The Pacific Center for Environmental Studies
Human Impacts and Hawaiʻi’s Coral Reef Health:
An Environmental Science Education, Stewardship and Research Program
for
High School Juniors and Seniors in Hawaiʻi

Annual Progress Report
June 1, 2011 – March 31, 2012

A Project of

The Pacific Center for Environmental Studies
Department of Natural Sciences
Windward Community College
University of Hawaiʻi

In partnership with

The Hawaiʻi Institute of Marine Biology
School of Ocean and Earth Sciences and Technology
University of Hawaiʻi

Principal Investigator
David A. Krupp
Faculty Coordinator
The Pacific Center for Environmental Studies

Co-Principal Investigator
Malia Rivera
Educational Specialist
The Hawaiʻi Institute of Marine Biology

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The Pacific Center for Environmental Studies

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1. Organization
Windward Community College Pacific Center for Environmental Studies (PaCES) in partnership with the Hawai‘i Institute of Marine Biology, School of Ocean and Earth Sciences and Technology

2. Project Title
Human Impacts and Hawai‘i’s Coral Reef Health:
An Environmental Science Education, Stewardship and Research Program for High School Juniors and Seniors in Hawai‘i

3. Award Number
Harold K.L. Castle Grant #3035

4. Report Period
01 June 2011 – 31 March 2012
In Memory of Rachel Clute

PaCES-HIMB Summer Program 2011
5. Introduction

During the summer of 2011, the Windward Community College’s (WCC) Pacific Center for Environmental Studies (PaCES), in partnership with the Hawai‘i Institute of Marine Biology (HIMB), conducted a college-level summer experience in environmental science education and research for high school juniors and seniors in Hawai‘i as it has since the summer of 2005. Through this intensive six-week summer program, we broadened students’ understanding of the Kāne‘ohe Bay area watershed and coral reef ecosystem, introduced them to pioneering scientific research areas, added to their knowledge of current scientific methodology, research techniques, and scientific tools, and encouraged environmental stewardship. Embracing the theme that human beings are part of the ecosystem, not separate from it, students learned these concepts and methods in the context of traditional and modern resource management practices. Students were also exposed to the HIMB faculty and state-of-the-art research facilities, and the modern laboratory facilities of the PaCES which supports environmental education and research at WCC.

6. Project Overview

Our summer program for high school students was initiated during the summer of 2005 as the PaCES/B-WET Summer Environmental Science Program for High School Students. The initial funding came from two sources, a Harold K.L. Castle Foundation grant to WCC’s Pacific Center for Environmental Studies and a National Oceanic and Atmospheric Administration (NOAA) Bay Watershed Education and Training (B-WET) grant to HIMB (Dr. Jo-Ann Leong, P.I., and Mr. Manning Taite, Co-P.I.). More recently, our funding has come from the following organizations: Harold K.L. Castle Foundation, Minami Community Foundation, Ameron Hawai‘i, Inc., Cultural Surveys Hawai‘i, Quady Foundation and several private donor (Appendix I).

As has happened since the program’s inception in 2005, most of the lectures, laboratory work, and outdoor activities took place in the Kāne‘ohe Bay area in the Ko‘olaul Positioned in the windward O‘ahu. This area is predominantly rural with forest reserves and agriculture and includes taro farms, cattle ranches, nurseries, horse stables, and other rural economic activities. Only one-fourth of the area is considered urbanized.\(^1\) Kāne‘ohe Bay itself is unique in that it is the only mature barrier reef and lagoon system in the main Hawaiian Islands.\(^2\) The Kāne‘ohe Bay watershed is divided into nine ʻahupua‘a, eight of which are associated with major streams entering the Bay. Receiving substantial freshwater input from this watershed, the Bay not only exhibits a semi-estuarine character, but is also under direct influence of human land-based activities. Yet, in spite of this input, Kāne‘ohe Bay is home to some of the most beautiful and productive shallow reefs in the Hawaiian Islands. As a result, Kāne‘ohe Bay is subject to intense

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recreational and commercial use by divers, fishers, boaters, and thrillcraft users\(^3\). In addition, the United States Marine Corps conducts training activities in the Bay. Unfortunately, these diverse uses of the Bay’s resources often lead to negative reef impacts and user conflicts. Kāne‘ohe Bay is also the home of HIMB, an important marine science education and research resource. Kāne‘ohe Bay was an ideal setting in which to deliver an environmental literacy training program for Hawai‘i’s high school students.

- As has been done since we began in 2005, the program utilized an integrated mix of conventional lectures, hands-on laboratory exercises, outdoor field exercises, field trips, research projects, and stewardship activities.
  - We made an intentional connection to the ahupua‘a by providing science-based lectures, laboratories, field trips and research expeditions in the Kāne‘ohe Bay watershed and coral reef environment. These experiences were selected to enhance the students’ understanding of environmental sciences, emphasize the linkage between the land and its adjacent marine environment with a particular emphasis on coral reefs, and promote stewardship and sustainability.
  - The outdoor field experiences were an integral part of the instructional program and were generally preceded by relevant lectures. Lab sessions were scheduled to allow students to process, analyze, and evaluate data samples. For example, a lecture on Hawai‘i’s climate was followed by a field activity that involved using instrumentation (e.g., environmeters and GPS units) to collect climate data (e.g., temperature, humidity, wind speed, light, etc.) at specific locations. Back at the lab, the data were processed using statistical analysis software. As another example, a lecture on coral disease would be followed by a field activity that involved surveying the reef for the incidence of disease and collecting samples for identification of potential pathogens using molecular techniques in the laboratory.
  - The outdoor field experiences gave the students project-oriented, hands-on, and investigative experiences. Each expedition had a specific focus and the objectives and expected outcomes of each expedition were explained clearly to the students during the lecture sessions.
  - The experiences were part of a sustained activity as explained in our Action Plan Outline (see below).
  - The curriculum involved an integrated, multidisciplinary learning approach where hands-on experiences in the field and in the lab were as important as the lectures in providing relevant historical, cultural, and scientific information.
  - The training program engaged students in environmental science with an emphasis on promoting environmental literacy.
  - Students developed group research projects that engaged them in the process of scientific inquiry applying the concepts and tools they learned through the lectures, laboratory exercises, field exercises, and field trips.

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The students took part in several stewardship/service projects such as Hawaiian fishpond restoration, native habitat restoration, and mentoring others.

- The project involved external sharing and communication.
  - Students engaged in external projects with our community partners. The projects included the clearing of mangroves, alien seaweed eradication, coral reef assessment, and Hawaiian fishpond restoration in collaboration with other groups.
  - Students shared the results of their research projects in formal written reports and public oral presentations at a closing symposium to which the community was invited.

- The project demonstrated partnerships.
  - We worked collaboratively with high schools on O‘ahu. To reach the significant proportion of communities with underserved and underrepresented student populations, Title I schools, especially Windward O‘ahu schools, were specifically targeted by this project.
  - Private organizations, including Waikalua Loko Fishpond Preservation Society, ‘Ahahui Mālama I Ka Lōkahi, NALU Studies and Reef Check Hawai‘i were brought in as participating partners.

- The experiences were for all high school juniors and seniors.
  - Students from all Hawai‘i high schools were encouraged to apply. However, we targeted Title I schools located on the Windward side of O‘ahu.
  - A significant percentage (56%) of the students were of Hawaiian or Pacific Islander ancestry.

7. Project Purpose

The long-term sustainability of our islands requires the creation of knowledgeable stewards who are committed to malama i ka honua (“caring for the world”), fostering the concept that we are integral components of a balanced ecosystem (both locally and globally). Thus the rationale for developing a program for high school students was that training students in environmental sciences would create a body of stewards who would pass on their knowledge and experience to their peers, promoting environmental literacy and ensuring the future stewardship of Hawai‘i’s coastal environment, especially its coral reefs.

The ahupua‘a of the Windward side of O‘ahu in Hawai‘i have been carefully maintained for many generations and are now facing severe challenges as the population steadily increases. Our children are destined to inherit the ahupua‘a. Stewardship is the key to maintaining the Kāne‘ohe Bay ecosystem. A deeper understanding of our Hawaiian culture and history and a solid scientific knowledge base are critical to addressing our future environmental challenges.

Furthermore, science education in Hawai‘i will be even more successful if we can establish a seamless educational experience from grade school through higher education. Currently, very
few students graduating from Hawai`i public schools enter the environmental sciences at the college level. Establishing a network among the high schools, WCC PaCES, in partnership with HIMB, is encouraging this learning progression.

Our specific program objectives were as follows:

- To provide Hawai`i high school juniors and seniors with an understanding of: (a) the integration between the watershed and the adjacent coral reef environment; (b) the influence of human activities in the watershed and the coastal environment on the health of Hawai`i’s coral reefs; (c) the roles of traditional and modern resource utilization and management practices on reef health and (d) the scientific method and process of research investigation.
- To increase the number of high school students who have the opportunity to participate in college-level environmental science education and research.
- To increase the number of students who decide to enroll in baccalaureate programs in environmental science or other related sciences.
- To create a cadre of stewards who will understand and promote sustainable natural resource utilization practices and environmental literacy.
- To provide students with competency in using a variety of environmental science instrumentation and data acquisition/analysis methods both in the laboratory and the field.
- To help students develop competency in the scientific process by having them develop and implement an environmental science research project.
- To provide students with competency in scientific communication by having them write formal research reports and make oral presentations.
- To promote leadership and collaboration skills by having the students work together in groups.
- To expose students to leading edge research areas at the Hawai`i Institute of Marine Biology (HIMB).
- To familiarize students with the WCC Pacific Center for Environmental Studies (PaCES) programs and the modern, fully-equipped facilities available for biological, marine, earth and space sciences, and its special emphasis on environmental monitoring and stewardship.

We achieved these objectives by presenting an integrated sequence of lectures, laboratory exercises, field exercises, field trips, and stewardship activities. In addition, students developed and reported on group research projects.
8. General Action Plan

Program Marketing and Student Recruitment

Planning and preliminary preparation took place beginning in September. We started to market the program in November and began the application and selection process in January. This marketing involved visiting schools, talking to teachers, email and utilization of a website (http://www.wcc.hawaii.edu/paces/highschoolprg.html) that included downloadable application forms. While we specifically targeted high school students from Title I schools from Windward O‘ahu, we did not exclude students from other schools.

For summer 2011, we recruited 15 students from Hawai‘i high schools and one local-born student attending a high school in Oregon. Five of these students were students who participated in the previous year’s program. These five students mentored the 11 other students selected for the program. Normally, we try to recruit 18 new student and six returning student mentors (24 total). But fewer students expressed an interest in participating in the summer 2011 program despite recruitment efforts.

We believe a reason fewer students expressed an interest may have been related to the depressed national economy. We believe potential students may have preferred to seek summer employment opportunities rather than participating in our summer program. Normally we advertise that participating students receive tuition-free college credit and a small stipend or scholarship. This stipend is offered to offset some of the income loss experienced by the students who often work at jobs during the summer. However, due to uncertain budgetary considerations, we did not advertise upfront that each student might receive a stipend - we hoped that the opportunity to earn tuition-free college credits would be sufficient to attract students to the program.

In the end, we were able to provide a $500 stipend to each student a $750 to each student mentor. The students also received college credit as BIOL 124 (Environment and Ecology) and BIOL 124 (Environment and Ecology Laboratory). The student mentors each received three credits of independent study.

Student Selection

The selection process involved submission of a formal written application, an essay describing the importance of conserving and managing our natural resources and how the student would benefit by participating in the program, one letter of recommendation from a teacher, and one letter of recommendation from a community member. After an initial screening, prospective participants were interviewed, first, in a group interview to assess collaboration skills, leadership, and problem solving ability, and, second, in a personal interview to learn more about the applicants’ motivations and interests in the environment.
The students were selected using the following criteria: junior or senior status in the Fall 2011 semester following the summer program, motivation and interest in the environment, potential to benefit from participation in the program, and ability to work with others. While we looked at academic performance during the selection process, it was not regarded to be an important indicator of the student’s motivation and potential to benefit. Recognizing that academically-exceptional students often have a plethora of programs available to them, we wanted to provide this opportunity to students who, on the basis of academic performance, might be denied participation in special programs like this. Thus we hoped to “grab” the environmentally-motivated student who might have low confidence for the sciences and, thus, may not have considered science as a viable academic direction. Our philosophy was that through environmental education with a connection to traditional environmental culture, we could encourage these students to become engaged and enthusiastic about modern science.

Program Topics

Topics (see Appendix II) included the following: coastal processes, coral reef biology, ecology and geology, reef survey methods (nektom, benthos & substrates using various methods), coral disease identification and assessment, coral reef habitat mapping, watersheds, hydrology, water quality analyses (temperature, pH, oxidation-reduction potential, nutrient concentrations, turbidity, suspended solids, dissolved solids, conductivity, salinity, chemical pollutants, water microbiology, etc.), stream bioassessment protocols, molecular approaches to environmental research, soils, global positioning systems (GPS), remote sensing (RS), traditional Hawaiian resource management practices (ahupua‘a, fishponds, lo‘i, ethnobotany, fishing prohibitions, etc.), modern resource management issues, habitat restoration, and human environmental impacts (local versus global scale impact, pollution, destructive resource extraction practices, alien introductions, etc.). Instruction involved invited guest speakers (e.g., HIMB researchers) as well as program staff.

Environmental Science Research Project

Following about four weeks of intense lecture, lab and field work, the students defined and implemented environmental science research group projects during the last two weeks of the program. The purposes of these projects were to provide students with opportunities to (1) apply the knowledge and skills acquired through the lecture, lab and field sessions, (2) do "real" scientific research, (3) learn how work collaboratively in groups, and (4) gain competency for communicating using the “language” of environmental science.

These projects involved dividing the students into five groups, each group led by one of the student mentors. After deciding on a research question to study, each group prepared a proposal that demonstrated an understanding of the problem (citing the appropriate literature), clearly
stated the research question and the hypothesis being tested, and outlined a specific approach to testing the hypothesis.

Once the groups clearly defined their research projects, as well as the approaches to studying them, participating researchers and program staff assisted the student groups in securing the resources and additional training that needed to implement the project and interpret the results.

These projects culminated in the preparation of formal written research reports and oral presentations at our closing symposium.

Assessment of Student Learning Outcomes

The student learning outcomes for this project were as follows:

1. The student will have knowledge of how a watershed may be impacted by human activities and how this impacted watershed affects the health of the adjacent coral reef environment, from historical, cultural and scientific perspectives.
2. The student will have knowledge of the various approaches to ensuring the conservation and wise management of natural resources.
3. The student will be able to use the instrumentation and procedures needed to study the environmental characteristics of a watershed and its adjacent coral reef environment.
4. The student will be able to develop a scientific research project that addresses an environmental and/or earth science question.

Assessing the achievement of these outcomes involved several approaches including surveys or quizzes to evaluate content knowledge (Outcomes 1 & 2) and lab/field reports to evaluate lab and field skills (Outcome 3). Assessment of the ability to develop a research project (Outcome 4) involved observations made by program staff and completion of the project proposal, final report, and oral presentation. We also asked the mentors to evaluate each student’s participation in the research project (Outcome 4; see Appendix III for evaluation instrument).

Program Location and Facilities

The program utilized resources on the WCC campus where PaCES is headquartered. The WCC campus is located in the ahupua‘a of Kāne‘ohe at the base of the Ko‘olau mountain range, several miles inland from Moku o Lo‘e. With WCC’s well-equipped laboratories (e.g., Hoa‘aina GIS/RS center, Water Quality Laboratory, Cell and Molecular Lab, Oceanography Lab), environmental analysis instruments (water sampling devices, sediment corer, variety of water quality field instruments, GPS units, nutrient analysis equipment, etc.), and distinctive faculty, PaCES is a leading center for environmental education and research programs and activities in Hawai‘i.

In addition, the program utilized facilities (classrooms, research laboratories, DNA sequencer, seawater system, boat fleet, etc.) at HIMB, which is located on Moku o Lo‘e (Coconut Island) in
the ahupua’a of He‘eia toward the south end of Kāne‘ohe Bay, O‘ahu. HIMB’s access to the coral reef environment offered unprecedented opportunities for education and research about Hawai‘i’s coral reefs and their environmental threats. Finally, HIMB researchers, having a world-class reputation, provided our students with the latest knowledge and technology for studying our reefs.

9. Participating Faculty and Researchers

Our PaCES-HIMB Summer Program was taught by a distinguished team of marine science researchers and educators. These educators included Windward Community College faculty, HIMB research faculty, and guest speakers with special expertise.

Principal Instructional Staff

Dr. David A. Krupp, Professor of Marine and Biological Sciences and Co-Director of PaCES at WCC, has had considerable experience in administering and teaching education programs in the marine and environmental sciences, most of these involving summer workshops taking advantage of HIMB-WCC collaborations. These programs have involved training younger school children, high school students, college undergraduates, graduate students, school teachers, and even college teachers. Dr. Krupp also holds an affiliate faculty position at the HIMB where he conducts research mainly on the reproductive biology of coral. While Dr. Krupp is an expert in the biology and ecology of coral reefs, he also has considerable experience instructing students in conducting water quality studies in Hawaiian streams. Dr. Krupp also exhibits considerable commitment to the Kāne‘ohe Bay environment and community. He served as HIMB’s representative on the on the Kāne‘ohe Bay Regional Council, a council that makes recommendations regarding management of the Bay to the Hawai‘i State Department of Land and Natural Resources. In addition, Dr. Krupp serves on the board of the Waikalua Loko Fishpond Preservation Society, a society devoted to restoration of Waikalua Loko, an ancient Hawaiian fishpond, and promoting education regarding traditional Hawaii resource management practices. In cooperation with the Society, this fishpond was used as a resource for some of our summer program’s educational and service activities. The Waikalua Loko Fishpond Preservation Society supported our project in this regard. Finally, Dr. Krupp serves as president of Reef Check Hawai‘i, a non-profit organization devoted to monitoring the health of Hawai‘i’s coral reefs. Reef Check Hawai‘i offers training in coral reef ecology and monitoring. Some components of Reef Check Hawai‘i’s curriculum were adapted to our summer program.

Dr. Malia Rivera is HIMB’s Education Specialist that oversees all activities of the HIMB Education Program and manages its core staff. She is the Principal Investigator of an innovate project funded by NOAA’s Office of Education that capitalizes on HIMB’s research expertise in the building of marine science lessons for middle and high school students using Autonomous Underwater Vehicle (AUV) technology, and Co-PI for HIMB on a large effort with NOAA’s Pacific Services Center and Office of Education on a marine science curriculum development
project for grades 3-5. She is HIMB’s principal liaison for Moku o Lo‘e’s resident science magnet learning site to the Myron B. Thompson Academy charter school, and also manages all of HIMB’s informal science education that brings cutting edge marine research programs to the community and student audience, including research programs for the Northwestern Hawaiian Islands Papahānaumokuākea Marine National Monument. Dr. Rivera’s scientific background is in marine population genetics, and she will be among the cadre of HIMB’s diverse research and education personnel to access for activities related to this proposed project. The locale, laboratory and educational facilities at HIMB are well suited for hosting research related teacher activities and workshops.

Mr. Manning Taite, also a science teacher at the Kamehameha Schools and Founder of the NALU Studies program whose mission is to design and implement scientific and ecological learning experiences that help to transform the lives of Hawai‘i’s at-risk youth, provided substantial support during the research phase of the project. Mr. Taite was the original principal investigator for the initial HIMB B-WET project that collaborated with PaCES to create our summer program.

Additional Instructional Staff, Guest Lecturers and Presenters

- Greta Aeby, Hawai‘i Institute of Marine Biology, University of Hawai‘i
- Leina‘ala Bright, Hawaiian Studies, University of Hawai‘i at Mānoa
- Chuck Burrows, ‘Ahahui Mālama I Ka Lōkahi
- Carl Evensen, College of Tropical Agriculture and Human Resources, University of Hawai‘i
- Kelvin Gorospe, Hawai‘i Institute of Marine Biology, University of Hawai‘i
- Bootsie Howard, Kāko‘o ʻOiwi
- Herb Lee, Pacific American Foundation
- John Quincy Adams, Lifeguards Hawai‘i State
- Mark Heckman, Hawai‘i Institute of Marine Biology, University of Hawai‘i
- Mindy Mizobe, Hawai‘i Institute of Marine Biology, University of Hawai‘i
- Christina Runyon, Hawai‘i Institute of Marine Biology, University of Hawai‘i
- Kaimi Scudder, ‘Ahahui Mālama I Ka Lōkahi
- Krista Steinfeld, Windward Community College
- Christie Wilcox, Hawai‘i Institute of Marine Biology, University of Hawai‘i
- Erin Yafuso, Windward Community College, University of Hawai‘i
- Kyrie Yonehiro, Kāko‘o ʻOiwi

Student Teaching Assistants

- Brent Fila, Windward Community College
- Celeste Yee, University of Hawai‘i at Mānoa
Additional Supporting Organizations

‘Ahahui Mālama I Ka Lōkahi
Kāko‘o ‘Oiwi
Eyes of the Reef
Hawai‘i Red Cross
NALU Studies
Lifeguards Hawai‘i State
Pacific American Foundation
Reef Check Hawai‘i
Waikalua loko Fishpond Preservation Society

10. Accomplishments and Evaluation

The PaCES-HIMB Summer Program combined college level lectures, laboratory work, and outdoor study activities to develop an understanding of the Kāne‘ohe Bay watershed and its relationship to the coral reef ecosystem. It encouraged high school students to pursue careers in marine biology, environmental science, and related sciences, or, as a minimum, to become concerned, informed future stewards of the Kāne‘ohe Bay watershed and the surrounding Kāne‘ohe Bay marine environment.

The most significant accomplishment of the PaCES-HIMB Summer Program was the successful completion of a rigorous program of college level courses and science-based activities by all 16 students who were recruited primarily from the Windward O‘ahu high schools. The accomplishment was impressive in view of the program’s intensive schedule (Appendix II), the level of instruction, the range of academic achievement, and the diverse science backgrounds of the students. Students (including mentors) from 10 O‘ahu high schools and one mainland high school participated in the program (see below). One of the students, a Castle High School graduate attending U.H. Hilo, was accepted into the program by special request. Three of the Hawai‘i high schools were Title I schools. Four schools were within the Windward O‘ahu region, which is located on the northeast and eastern side of the island of O‘ahu. The region includes both suburban and rural areas4, where a substantial number of residents in the area are of Hawaiian or Pacific Islander ancestry5. Historically, students of Polynesian ancestry have lagged academically behind other ethnic groups in Hawai‘i’s public schools6. In the past, about half of our students were of Hawaiian ancestry. During the summer of 2011, nine of the students self-claimed Hawaiian/part-Hawaiian ancestry.

4 About the Hawaii DOE: Geographical Locations-Windward O‘ahu District Public Schools.
5 Proximity Census 2000 School District General Demographic Characteristics profile Geographic Area: Windward Administrative Area, HI.
High School Students Participants

Joelle Arakaki, Mililani High School  
Keana Chan Wa, Kaiser High School  
Rachel Clute, University of Hawai‘i Hilo  
Shae Ideue, Pearl City High School  
Jacqueline Kim, Pearl City High School  
Rachel Look, Pearl City High School  
Kamalei Lyons, Mid Pacific Institute  
Duke Orton, Kahuku High School  
Kainui Rapaport, South Eugene High School  
Sheanae Tam, Kailua High School  
Hope Whitney, Halau Ku Mana PCS

Student Mentors

Jaslynne Kauionapua Mei-Yi Chang, Castle High School  
Victoria Kaleikaumaka Davis, Kaiser High School  
Ka‘imi Kalei Kukahiwa Naone, Kalaheo High School  
Samantha Emerald Shipley, Kahuku High School  
Noelle Victoria, Castle High School

Student Research Projects

By the end of the program, all the students had planned and implemented a research program and worked collaboratively on a research team that planned and implemented a research project. These research projects indicated the breadth and depth of learning that resulted from the PaCES-HIMB program. The students presented the results of their projects to the Windward community at a public symposium at the end of the term. These research projects included the following topics:

- A comparative study of closed and open aquatic systems in the production of phytoplankton.
- A descriptive study of human impacts and urbanization upon water quality in the various ahupua‘a of Kāne‘ohe Bay.
- The effects of the Kawainui Marsh on the quality of water and *E. coli* and *Enterococcus* concentration.
- The characterization of snaps based on size and gender of the Snapping Shrimp, *Alpheus heeia*
Conceptual Knowledge and Technical Skills

As a result of their participation in the PaCES-HIMB Summer Program in Environmental Science for High School Students, the students acquired knowledge and skills of:

- Research techniques (methodology).
- Kāne‘ohe Bay watershed history, boundaries, and status.
- Ancient Hawaiian and contemporary land use practices.
- Coral reef biology, ecology, and geology.
- Coral diseases and human impacts on coral reefs.
- Climate and weather.
- Data collection, measurement, and survey methods.
- Water quality and water pollution.
- Soil formation and composition.
- Learned to use scientific equipment and computer technology to process water samples.
- Learned to perform independent research and be a member of a scientific team to plan, develop, and implement research projects.
- Learned to share their findings with the Windward community at a public symposium.

Student achievement of learning outcomes was assessed using several measures: laboratory/field assignments, regular quizzes, and completion of group research projects. Virtually every student passed both the lecture and laboratory sections of the class, most with A’s.

The Student Evaluation

The student evaluation forms were another significant indication of the program’s success. At the end of the program, we asked the students to fill out an evaluation form (see Appendix III) that included ten questions that asked the students to comment on how much they felt they learned from the program, what they learned, the appropriateness of the curriculum content, areas that were challenging or enjoyable, the student selection process, and how to improve the program. The evaluation results were similar to previous years. The comments were overwhelmingly positive. Students expressed having a better understanding of the environment and the science of biology. They were especially positive about developing their group research projects. They found the opportunity to work in groups not only challenging, but also very rewarding. They also felt that their participation prepared them better for college.

NALU Studies

One of the spin-offs of our summer programs is the use of PaCES facilities and summer program curriculum in support of NALU Studies. NALU Studies provides support for at-risk youth by engaging them in positive activities. Initially, these youth were engaged in nature activities as confidence-building alternatives to the negative engagements these youth might tend to gravitate towards. While the students were on these activities, they also learned about the environment through “talk-story” sessions. During the June and October 2011, the NALU Studies students (about 12 each session) were brought into the classroom for two weeks and treated to some of
the environmental curricular activities developed in the PaCES summer program. The classroom (and field) instruction also utilized PaCES materials and equipment. Finally, Windward Community College granted these students with college credit for their participation. NALU Studies, working under its fiscal sponsor the Pacific American Foundation, is funded by Castle Foundation, Hawai‘i Community Foundation, and others.

Changes/Problems Encountered

We encountered no significant problems. However, our activities suggested ways in which we can improve the program. Here are some of the things we will be considering as we plan and implement the second year of our program.

Because of fewer donations, our operating funds for the 2011 program was less than we had in previous years. As in 2010, this problem was partially offset by the fact that we shared some resources (mainly equipment and consumable supplies) with the NALU Studies program. Also, because we had fewer students, we ran the program with a smaller staff.

As noted, fewer students than expected applied to participate in the program. We ran the program with seven less students and one less mentor than usual. We believe one of the reason for this situation was that, because of budget uncertainties, we did not advertise that we would provide stipends to the students.

The PaCES-HIMB curriculum was very ambitious for such a diverse group of students. Some students had very little knowledge of molecular biology or computer programs. Different levels of comprehension in the required areas among students from different schools resulted in a pace that seemed arduous for some and tedious for others. Our mentors and student teaching assistants were of great value in helping the less-prepared students be successful. In addition, our group approach, having the students participate in student research teams, encouraged peer mentoring – the students with more experience helped those with less experience. Thus the PaCES-HIMB program successfully provided a unique and challenging learning experience for all our students.

The Future

We are well underway to run the program again this summer – this summer will be our eighth summer. We are currently engaged in the selection process. This summer, it looks as though our numbers will be back up to normal.

As usual, one problem we are facing is the difficulty associated with funding. More students mean more costs (staffing, van rentals, material supplies, etc.). We must seek funding from multiple sources. Fortunately, we received a grant of about $15,000 from the National Science Foundation Islands of Opportunity Alliance – Louis Stokes Alliance for Minority Participation. With these funds, and others, we expect to run another successful program this summer.
The ideal situation would be to establish an endowment to fund our program so that we no longer need to scramble to find funds each year.

11. Conclusion

Once again, the PaCES-HIMB Summer Program for high school students, “Human Impacts and Hawai‘i’s Coral Reef Health: An Environmental Science Education, Stewardship and Research Program for High School Juniors and Seniors in Hawai‘i,” was an exceptionally rewarding experience. The feedback that we received from students, parents, teachers, program staff, and community members was extremely positive. We expect to have a long-lasting positive impact for the promotion of environmental science education, research and stewardship for Hawai‘i.

Submitted by:
Principal Investigator
David A. Krupp, Professor
Marine and Biological Sciences
Windward Community College
University of Hawai‘i
45-720 Kēa‘ahala Road
Kāne‘ohe, HI 96744
(808) 236-9121 krupp@hawaii.edu

Co-Principal Investigator
Malia River, Educational Specialist
Hawai‘i Institute of Marine Biology
P.O. Box 1346
Kāne‘ohe, HI 96744
(808) 236-7406 maliar@hawaii.edu
Human Impacts and Hawai‘i’s Coral Reef Health:
An Environmental Science Education, Stewardship and Research Program
for High School Juniors and Seniors in Hawai‘i

APPENDIX I
Financial Summary for 2011 Program

<table>
<thead>
<tr>
<th>Donations Received</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Harold K.L. Castle Foundation</td>
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<tr>
<td>Minami Community Foundation</td>
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<tr>
<td>Ameron Hawai‘i</td>
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<tr>
<td>Cultural Surveys Hawai‘i, Inc.</td>
<td>$5,000</td>
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<tr>
<td>Private Donor</td>
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<td><strong>Total Donations</strong></td>
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<table>
<thead>
<tr>
<th>Expenditures</th>
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<tr>
<td>UH Agreements (Salaries &amp; Student Help)</td>
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<td>Student Scholarships</td>
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<td>Supplies (Lab Supplies, Duplication &amp; Office Supplies)</td>
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<td>Transportation (Van Rental &amp; Gasoline)</td>
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<td>Business Meetings (Symposium &amp; Other Meetings)</td>
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<td>Protocol</td>
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<td>Other Services (Lifeguards, Boat Rentals &amp; Analyses)</td>
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<tr>
<td>UHF Administrative Fee</td>
<td>$1435</td>
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<td><strong>Total Expenditures</strong></td>
<td><strong>$54,300</strong></td>
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Human Impacts and Hawai‘i’s Coral Reef Health:
An Environmental Science Education, Stewardship and Research Program
for High School Juniors and Seniors in Hawai‘i

APPENDIX II
Summer 2011 Schedule
<table>
<thead>
<tr>
<th>Time</th>
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<th>Tuesday</th>
<th>Wednesday</th>
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<tbody>
<tr>
<td>8:00</td>
<td>ARRIVE WCC ORIENTATION</td>
<td>ARRIVE WCC ORIENTATION</td>
<td>ARRIVE WCC ORIENTATION</td>
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<td>ARRIVE WCC ORIENTATION</td>
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<tr>
<td>8:30</td>
<td>Oli &amp; Chant Course Orientation</td>
<td>Introduction to the ‘Ahupu’a Lecture</td>
<td>Recap and Quiz</td>
<td>Recap and Quiz</td>
<td>Recap and Quiz</td>
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<tr>
<td>9:00</td>
<td>Travel to HIMB</td>
<td>Laboratory and Field Safety Lecture</td>
<td>Data Summarization &amp; Presentation</td>
<td>Climate and Hydrology Lecture</td>
<td></td>
</tr>
<tr>
<td>10:00</td>
<td>Welcome Brief History of Moku o Loe, lab tour and island tour (HIMB)</td>
<td>Kāne‘ohe Ahupua’a &amp; Watershed Tour Field Trip With Environmetrs and Barometers</td>
<td>Introduction to EXCEL Lab</td>
<td>Making Measurements &amp; Collecting Data Lab</td>
<td>Watershed Mapping Lab</td>
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<td>11:00</td>
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<td>11:30</td>
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<tr>
<td>12:00</td>
<td>LUNCH at HIMR Beach House</td>
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<tr>
<td>13:00</td>
<td>Swim Test</td>
<td>Review of Environmeter Data</td>
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<td>Properties of Water Lecture</td>
<td>Formation and Characteristics of Hawaiian Soils Lecture</td>
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<tr>
<td>13:30</td>
<td></td>
<td>Science and the Scientific Method Lecture</td>
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<tr>
<td>14:00</td>
<td>Snorkel Tour</td>
<td>Using EXCEL for Data Entry and Table Generation Lab</td>
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<td>Properties of Water Lab</td>
<td>Properties of Soils Lab</td>
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<td>Science and the Scientific Method Lab</td>
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<td>16:00</td>
<td>Back to WCC</td>
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## PaCES-HIMB Summer Program in Environmental Science
### 2011-2012 Annual Report

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<tr>
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<td>Introduction to Ecology &amp; Population Growth Lecture</td>
<td>Water Pollution and Water Quality Parameters Lecture</td>
<td>Life in Hawaiian Streams Lecture</td>
<td>Native Native Hawaiian Terrestrial Ecosystems</td>
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<td>Population Growth Lab</td>
<td>Stream Water Quality Survey</td>
<td>Stream Bioassessment Survey</td>
<td>Intertidal Zone Survey</td>
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<td>Ho'omaluhia Botanical Garden Field Trip</td>
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## WEEK 3

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<td>8:30</td>
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<td>Recap and Quiz</td>
<td>Recap and Quiz</td>
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<tr>
<td>9:00</td>
<td>Estuaries and Wetlands Lecture</td>
<td>The Hawaiian Fishpond Lecture</td>
<td>Biology and Ecology of Corals and Coral Reefs Lecture</td>
<td>Travel to HIMB</td>
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<td>Māhuahu ‘Ai o Hoi Lo ‘1 Restoration Service Project</td>
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<td>10:00</td>
<td>Estuary Dynamics Field Study</td>
<td>Aquaponics Facility Tour</td>
<td>Coral Lab</td>
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<td>Coral Reef Surveys on Coconut Island Field Survey</td>
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<tr>
<td>13:00</td>
<td>Conventional Agriculture</td>
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<td>Travel to HIMB</td>
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<td>13:30</td>
<td>Estuary Data Workup Lab</td>
<td>Waikakua Loko Restoration Service Project</td>
<td>Coral Reef Survey Methods Lecture/Demo</td>
<td>Coral Reef Survey Data Workup Lab</td>
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<td>Lab Assignment Catch Up</td>
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### WEEK 4

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<td>Environmental Microbiology Lecture</td>
<td>Principles of PCR Lecture</td>
<td>Human Impacts on Coral Reefs Lecture</td>
<td>Writing a Proposal and a Scientific Paper Lecture</td>
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<td>9:30</td>
<td>Microbiology Lab</td>
<td>PCR Reaction Set Up Lab</td>
<td>Lab Assignment Catch Up</td>
<td>Searching the Literature</td>
<td>The Big Picture Lecture</td>
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<tr>
<td>10:00</td>
<td>Microbiology Lab</td>
<td>PCR Reaction Set Up Lab</td>
<td>Lab Assignment Catch Up</td>
<td>Searching the Literature</td>
<td>The Big Picture Lecture</td>
</tr>
<tr>
<td>10:30</td>
<td>Microbiology Lab</td>
<td>PCR Reaction Set Up Lab</td>
<td>Lab Assignment Catch Up</td>
<td>Searching the Literature</td>
<td>The Big Picture Lecture</td>
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<tr>
<td>11:00</td>
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<td>Environmental History of Kāne‘ohe Bay Lecture</td>
<td>BLAST Lecture</td>
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<tr>
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<td>Molecular Genetics</td>
<td>Process PCR Products Lab</td>
<td>Proposal Development</td>
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<td>Proposal Development</td>
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<td>DNA Extraction Lab Start</td>
<td>Environmental History of Kāne‘ohe Bay Lecture</td>
<td>BLAST Lecture</td>
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<tr>
<td>13:00</td>
<td>DNA Extraction Lab Start</td>
<td>Environmental History of Kāne‘ohe Bay Lecture</td>
<td>BLAST Lecture</td>
<td>BLAST Lecture</td>
<td>BLAST Lecture</td>
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<tr>
<td>13:30</td>
<td>Molecular Genetics</td>
<td>Process PCR Products Lab</td>
<td>Proposal Development</td>
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<tr>
<td>14:00</td>
<td>DNA Extraction Lab Continued</td>
<td>Research Project Brainstorming</td>
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<tr>
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<td>DNA Extraction Lab Continued</td>
<td>Research Project Brainstorming</td>
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<td>Research Project Brainstorming</td>
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<td>Time</td>
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<tr>
<td>8:30</td>
<td>Recap and Quiz</td>
<td>Project Update</td>
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<tr>
<td>9:00</td>
<td>Group Project Proposal Discussion and Revision</td>
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<tr>
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<td>Group Project Planning and Set Up</td>
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Human Impacts and Hawai‘i’s Coral Reef Health:
An Environmental Science Education, Stewardship and Research Program
for High School Juniors and Seniors in Hawai‘i

APPENDIX III
Evaluations

Student Evaluation – Survey Results

<table>
<thead>
<tr>
<th>SURVEY QUESTIONS</th>
<th>Average</th>
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<tbody>
<tr>
<td>I gained useful knowledge through my participation in this program.</td>
<td>4.79</td>
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<tr>
<td>I acquired useful skills through my participation in this program.</td>
<td>4.93</td>
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<tr>
<td>The program goals and objectives were clear.</td>
<td>4.71</td>
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<td>The instructors were well-prepared and organized for class.</td>
<td>4.14</td>
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<td>The instructors returned exams and assignments promptly.</td>
<td>3.86</td>
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<td>The instructors were knowledgeable about their subjects.</td>
<td>4.79</td>
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<td>The instructors spoke clearly and were easy to understand.</td>
<td>4.36</td>
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<tr>
<td>The instructors made good use of examples in class.</td>
<td>4.64</td>
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<tr>
<td>The instructors related their subjects to the &quot;real world&quot;.</td>
<td>4.86</td>
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<tr>
<td>The instructors made effective use of presentation media.</td>
<td>4.93</td>
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<td>The instructors encouraged questions.</td>
<td>4.86</td>
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<tr>
<td>The instructors emphasized the main points.</td>
<td>4.93</td>
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<tr>
<td>The instructors ask questions to see if the students understood difficult concepts.</td>
<td>4.86</td>
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<tr>
<td>The instructors encouraged an atmosphere of good feeling in the class.</td>
<td>4.86</td>
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<tr>
<td>The instructors treated all students fairly.</td>
<td>4.57</td>
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<tr>
<td>The instructors were interested in the subjects.</td>
<td>4.85</td>
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<tr>
<td>The instructors were genuinely interested in the students.</td>
<td>4.93</td>
</tr>
<tr>
<td>The instructors were willing to help with individual problems.</td>
<td>4.79</td>
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<tr>
<td>The instructors were honest and approachable.</td>
<td>4.71</td>
</tr>
<tr>
<td>Overall, this program was a good program.</td>
<td>4.64</td>
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</tbody>
</table>

Students ranked their response 1 to 5: 1 = strongly disagree; 5 = strongly agree.
Student Evaluation - Written Responses to Survey Questions

What do you feel you have gained from this experience and was it meaningful? Please elaborate.

- I’ve gained life skills and knowledge about the “real world” that I am about to enter.
- I feel that I gained information that helps me choose the appropriate career I want to go into by exposing me to different fields.
- Learned a lot, won’t forget anything.
- Gained lots of leadership skills, for reals!
- I feel like I gained a lot of real life connections and experiences.
- I have gained a totally different perspective of our earth’s environment. It was very meaningful and important.
- I gained so much knowledge throughout this program that I didn’t know and now I can better myself in my studies. I feel that I have gained a better understanding about science and a greater appreciation for marine life in general.
- I feel like I gained a better understanding of the environment and a real passion to go into marine biology.
- I feel I have used materials well and I learned how to use science and apply it.
- I learned so much about how to work with people my own age and help them to learn. This is quite difficult to learn as a young adult.
- I feel I have gained a lot of experience with real science that wouldn’t have got unless I actually became a researcher
- I have gained leadership skills!

What were some of the challenges you experienced in this program?

- Irritating people!
- Some of the challenges were because of the lack of time and we were unable to finish projects or assignments well.
- There were slight disrespectful attitude problems that I encountered while in this program. I did not appreciate the rudeness.
- I had to travel really far each day to get here which was really a challenge.
- That your experiments don’t always go as planned.
- Some challenges I experienced were having a lot to do in a little amount of time given to do it.
- Working in groups, but other than that, not too much.
- Waking up early
- The time crunch and lack of teachers was hard.
- Organization
- Remembering definitions
- I found that I was challenged by working with different people.
**What activity do you feel was the most successful and why?**

- I feel that the most successful was the PCR lab because I learned the most.
- When we helped make the Lo‘i.
- When we helped at the Lo‘i.
- Service learning activities, outdoorsy stuff.
- I liked our final project because I learned the most.
- Our group project we found statistically significant data.
- DNA extraction. This lab was awesome! I love doing complicated, but important lab processes.
- Lo‘i because we got out there and helped it. Was also simple and didn’t require much knowledge about it.
- The activity I feel was the most successful was our presentation because we went through so much changes and it came out great.
- Cleaning algae out of the fishpond was the most successful because we got a lot done.
- Lab work.
- I felt like the DNA lab was the most successful because it gave us a real lab experience.
- I feel our final project was the most successful because it was totally completed and our own ideas went into it.
- Volunteer work.

**What activity do you feel was the least successful and why?**

- Lectures. Very boring.
- I feel that the DNA lab was the least successful because we made a mistake the first time.
- The final project, because we did something.
- I feel that the soil testing was the least successful because he didn’t use it for our final project.
- Not having to come to the reef and find condos missing because the glue didn’t work.
- Working in Kawainui Marsh. There was too many people so it was hard to walk anywhere.
- One water quality survey. Did analysis wrong.
- The coral lab was a little hard to understand.
- I feel that the least successful was the HIMB tour because I did it before.

**How should students be selected for this program?**

- I think the current process is well thought out.
- By personality and wanting to learn.
- Motivation and passion.
- They should be selected as long as they have honest interest.
- By science teachers letting students know about Paces.
- Students should continue to have interviews live, they should be selected very carefully.
- If they want to learn and have drive in doing something in the program because I think those types are the best to work with.
- Based on passion intuition to learn and leadership.
• Students that show a interest in marine biology.
• Interviews.
• The current system is working. They should also select people that don’t have attitudes.
• The process is good the way it is.

Do you feel more prepared for college after taking this course? Please explain.

• Yes. I’m not going to be surprised.
• Yes. I am more prepared with the concepts and also I have experience with the equipment
• Yes. It gave me college level material and assignments.
• I know what its like in lectures and how to take notes
• Yes, I learned useful skills and it gave me an idea about what I want to do
• Yes, because now I am not afraid to take it on.
• Yes, well being in college is simple but there are always new things to learn and add to
  make you a better person, which I did through this program.
• I feel a little more prepared. I already am taking some college courses.
• Yes, very much. It was like if I took a college course.
• Yes, because I gained real life experience.
• Yes.
• Yeah! I learned more than most kids my age would.
• Yes!
• I feel more prepared and focused because I can see the field I want to go into.

How could the instructors better keep your attention during the lectures?

• The instructors could use shorter, more concise PowerPoint.
• Simple. Quick. Knowledgeable.
• Be more simple.
• Don’t be so monotone. Spice it up.
• Having more interactive slides and lectures.
• Use more fun concepts.
• If they could stay off lengthy examples and explanations.
• Be simple, quick and easy. Also apply whatever you are talking about into things students
  can relate to.
• Make it fun and so we can relate to it.
• Make it more interactive and fun.
• Be fun. Don’t monologue.
• Make talks more concise.
• They can use more relevant examples for every concept.
• By putting more interesting things in it.

Do you feel this course challenged you academically? Please explain.

• Yes. It was different.
• Yes. I feel like it challenged me in my creativity in analyzing data.
• Yes. You don’t learn these things in high school.
• The test online because I got bad scores.
• Yes, It gave me direction I want to go into.
• Yes, because I go to charter school and this was a gigantic step by having to measure and all types of chemicals.
• Being college and seeing the work load this was fairly easy for a college course. I liked the amount of work.
• I feel like it definitely challenged me, especially the DNA extracts
• Yes. It made me analyze every little thing.
• Not really. Because there were many points that were mostly logic.
• Yes! Lots of numbers.
• Yeah! Because I’m not that smart and made me think more.
• The instructors made us think about what was being asked.
• In certain areas because I know some of the stuff.

How has this program educated you about the environment?

• I learned more about how much impact humans have,
• It showed us what we can do as individuals in our community.
• About taking care of our world.
• Lots of things to now take into account.
• I learned about more ways to analyze water samples and better understand the environment.
• In almost every aspect of it.
• This program has reminded me and encouraged me to think about the environment.
• It has educated me so much because now I know what I can do to help.
• It taught me to pay attention to the natural environment.
• It gave me a better understanding of what is happening and what can be done.
• We were in the field a lot.
• I am so much more aware of the environment now.
• This program really opened my eyes to how every human action has an impact on the environment.

What suggestions would you make for next year?

• Make it more interesting.
• I would suggest that time management for the project be stressed more.
• Not sure.
• Fewer lectures and more activities out in the field.
• That we have more time.
• This program is great for high school students. I think its a great that you guys give this opportunity for them. I wouldn’t change a thing.
• More marine activities.
• Equal treatment between different groups.
• More organized.
• More hands on.
• More field work.
I would suggest that more info given.

*Explain how you have learned to promote stewardship through this program?*

- I learned to promote stewardship through educating others as to their impact on the environment around them.
- More group interactions.
- The service projects.
- I learned more about the islands water system works and how it affects the ocean.
- We learned how to teach what we learned and be a visual of a leader and steward.
- I learned how to conduct work in a professional manner in educating people.
- I have learned that it is important to make sure that people are aware of what we have.
- Educate the future.
- Educate public.
- We informed the public of how to take care of the land.
- I have learned the activities that helped and harm the land, so I can be more informed.
- I want Hawaii to survive.
Evaluation Instrument

PaCES-HIMB Summer Program in Environmental Science
Mentor Evaluation of Students

Student's Name ________________________________

Check the box below that best represents your opinion for each criterion listed.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

This student was able to work well with others.
This student listened well and understood instructions provided.
This student showed initiative and enthusiasm for the project.
This student was able to solve problems when they arose.
I was able to trust this student to complete his/her obligations to the group.
This student contributed significantly to the development and completion of the group project.
This student was punctual.
This student took care to carry out assigned tasks correctly.
This student exhibited leadership skills.
I think this student would make a good mentor.

Please answer the following questions as thoughtfully as possible.

1. What were this student's greatest strengths?

2. In what ways could this student have improved his/her performance?

3. What else would you like to say about this student?
Human Impacts and Hawai‘i’s Coral Reef Health:
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APPENDIX IV
2011 Symposium Agenda
2011 Student Research Project Symposium

16 July 2011 ♦ Hale ‘Ākoakoa 105 ♦ Windward Community College

for the

Pacific Center for Environmental Sciences (PaCES)
and
Hawai‘i Institute of Marine Biology (HIMB)

Summer Environmental Science Program for High School Students

Funded By
Ameron Hawai‘i
Cultural Surveys Hawai‘i, Inc.
Harold K.L. Castle Foundation
Minami Community Foundation
Fred Paine
Program Participants

Student Participants
Joelle Arakaki, Mililani High School
Keana Chan Wa, Kaiser High School
Rachel Clute, University of Hawai‘i Hilo
Shae Ideue, Pearl City High School
Jacqueline Kim, Pearl City High School
Rachel Look, Pearl City High School
Kamalei Lyons, Mid Pacific Institute
Duke Orton, Kahuku High School
Kainui Rapaport, South Eugene High School
Sheanae Tam, Kailua High School
Hope Whitney, Halau Ku Mana PCS

Student Mentors
Jaslyne Kauionapua Mei-Yi Chang, Castle High School
Victoria Kaleikaumaka Davis, Kaiser High School
Kā’īmī Kulei Kukahiwa Naone, Kalaheo High School
Samantha Emerald Shipley, Kahuku High School
Noelle Victoria, Castle High School

Student Teaching Assistants
Brent Fila, Windward Community College, University of Hawai‘i
Celeste Yee, University of Hawai‘i at Mānoa

Program Faculty and Coordinators
Kelvin Gorospe, Hawai‘i Institute of Marine Biology, University of Hawai‘i
David Krupp, Windward Community College & Hawai‘i Institute of Marine Biology, University of Hawai‘i
Malia Rivera, Hawai‘i Institute of Marine Biology, University of Hawai‘i
Krista Steinfeld, Windward Community College
Manning Taite, Windward Community College
Clyde Tamaru, College of Tropical Agriculture and Human Resources & Hawai‘i Institute of Marine Biology, University of Hawai‘i

Guest Speakers and Contributors
Greta Aeby, Hawai‘i Institute of Marine Biology, University of Hawai‘i
Leina‘ala Bright, Hawaiian Studies, University of Hawai‘i at Mānoa
Chuck Burrows, ‘Ahahui Mālama I Ka Lōkahi
Carl Evensen, College of Tropical Agriculture and Human Resources, University of Hawai‘i
Bootsie Howard, Kāko‘o ‘Oiwi
Herb Lee, Pacific American Foundation
John Quincy Adams, Lifeguards Hawai‘i State
Mark Heckman, Hawai‘i Institute of Marine Biology, University of Hawai‘i
Mindy Mizobe, Hawai‘i Institute of Marine Biology, University of Hawai‘i
Christina Runyon, Hawai‘i Institute of Marine Biology, University of Hawai‘i
Kaimi Scudder, ‘Ahahui Mālama I Ka Lōkahi
Christie Wilcox, Hawai‘i Institute of Marine Biology, University of Hawai‘i
Erin Yafuso, Windward Community College, University of Hawai‘i
Kyrie Yonehiro, Kāko‘o ‘Oiwi

Institution Administrators
Doug Dykstra, Chancellor, Windward Community College, University of Hawai‘i
Ardis Eschenberg, Dean of Instruction, Windward Community College, University of Hawai‘i
Richard Fulton, Vice Chancellor, Instruction, Windward Community College, University of Hawai‘i
Lui Hokoana, Vice Chancellor, Student Services, Windward Community College, University of Hawai‘i
Jo-Ann Leong, Director, Hawai‘i Institute of Marine Biology, University of Hawai‘i
Brian Richardson, Dean of Instruction, Windward Community College, University of Hawai‘i
Logistical Support

Karen Cho, Personnel Officer, Windward Community College, University of Hawai‘i
KC Collins, Director of Development for Community Colleges, University of Hawai‘i Foundation
Rosalyn Dias, Coordinator, Waikalua loko Fishpond Preservation Society
Lisa Hayashi, Educational Specialist, Natural Sciences Department, Windward Community College, University of Hawai‘i
Geri Imai, Registrar, Windward Community College, University of Hawai‘i
Kevin Ishida, Fiscal Officer, Windward Community College, University of Hawai‘i
Kristen Kong, Facilities Use Specialist, Windward Community College, University of Hawai‘i
Lara Kong, Secretary to the Dean of Instruction, Windward Community College, University of Hawai‘i
Deanna Lee, Administrative Assistant to the Director, Hawai‘i Institute of Marine Biology, University of Hawai‘i
Jerry Levinson, Manager, The Testing Center, Windward Community College, University of Hawai‘i
Erin Mattos, Secretary to the Vice Chancellor of Instruction, Windward Community College, University of Hawai‘i
Willis Motooka, Kupuna, Waikalua loko Fishpond Preservation Society
Sharon Nakagawa, Assistant Fiscal Officer, Windward Community College, University of Hawai‘i
Kathy Nishimura, Admin Assistant to the Director, Hawai‘i Institute of Marine Biology, University of Hawai‘i
Stacie Sato, Personnel Officer, Windward Community College, University of Hawai‘i
Fred Takebayashi, Kupuna, Waikalua loko Fishpond Preservation Society
Ivy Yagi, Secretary to the Chancellor, Windward Community College, University of Hawai‘i

Māhalo to Our Generous Foundations, Corporations & Private Donors
Ameron Hawai‘i
Harold K.L. Castle Foundation
Cultural Surveys Hawai‘i
Minami Community Foundation
Fred Paine

Special Thanks To
‘Ahahui Mālama I Ka Lōkahi
Hawai‘i Institute of Marine Biology
Kāko‘o ‘Oliwi
NALU Studies
Pacific American Foundation
University of Hawai‘i Foundation
Waikalua Loko Fishpond Preservation Society
Parents and Guardians of Student Participants
Symposium Schedule

8:00 A.M.  Refreshments

8:30 A.M.  ‘Oli
  Kumu Krista Steinfeld, Instructor in Hawaiian Studies, Windward Community College

8:40 A.M.  Welcome and Introductions
  David Krupp, Professor, Windward Community College & Hawai‘i Institute of Marine Biology, University of Hawai‘i
  Doug Dykstra, Chancellor, Windward Community College, University of Hawai‘i
  Malia Rivera, Educational Specialist, Hawai‘i Institute of Marine Biology, University of Hawai‘i
  Manning Taite, Founder, NALU Studies

9:00 A.M.  Keynote Presentation
  Protecting Hawai‘i’s Marine Environment - A View to the Future
  Malia Chow, Superintendent, Hawaiian Islands Humpback Whale National Marine Sanctuary, NOAA

9:20 A.M.  Break

9:30 A.M.  Student Presentations (Manning Taite, Moderator)

  A comparative study of closed and open aquatic systems in the production of phytoplankton
  Keana Chan Wa, Rachel Clute and Kainui Rapaport
  Jaslynne Kauionapua Mei-Yi Chang, Mentor

  A descriptive study of human impacts and urbanization upon water quality in the various ahupua‘a of Kāne‘ohe Bay
  Joelle Arakaki and Sheanae Tam
  Victoria Kaleikaumaka Davis, Mentor

  Individual variation in reproductive methods of lace coral, Pocillopora damicornis, in Kāne‘ohe Bay
  Jacqueline Kim and Hope Whitney
  Ka‘imi Kalei Kukahiwa Naone, Mentor

  The effects of the Kawainui Marsh on the quality of water and E. coli and Enterococcus concentration
  Shae Ideue and Kamalei Lyons
  Samantha Emerald Shipley, Mentor

  The characterization of snaps based on size and gender of the Snapping Shrimp, Alpheus heeia
  Rachel Look and Duke Orton
  Noelle Victoria, Mentor

11:00 A.M.  Special Treat

11:15 A.M.  Closing Remarks and Refreshments
Dr. Malia Chow is a product of the Islands and was raised on the island of O'ahu. She left the islands after high school and received her Bachelor’s of Science Degree from the University of Washington and went on to obtain her Ph.D. in cellular and molecular biology from the University of Pennsylvania. She also trained as a post-doctoral fellow at the University of Maryland’s Center of Marine Biotechnology. After receiving her formal training on the continental United States, Malia returned back to the Islands and began working as a researcher at the University of Hawai’i’s Hawai’i Institute of Marine Biology on Coconut Island where she gained a tremendous appreciation of the unique and fragile marine resources of the Hawaiian Islands.

Malia began working for NOAA as a policy analyst with the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve soon after it was established by then President Clinton. She was part of a team that led the site through a sanctuary designation process, the establishment of NOAA’s first National Marine Monument by then President Bush (renamed the Papahānaumokuākea Marine National Monument) and more recently, the establishment of the site as a mixed cultural and ecological World Heritage site.

Dr. Malia Chow was recently selected as the Sanctuary Superintendent for NOAA’s Hawaiian Islands Humpback Whale National Marine Sanctuary. The sanctuary, which is jointly managed by the National Oceanic and Atmospheric Administration and the State of Hawai‘i, lies within the shallow warm waters surrounding the main Hawaiian Islands and constitutes one of the world’s most important humpback whale habitats. The sanctuary is currently undergoing a management plan review process to consider expanding the scope and direction for the sanctuary which may include adding additional cultural and natural resources of national significance.