	Sociology and Anthropology
Galápagos tortoise ( <i>Geochelone</i> spp.) feeding on vegetation of different heights	Biology
Mother-pup interactions in Galápagos sea lions ( <i>Z. wollebacki</i> )	Biology
Blue-footed booby ( <i>Sula nebouxii</i> ) and waved albatross ( <i>Phoebastria irrorata</i> ) courtship patterns	Sociology and Anthropology
Galápagos penguin ( <i>Sphensicus mendiculus</i> ) and Galápagos sea lion ( <i>Z. wollebacki</i> ) distributions	Biochemistry
Lava lizard ( <i>Microlophus</i> spp.) head bobbing behavior	Biology
Galápagos penguin ( <i>S. mendiculus</i> ) locomotion frequency	Biology
Sally Lightfoot crab ( <i>Grapsus grapsus</i> ) locomotion	Business Administration
Basking site choice in marine iguana ( <i>Amblyrhynchus cristatus</i> )	Biology
Blue-footed booby ( <i>S. nebouxii</i> ) diving angle	Biology
Galápagos sea lion ( <i>Z. wollebacki</i> ) vocalizations	Psychology
Color variation in Sally Lightfoot crabs ( <i>G. grapsus</i> )	Biology
Basking behavior in marine ( <i>Amblyrhynchus cristatus</i> ) vs. land iguanas ( <i>Conolophus subcristatus</i> )	Biochemistry
Lava lizard ( <i>Microlophus</i> spp.) vigilance in habitats with varying levels of vegetation	Biology

important aspect of the students' proposals was recognizing that their research was contingent on a number of factors (e.g., weather, opportunity to observe that particular animal, breeding season constraints, etc.), and was subject to change. Case in point: one student wanted to compare behavior of two seabirds, specifically the red-footed booby and the blue-footed booby. However, after we arrived in the Galápagos Islands, we learned that the island where the red-footed booby resides was not on our itinerary. Moreover, they are not very abundant even in that habitat. Thus, conducting research in the field in this course gave the students a genuine taste of scientific fieldwork in animal behavior that cultivated in them an appreciation of the need to be flexible as researchers and that helped them figure out how to recover when things do not go as planned. This piece of learning went above and beyond the formal course objectives, and it proved to be particularly beneficial for the science majors' career development.

Happily, all participants in this course said it was the experience of a lifetime. In both formal and informal evaluations, students expressed gratitude for the opportunity to study science in this unique setting and were proud of the work they did. They recognized how arduous field work often is and gained a new respect for it. As such, all students remarked, "I can't believe how much I've learned."

## DISCUSSION

Clearly, travel courses such as this have many payoffs, some of which may not even be anticipated. However, they require much planning (McLaughlin and Johnson, 2006; Stanitski and Fuelhart, 2003; Zervanos and McLaughlin, 2003). Often, the instructor is the person who has ultimate responsibility for every aspect of the course from the planning to its delivery at home and abroad. This is why coordination among the administration of your institution, your department, and the agencies that are helping arrange your trip logistics is essential. Moreover, given the many details that come with even a shorter-term travel course, it is necessary to begin the planning process as much as a year in advance of its delivery. Therefore, it is unwise to wait until the beginning of the academic year to start planning.

If your field site is as remote as the Galápagos Islands, the benefit of having two faculty members is great; therefore, team-teaching is recommended. This becomes most apparent in the case of an emergency, but on a day-to-day basis, it is very helpful to share all responsibilities, especially managing students around the clock while abroad. In short, a collaboration between colleagues that is balanced reduces the effort and stress involved in planning and executing a travel course. As we have found, similar philosophy of teaching and compatible

personalities are the essential components to making this team-teaching approach work.

In terms of students, we found that fieldwork conducted abroad combined with a project far surpassed any reading materials or classroom lecture in terms of conveying scientific concepts and applying research methods. This echoes the findings of others (e.g., McLaughlin and Johnson, 2006; Zervanos and McLaughlin, 2003). We discovered that having students keep a journal of field notes was an excellent way to teach them techniques of data collection used by professional biologists (Stanitski and Fuelhart, 2003). Additionally, it helped students preserve their experiences not only for the purposes of a research project, but potentially for the rest of their lives. Finally, the tight quarters, nearly constant activity, and research setbacks that occurred proved to be useful for challenging students' coping abilities. This was an added and somewhat unexpected benefit of this course. Consequently, this learning experience gave them a very real sense of the rigors of field research in graduate school and beyond. However, not only did the science majors reap the benefits of this course; the non-science majors were truly grateful for the experience as well. One does not need to plan a course such as this one solely for science majors, which is what other authors have suggested (see McLaughlin and Johnson, 2006; Stanitski and Fuelhart, 2003; Zervanos and McLaughlin, 2003). In fact, this course illustrates how well science can be delivered to individuals who may have been avoiding the sciences. In fact, half of the non-science majors performed as well as or better than the science majors on their papers, exams, and projects. Multiple factors (e.g., writing ability, study habits) influenced the final grades earned by the non-science majors. In addition, future offerings of this course should include an assessment of the application of experimental design for both science majors and non-science majors. This can easily be accomplished with a modified version of the EDAT (Experimental Design Ability Test) (Sirum and Humburg, 2011).

In summary, creating and teaching "In Darwin's Footsteps" was a highly satisfying and stimulating experience. The course exceeded our expectations and those of our students; each day was better than the one before it. Learning science in this breathtaking environment was worth all the effort, so much so that we will offer this course again. We encourage other faculty to think of doing the same.

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## REFERENCES

- BODYCOTT, P., AND WALKER, A. 2000. Teaching abroad: Lessons learned about inter-cultural understanding for teachers in higher education. *Teaching in Higher Education* 5(1): 79-94.
- DARWIN, C. AND JONES, S. 2001. *The Voyage of the Beagle: Journal of Researches into the Natural History and Geology of the Countries Visited During the Voyage of H.M.S. Beagle Round the World*. Modern Library. 496p.
- DRUMMOND, D. 2001. Travel abroad: A sine qua non for geography teachers. *Journal of Geography* 100: 174-175.
- MARCUM, J., AND ROOCHNIK, J. 2001. What direction for study abroad? 2 views. *The Chronicle of Higher Education* 47(36): B7.
- MARTIN, P. AND BATESON, P. 2007. *Measuring Behaviour: An Introductory Guide*. Cambridge University Press. 187p.
- MCLAUGHLIN, J.S., AND JOHNSON, D.K. 2006. Assessing the field course experiential learning model: Transforming collegiate short-term study abroad experiences into rich learning environments. *The Interdisciplinary Journal of Study Abroad* 13: 65-85.
- ORNSTEIN, S. AND NELSON, T. 2006. Incorporating emotional intelligence competency building into the preparation and delivery of international travel courses. *Innovations in Education and Teaching International* 43(1): 41-55.
- SIRUM, K., AND HUMBURG, J. 2011. The Experimental Design Ability Test (EDAT). *Bioscene: Journal of College Biology Teaching* 37: 8-16.
- STANITSKI, D., AND FUELHART, K. 2003. Tools for developing short-term study abroad classes for geography students. *The Journal of Geography* 102(5): 202-215.
- WEINER, J. 1995. *The Beak of the Finch*. Vintage books. 352p.
- WUBBELS, G.G., AND GIRGUS, J.S. 1997. The natural sciences and mathematics. In Gaff, J.G., and J.L. Ratcliff. 1997. *Handbook of the Undergraduate Curriculum*. San Francisco, Jossey-Bass. 747p.
- ZERVANOS, S.M., AND MCLAUGHLIN, J.S. 2003. Teaching biodiversity through travel course experiences. *The American Biology Teacher* 65(9): 683-688.