

Ocean Leader Initiative

Initiative Objectives

Ocean Discovery Institute verifies the success its programs based on the outcomes of quantitative and qualitative evaluation led by Roxanne Ruzic, Ed.D., a contracted specialist in educational research. Dr. Ruzic received her doctorate in education from Harvard University. She is an education and research consultant and teaches graduate level courses in research methods for Chapman University.

This report includes evaluation results from the Ocean Leader Initiative, a series of after-school and summer programs provided in conjunction with support services to students in middle school through college. The results provided here include tracking information gathered from high school and college student participants in the 2008-2009 academic year. The tracking information is gathered from school records, student surveys and students interviews to follow participation and progress in the areas of academics, college preparation and attainment, major selection, extracurricular involvement, and awards and acknowledgments. In addition, program participants participate in science tests administered to assess content knowledge and understanding and surveys and interviews measuring attitudinal and behavioral changes. This evaluation is in progress and the final assessment of program objectives will be provided in our final evaluation report, which will be sent in January 2010.

Each outcome as described in the grant application is listed with progress towards each recorded below.

Goal: Increased interest and participation in the sciences among individuals from underserved communities

Outcomes:

- 44 Ocean Discovery Institute students participated in 13,924 hours of science instruction through Ocean Discovery Institute.
- 25 high school students participated in 3,986 hours of authentic scientific research.
- 15 high school students presented their research findings to outside audiences through scientific presentations.
- 32 students participated in at least one or more science-related program/internship each during the 2008-2009 academic year.
- Students participated in pre-program interviews and surveys to measure interest in the sciences. Post evaluation will take place in August 2009.

Goal: Performance & persistence in science by students from underserved communities

Outcomes:

- Students participated in pre-program science content assessments and interviews to assess performance in science. Post-program evaluation will take place in August 2009.

Goal: Pursuit of science degrees in college by students of diverse backgrounds

Outcomes:

- 86% of students that have declared a major have done so in the sciences.

Goal: Knowledge & understanding of environmental issues among students of diverse backgrounds

Outcomes:

- Students participated in pre-program interviews and surveys to measure knowledge and understanding of environmental issues. Post evaluation will take place in August 2009.

Goal: Interest & engagement with the natural world among students from urban communities

Outcomes:

- 54 Ocean Discovery Institute students participated in 5,400 hours of field experiences in natural settings.
- Students participated in pre-program interviews and surveys to measure interest in the natural world. Post evaluation will take place in August 2009.

Goal: Diversity among those who support and act for the benefit of the environment

Outcomes:

- 43 Ocean Discovery Institute students participated in over 1,290 hours of environmental service with Ocean Discovery Institute during the 2008-2009 academic year.

Goal: College attendance & persistence among students from underserved communities

Outcomes:

- 25 high school students participated in 751 hours of college readiness instruction.
- 22 students participated in 4 college visits to 8 different colleges and universities through local, regional, and national college visits.
- 75% of high school students increased their grade point average since starting Ocean Discovery Institute programs.
- 100% of Ocean Discovery Institute 2009 high school graduates are continuing on to further education. 88% will be attending a four year college.
- 2009 student graduates will be attending: San Diego State University, University of California Los Angeles, University of California Santa Barbara and University of California San Diego.
- 94.7% of students who enrolled in college persisted past their first year.

Initiative Narratives

The *intensive after-school and summer programs* are comprised of several programs that build knowledge of science, facilitate exploration of scientific careers and encourage students to pursue higher education. These programs act as building blocks and follow students from 5th through college, to ensure students build leadership skills and have the opportunity to pursue a career in the sciences. The programs focus on young people from City Heights - a high-poverty, traditionally underserved community in central San Diego, California.



SEA SEMESTER: Intensive, After-School Program

From August 2008 through June 2009, **10 sixth grade students** from Monroe Clark Middle School and **three mentors from the associated high school, Hoover High School**, participated in Ocean Discovery Institute' *SEA Semester* intensive, after-school program. **Each student participated in over 120 hours of marine science lab and field based activities** focused on the California kelp forest.

Concentrated Study of the Kelp Forest

The *SEA Semester* students met three days per week after school and on weekends to study the kelp forest through lab and field activities; from the life cycles of invertebrates to the ways humans can negatively impact this important habitat. Students explored scientific concepts in the lab and experienced them in the field. Students were taught how to sample and collect data, run experiments, dissect marine animals, snorkel to explore the marine ecosystem first hand, and perform field research in partnership with local universities. In addition, mentors met weekly with program personnel to prepare for their role in activities and improve their leadership skills.

Exploration of USC's Wrigley Institute for Environmental Studies

The *SEA Semester* program culminated with a trip to University of Southern California's Wrigley Institute for Environmental Studies on Catalina Island, where each student had the opportunity to demonstrate their new expertise in an authentic field station setting. They spent the weekend in dormitories and explored science in a structured program, using the facility's labs and ecological reserve.



SCIENCE EMPOWERING STUDENTS: After-School, Mentoring Program

The *Science Empowering Students (SES)* after-school, mentoring program continues to provide science experiences and engage the 6th through 12th grade students who have completed the SEA Semester program. Sixth and 7th grade students are mentees, 8th grade students are “mentors in training,” and 9th through 12th grade students were paired with younger students to act as mentors.

After-School Sessions

Together, **40 students (27 middle school and 12 high school students)** met weekly after-school in mentor-mentee groups and participated in lab and classroom-based, experiential learning activities. Students participated in a total of **1,260 hours of marine science education** including interacting with a variety of scientists to learn about careers in the science and conservation fields, deep sea ecology, natural history of grey whales, and geology.

Field Explorations

Each month students participated in a field exploration based on the concepts explored in the classroom, allowing them to further investigate their theme of study.

- **Biotech Industry:** Students learned about various careers in the biotech industry including product creation, conducting clinical trials, and product quality control. To better understand the work possibilities in the biotech field, the students ran gel-electrophoresis to identify DNA, looked at slides of brain tissue, and learned how to identify specific regions of the brain.
- **Engineering:** Students learned about the diversity of possible career paths in engineering and engineering concepts by designing and constructing hover crafts, water bottle rockets, and straw towers.
- **Discover SCUBA:** Students learned about the role of SCUBA in scientific research and worked with dive masters and scientists to use the equipment first hand.
- **Whale Watching:** Students participated in whale watching to see gray whales in their natural habitat and observe the behaviors they learned about in the lab.
- **Local Geology:** Students participated in a hike and rock climbing to get a closer look at San Diego’s geologic features.

At the conclusion of the program, students travelled from the Anza Borrego desert to San Diego’s coast to study the local geology. Students used knowledge gained throughout the year and scientific equipment to understand geologic clues and solve mysteries about how the earth has changed over time.



BAHÍA: Intensive, Research Program

Twenty high school students from a high poverty community in central San Diego participated in the 2008 BAHÍA intensive, research-focused education experience that in part takes place at a field site in Baja California, Mexico. The students completed **800 hours of education** beginning in San Diego, where they spent several weeks preparing for their intensive research experience. They studied science concepts, and learned to swim and snorkel to make observations of the marine environment and collect data. Following, the high school students spent five weeks living and conducting research projects alongside scientists from universities and government agencies, at a field research station located in Bahía de los Angeles (BLA) on the Sea of Cortez in Baja California, Mexico. This research makes a legitimate contribution to scientific understanding and practices.

Conservation Focused Research Projects

Through the program, **three research studies were conducted** with a team of high school students associated with each. The student research teams spent the five week time period developing project design and hypotheses, collecting data, and analyzing data. These studies were designed to advance conservation strategies for threatened marine and coastal ecosystems and species in partnership with U.S. and Mexican scientists. Following is a summary of each project and the results.

- *Oceanic Effects on Island Ecosystems: Linking Marine with Terrestrial Conservation:* In this study, we examined how ornithogenic (bird-derived) nutrients affect intertidal ecosystems. High guano input tended to increase overall faunal abundances, and had broad taxa-specific effects. These findings suggest that **seabirds are important mediators of intertidal community structure**, and have important consequences for ecology and conservation.
- *Understanding Wetland Community Structure and Connectivity: Informing Management Plans:* We examined how the presence of wetlands affects regional biodiversity. Baseline data regarding wetland community structure was collected to provide a reference to which data from future years can be compared and changes can be detected. We also **found potential ecosystem links between the desert and through food web connection**. To ensure that regional biodiversity is preserved, **we recommend conservation efforts take a regional approach and protect not only the wetland or desert ecosystem, but the adjacent ecosystems as well**.
- *Developing Strategies to Reduce Sea Turtle Bycatch in Commercial Fisheries: Informing Policies to Protect Sea Turtles:* This research project builds off of previous studies which demonstrated that visual deterrents significantly reduce sea turtle interactions with fishing gear. We tested these methods in an existing commercial gillnet fishery in BLA to determine the effect on target species. **Results indicate that net illumination could be a viable strategy** while shark shapes require further modification and study. **These strategies may later be directly applied to gillnet fisheries worldwide and may even be exported with modifications to other fisheries** to effectively reduce sea turtle captures.

Community Connections

While in BLA, students worked three days a week with community partners to implement environmental service projects. Outcomes of the projects include:

- A **marine invertebrate field guide was created** for the community and resource managers to utilize in ecotourism and education efforts. The book was made available to the public through the Museo de Cultura y Naturaleza de Bahía de los Angeles and Comisión de Áreas Naturales Protegidas (CONANP), a Mexican environmental agency that oversees protected areas.
- In partnership with the Museo de Cultura y Naturaleza de Bahía de los Angeles, students **created a bat exhibit** emphasizing this animal's important role in desert and marine ecosystems. 5,000 people visit the Museo annually and view this student created exhibit.
- Students **created a beachfront mural** near the boat launch area highlighting the marine resources found in BLA and the need for their protection.
- In partnership with CONANP, a **sea turtle activity book for primary school children was created** to educate youth about sea turtles, threats, and conservation needs.

College Preparation, Career Exploration and Personal Growth

The program also incorporated:

- College preparation classes focusing on achieving success in high school, choosing a college, financing college, and applying to college.
- Lectures by visiting scientists (i.e. molecular biologist, bat researcher, natural resources manager, and local conservation groups).
- Field trips that included snorkeling to compare habitats in San Diego and Baja California, investigating the biodiversity of the Sea of Cortez, and learning about sustainable fishing practices.
- Completion of journal entries and personal reflections.
- Student led discussions based on scientific and conservation articles.

Research Dissemination

Students disseminated their research findings at an annual event held at the University of San Diego as well as national and international professional meetings. These include:

- Results from the bycatch reduction research were presented at the **American Fisheries Society in Ottawa, Canada** in August 2008. We chaired a symposium entitled, "Innovative Approaches to Bycatch Reduction" in which staff and students presented their findings from the bycatch reduction research.
- Students presented the results of the wetland biodiversity study at the **Restore America's Estuaries Conference in Providence, Rhode Island** in October 2008.
- Students presented the results of the island ecosystem research at the **Benthic Ecology Meeting in Corpus Christi, Texas** in March 2009.
- Data was provided to non-profit and government organizations such as CONANP and Pronatura, and environmental non-governmental organization in Mexico, to utilize in their conservation efforts.



Support Services

In addition to programming, students were provided with a series of academic and non-academic supports and services that attend to the whole person and help to ensure their progress towards post-secondary education and a career in the sciences. Because students of color from low-socioeconomic status communities face several barriers to access continued education, a support structure to address the challenges is provided. Upon intake, every student was assigned to a case manager and their grades, participation in internships, etc. were tracked. The following table highlights our areas of focus, as well as the activities that have been provided during this reporting period.

<p>Academic Support</p>	<ul style="list-style-type: none"> • Academic meetings have been held with 44 students and families, and together contracts were created to identify how students can reach their goals with the support of their family, school, and Ocean Discovery Institute. • Grades and academic progress for 44 students were monitored to ensure they are on track to graduate high school and meet college admissions requirements. • A meeting was held with middle school parents and students as an introduction to the academic planning process and to teach them about what they can do to develop habits to be successful in school.
<p>College Preparation</p>	<ul style="list-style-type: none"> • Eleven students participated in a Northern California college tour to visit universities and lab research facilities including University of California, Berkeley and University of California, Davis. • Eight high school seniors completed one-on-one monthly senior meetings to ensure they were prepared for graduation and the college application process. • Four ninth grade students participated in a local college trip to learn about different types of colleges. • Over 35 students and family members participated in a College Family Workshop focused on financing and applying to college. The workshop was held on campus and in partnership with University of California, San Diego's Academic Connections. • Over 30 students and family members participated in a College Family Workshop focused on choosing where to apply to college held on campus and in partnership with University of San Diego. • Six high school seniors participated in a college selection series where they compared college and financial aid packages to help them select the college they will attend in the fall.
<p>Career Exploration</p>	<ul style="list-style-type: none"> • Twenty students were mentored by a scientist during the intensive, research program. • Nineteen students completed leadership training to gain skills needed during internships. • Five students participated in an internship led by Dr. Theresa Talley

	<p>and in partnership with Tijuana River National Estuarine Research Reserve to research the effectiveness of several common restoration practices.</p> <ul style="list-style-type: none"> • Five students began a Canyon Community Connections internship to improve the ecological health of a City Heights canyon and increase access and benefit for the community. • Twelve students became mentors in Ocean Discovery Institute’s <i>Science Empowering Students</i> after-school, mentoring program. • Two students participated in Sierra Club’s national environmental justice training in Oregon in which they learned how to manage an effective environmental campaign. • Two students participated in a lab-based summer internship at Scripps Institution of Oceanography. • Two students participated in Hampton University’s MAST (Multicultural students at sea together) program, spending 4 weeks under sail, studying marine science, policy, and cultural heritage. • Forty-five students participated in a <i>Nature Art Seminar</i> to learn how art and science are utilized in various careers. They heard from professionals in the field and participated in activities in the areas of scientific illustration, nature photography, and writing. • Twenty-five students participated in a career exploration day at Life Technologies where they learned about the biotech industry, heard from a panel of speakers, completed a lab, and toured the facility.
<p>Crisis Prevention & Response</p>	<ul style="list-style-type: none"> • Twenty-seven students became mentees in Ocean Discovery Institute’s <i>Science Empowering Students</i> after-school, mentoring program. • Program staff received ongoing training and emergency assistance from psychological and social service experts to best support students. • In partnership with clinical psychologist Dr. Carlos Nelson, students received access to mental health and social service resources.

Initiative Enhancements

Using evaluation results and information from student tracking, we enhanced the initiative through the following revisions.

- Academic success supports were expanded to reach middle school students. As a part of this expansion, all middle school students and families participated in an academic planning meeting to discuss grade improvement strategies. Eighth grade students and families participated in meetings to better understand the transition to high school and for guidance in selecting courses. Relationships and regular meetings were established with school administrators to determine

existing supports available for students and assess the areas where additional academic support services are needed.

- A series of fellowships were established to give college students who are program alumni opportunities to expand their knowledge and interest in the science and environmental fields while gaining leadership skills. In addition, the fellowships incorporate career exploration including informational interviews and professional development.
- A partnership was established with the City Heights Educational Collaborative (a collaboration between San Diego State University, San Diego Unified School District, and a foundation) to provide professional development and technical support in the areas of student tracking, case management, and program evaluation. Through this partnership, we are gaining access to student data from their schools, setting up systems to best analyze this data, and receiving comparison data regularly.