

KEAHOLOA STEM PHASE I - TCUP METRICS ANALYSIS

Note: When listed below, Keaholoa staff refers to Sonia Juvik (Project Director, PD), Kamaka Gunderson (Project Manager), and Drew Kapp (Project Specialist and Internship Coordinator).

Subject	Description	Action Taken	Timeline of Completion/ Outcomes	Responsible Personnel
GENERAL				
Create a new model for STEM education, called HCAST (Hawaiian Compass for Advancement in Science and Technology).	9 meetings (11/20/02-3/13/03)	Guide for Keaholoa STEM Program developed; all decisions are made in concert with the HCAST model. Refer to specific accomplishments and program elements below.	Established as framework for grant implementation	Keaholoa STEM PD, UH Hilo faculty (Rebecca Ostertag)
Incorporate Hawaiian epistemology in research, faculty development and in curricula areas.	A program that combines and acknowledges indigenous knowledge and science with western science learning and teaching.	Faculty seminars, field trips and focus faculty to revise courses to be place-based, which include culture, information, and Hawaiian perspectives. Allow faculty to be creative in learning and teaching.	In implementation stage. Process of gaining faculty buy-in across the board is ambitious but being striven for.	Keaholoa staff In partnership w/ UH Hilo Faculty
Partner with an existing UH Hilo organization with a track record of success in reaching Hawaiian students.	Working with UH Hilo Student Services, Kīpuka Native Hawaiian Student Center (Kīpuka), PDPEP (Pacific Internship Programs for Exploring Science), Nā Pua No' eau (Center for Gifted and Talented Native Hawaiian Children), Alu Like (community based Native Hawaiian serving organization).	<ol style="list-style-type: none"> 1. Collaboration with Kīpuka Native Hawaiian Student Center in implementation of Summer Intensive [a four-week math and chemistry bridge program for graduating high school seniors desiring a career in a STEM discipline]: <ul style="list-style-type: none"> • 2003 – 13 students, 4 mentors, 2 faculty • 2004 – 14 students, 4 mentors, 3 faculty • 2005 – 16 students, 4 mentors, 2 faculty • 2006 – 7 students, 3 mentors, 2 faculty • Other activities sponsored by Keaholoa and Kīpuka are the Kīpuka Bash, seminars and lecture series 2. Collaboration with PIPES, REU, UH-HIP for placing Native Hawaiian students in summer research opportunities with state and federal agencies 3. Partnership with Nā Pua No' eau (NPN), in delivering Summer Science Institute classes for high school Native Hawaiian students. Partnership extends to NPN's science Pathways and Ho'omau – middle and high school programs that provide curriculum enhancement for students preparing for natural resources/STEM careers. Ho'omau continues its support for NH students through their first year of university at which point UH Hilo programs like Keaholoa STEM take over. 	Partnerships established and active throughout implementation process. The network is invaluable for student recruitment, retention and overall program support.	Keaholoa staff Gail Makuakane-Lundin and Kīpuka staff Sharon Ziegler-Chong and PIPES staff David Sing and Nā Pua No' eau staff
Create a new paradigm that can improve attitudes (Hawaiian and others) towards, and the attraction of students to STEM	Pair, and or integrate and relate science to culture through diverse methods including field trips for faculty and students that	<ol style="list-style-type: none"> 1. Faculty excursions are undertaken to Native Hawaiian cultural sites with area scientists and Native Hawaiian culture. See list of faculty excursions to cultural sites. 2. Conduct seminars and workshops that expose faculty to various indigenous perspectives on scientific research (see list of faculty 	The “seeds” have been planted for the growth of a new paradigm and implementation is ongoing. Because this	Keaholoa STEM faculty and Keaholoa staff, College of Arts and Sciences

disciplines.	provide opportunity to view natural processes through varying cultural lenses; seek to achieve curricula that are culturally relevant.	development workshops, seminars and fieldtrips) 3. Introduce pedagogical models that enhance interest and learning in STEM courses (sample: Archeo-astronomy 220 – interdisciplinary subject which provides a new perspective on ways in which both ancient (including Hawaiian) and modern cultures have responded to the physical universe).	ambitious goal is change-making and as such demands patient endurance and time. Sustainability will require more widespread adoption of goal in curricula across the university. Other programs on campus like Kīpuka have borrowed the goals and are contributing to its establishment at UH Hilo.	Dean’s office and targeted departments
Create pedagogical changes that honor the science in Hawaiian cultural knowledge.	Faculty field trips, seminars, literature that provide guidelines for implementation and for the achievement of change.	1. Changes implemented in specific new or enhanced courses: <ul style="list-style-type: none"> • NSCI 197 (same as STEM 101) • Geology 250 • Geology 220 • Math 103 (college algebra) • Math/Physics Cohort (for calculus 205) • Summer Intensive (bridge course only) in MATH and Chemistry. 2. Other changes less discrete but attested to by faculty who participate in Faculty Development activities.	This is an ongoing process recognizing the ambitious nature of the change that is hoped for. Activities have begun, more needs to be done in this area, particularly in addressing the needs in the majority of STEM gateway courses.	PD, Keaholoa STEM faculty, CAS Dean’s office
Address: (1) the need to build a campus that has a faculty and curricula that promotes the utilization of the island of Hawai’i as a natural learning laboratory; (2) Promotion of an educational climate that offers conditions that optimize learning for Hawaiians.	Established through UH Hilo policy but implementation is ongoing and incomplete. Seek to implement faculty development, curricula reform, and faculty research, enculturate faculty to awareness and sensitivity of Hawaiian cultural perspectives, develop a caring attitude coupled with quality of teaching, through working with NH students in internships – reciprocity in sharing of culture/science knowledge.	1. UH Hilo Mission: “ The primary mission of UH Hilo is to offer high quality undergraduate liberal arts and professional programs. Selected graduate degree programs are also offered where need warrants and the university has strong expertise. UH Hilo offers "hands-on" learning, service, and leadership opportunities and especially encourages close student-faculty interaction and collaboration on research projects . The university encourages theoretical and applied research, and benefits Hawai’i Island and the state through resource centers, community partnerships, continuing education, and distance learning programs.” 2. Recognizing the absence of NH STEM faculty, a Faculty Diversity Summit was held January 7, 2005 at UH Hilo; 33 professional, administrative, and staff members from UH Hilo and HawCC attended the summit (+6 others). Recommendations forwarded to Chancellor. Expected outcome: gathering of ideas and recommendations to forward to people in key positions of hiring in order to develop a plan to increase faculty diversity at UH Hilo. 3. Faculty/student research projects are largely centered on building knowledge about Hawai’i’s ecosystem. Keaholoa supports faculty search through paid student internships in which students are paired with appropriate faculty mentors on research projects. Projects use the island of Hawai’i as the laboratory: Some projects include:	Faculty development is well established but must be a continuing activity because of the dynamic nature of faculty statistics. Completion also must aim to achieve significant modification in a larger number of STEM courses than so far achieved. Continuing action and qualitative assessment of effectiveness needed (quantitative assessment available in performance and retention statistics). Faculty research is growing and faculty is	PD, Keaholoa STEM faculty, Keaholoa staff

		<ul style="list-style-type: none"> • Hawaiian ethno-climatology at ‘Umikoa • Assessment of sub millimeter-wave intero-metric data quality from Mauna Kea • Impact of non-native species in lowland wet forests • Field and molecular studies of evolutionary divergence in ‘ōhi‘a • Water quality of estuarine ponds in Keaukaha • Malaria and other diseases in Native Hawaiian birds • Tree ring analysis as a tool for determining historical insect outbreaks <p>Faculty/student research projects allow students to teach faculty about Hawaiian cultural knowledge and perspectives on specific research questions/topics. In this way, both professor and student learn from each other. Thus both knowledge systems are embraced and changes take place in the attitudes of faculty as well as students. Barriers do come down.</p>	open to new approaches that will help them become better teachers. They are also open to having student interns and are enthusiastic to learn about NH language, customs and perspectives on STEM topics.	
FACULTY DEVELOPMENT				
Enculturate UH Hilo faculty				
Series of seminars and encourage faculty-learners to take an introductory course in Hawaiian language.	Language exposure through off campus faculty excursions: e.g., to Waipi‘o, Mauna Kea, Pu‘uhonua o Hōnaunau, Pu‘ala‘a. Language courses offered beginning with 9 week Hawaiian language course for faculty in 2004. Subsequent language offerings by Kīpuka.	Seminars offered to date: <ol style="list-style-type: none"> 1. Feb 22, 2003 - Pu‘ala‘a, Puna - Keiki & Susie Osborne “Hawaiian Alternatives in Education” - 13 faculty (11 STEM), 2 students 2. Apr 5-6, 2003 - Waipi‘o, Hamakua - Pua Kanahēle & Ana Kon “Integrating Culture and Science in Taro Farming”- 11 faculty (9 STEM), 3 students 3. Summer 2003 - Kalani Makekai-Whittaker “Hawaiian Language” -10 Faculty & Students 4. Sep 22, 2003 - UH-Hilo - Dr. Peter Vitousek “Ancient Hawaiian Farming Practices in Leeward Kohala” - Approximately 50 faculty and students 5. Oct 3-4, 2003 - Mauna Kea - Koa Ell “Mauna Kea, a Sacred Mountain” – 12 faculty (9 STEM), 2 students 6. Oct 17, 2003 - UH-Hilo - Dr. His Horse Is Thunder “The Wakan in Academe” – 10 faculty 7. Jan 30-31, 2004 - Pu‘uhonua o Honaunau NHP & Kealakekua - Chad Baybayan & Terri Leianuenue Reveira “Models for Hands-on Ecological Education” - 13 faculty (10 STEM) + 5 students 8. Feb 25, 2005 - UH-Hilo - Will McClatchey “The Pacific Way: Oldest Agriculture in the World to Space Age Solutions” - Approximately 35 in audience 9. Spring 2004 - UH-Hilo - Manu Meyer “Hawaiian Epistemologies” - Approximately 10 STEM Faculty 10. Apr 23, 2004 - UH-Hilo - Judith Vergun “Recruiting and Retaining Indigenous Students” - 6 Faculty 11. July 20, 2004 - UH-Hilo - Michael Little Crow “Math and Indigeneity” -6 Faculty 	A variety of faculty development events implemented as of Fall 2006. The next step (2006 and beyond): <ol style="list-style-type: none"> 1. Increase dissemination of lessons learned. 2. Implement faculty-faculty mentoring to share lessons learned. 3. Assess application of ideas Application in classroom settings of what was learned in faculty development sessions (through survey of targeted faculty learners). <ol style="list-style-type: none"> 4. Continually offer opportunities for new faculty to become exposed to HCAST model and pedagogy. 	Keaholoa staff, STEM faculty especially faculty participating in FD activities.

		<ol style="list-style-type: none"> 12. Oct 25, 2004 - UH-Hilo - Renee Louis “A Hawaiian Cartographer: In Search of Common Ground” – 8 faculty, 3 students 13. Nov 2004 - UH-Hilo - Richard Crowe “Ahu a Umi” - 15 faculty and students 14. Nov 22, 2004 - UH-Hilo - Keiki Kawai’ae’a “Nurturing the Fire Within” - Approximately 15 Faculty & Interns 15. Jan 7, 2005 - UH-Hilo - Faculty Diversity Summit – keynote speaker Deborah Swisher - 33 UH Hilo administrators, faculty (9 STEM) & staff, 6 other guests 16. Mar 11, 2005 - Hilo Bay on ‘Four Winds’ vessel - Discussion on holistic view of marine environments (Gunderson, Parsons, Crowe) - 12 STEM Faculty, 3 Non-STEM faculty, 3 Keaholoa interns/students, & 5 other guests 17. Aug 17-18, 2005 - UH-Hilo - New Faculty Orientation – Approximately 45 persons in attendance. Students shared with new faculty about the way local and, particularly, Native Hawaiian students learn and the dynamics of their world. 18. Oct 3, 2005 - UH-Hilo - Gail Makuakane-Lundin: “Native Hawaiian Students: Through their Eyes and Voices – 10 faculty (8 STEM), 13 staff from Student Affairs, Women’s Center and campus wide. 19. Oct 10, 2005 – UH Hilo - Kalani Makekau-Whittaker: “Hawai’i – Center of the Scientific World” - 10 Faculty (5 STEM), 13 Staff (Student Affairs, Women’s Center, Kīpuka, etc.) 20. Oct 17, 2005 - UH-Hilo - Elizabeth Stacy & Kamaka Gunderson: “On-Course 1 – Attention to Retention” – 11 STEM faculty, 4 others 21. Oct 24, 2005 – UH Hilo - Becky Ostertag: “Student-centered teaching for scientists” - 8 Faculty (7 STEM), 1 staff 22. Oct 31, 2005 – UH Hilo Cam Muir: “Dirty Fingernails – Supporting Learning With Experience” – 7 faculty (6 STEM), 2 staff 23. UH Hilo/Kīpuka – Kumu Hoku Kamake’eaina – Hawaiian language classes. Fall 2005 – 23 students including 9 STEM faculty; Spring 2006: 17 students, including 7 STEM faculty 24. May 24-26, 2006 - On-Course 1 with facilitator Jonathan Brennan – 43 participants including 15 STEM faculty, 21 UH Hilo faculty/staff, 2 HawCC faculty/staff, 2 MauiCC faculty/staff, 8 Kaua’i CC, 4 UH Hilo students 25. Aug 16, 2006 – New Faculty Orientation, included panel of Keaholoa students who spoke on research opportunities and experience at UH Hilo. 		
--	--	---	--	--

Redesign course offerings				
Research and review of curricula initiatives, models, and activities that have been successfully implemented elsewhere and which may be used by the Project.	Faculty are developing new models in geology, astronomy, and environmental studies. Communication with TCUP partners locally and nationally. Literature search. Draw on NH expertise locally available (e.g., Dr. Kawai'ae'a, Director Kahuawailoa Center for Native Hawaiian education).	Work has begun with STEM Maui in environmental studies, Hawaiian land management (pre-Western contact) and Hawaiian protocol. <ul style="list-style-type: none"> A Math/Physics cohort was implemented in Fall 2006. Students will study Physics with Mathematics, side-by-side, with in-class peer tutoring, and facilitated by Raina Ivanova. This was sparked by her attendance at an On-Course 1 Workshop. She also attended the On Course II Workshop and the result is a radical change in approach to science and mathematics. Rebecca Ostertag, a Keaholoa STEM faculty, has rewritten a Biology course (BIOL 481L) based on her participation in a NSF-sponsored workshop at Washington State University. A degree in Environmental Science has been introduced at UH Hilo through the Geography Department. 	2006 and beyond - identify national workshops appropriate to our mission and support participation of select faculty (especially new approaches for stimulating STEM student retention and recruitment).	PD and select departments (e.g., Mathematics Dept.)
Identify and collaborate with various individuals, programs, and organizations that have some expertise and may contribute to the Project.	Range of collaborations can be demonstrated with: Hawai'i EPSCoR, National Park Service, Edith Kanaka'ole Foundation, Polynesian Voyaging Society, Nā Pua No'eau, professors with specialties in STEM disciplines, State DOE Science specialist (Ms. M. Correia).	This is happening throughout the program. Student interns' work and study with state and federal agencies. Keaholoa students work at the Hawai'i Volcanoes National Park as interpreters to share the cultural beliefs and practices and integrate them with the geothermal environment of the Park. Keaholoa interns work with Nā Pua No'eau in Super Enrichment Saturday science projects, the most recent is the study of tsunamis, its effects upon the geography of the land, and the physics behind tsunamis. Additional agencies that add resource to Keaholoa are USGS at Hawaii Volcano Observatory, Department of Land and Natural Resource, Hawai'i Island Economic Development Corporation, On Course, NOAA BWET, Mentor-Net, Project EAST, Alu Like, and US Fish and Wildlife.	Much has been implemented but the timeline needs to be extended to ensure lasting impact.	Keaholoa staff and collaborating partners because of mutual benefits
Put on a weekend activity using the new ideas with the Outreach component.	Super Saturday events conducted by partnering organization NPN and involving Keaholoa senior interns.	Demands grows for interaction that demonstrates intellectual merit and spreads effects. For example: <ul style="list-style-type: none"> Hosted and implemented a program with Michigan State University students. Students from MSU learned from Keaholoa interns about the estuarine water quality, experiments and lab work. Working with MauiCC STEM. 22 students and staff from Maui came to UH Hilo to learn about the research opportunities. They met with Geology, Geography, Marine Science, Math, Hawaiian Studies, and Biology faculty and student researchers. Collaborative relationships developing and being developed; ongoing working relationships are being established. 	Broad impact being developed as demands are made for interaction in K-12 programs locally; with other Hawai'i TCUP-STEM partners and with other higher education institutions in the USA.	Keaholoa staff and interns David Sing, NPN Director
Develop a component such as faculty-learner discussion groups, Groove (chat room) software, for Project team support and feedback.	Designated Keaholoa STEM Chat room not in place.	UH Hilo "Ohana" Listserv is used extensively for communication within UH Hilo community including STEM faculty. Facilitation of discussion among STEM faculty only not acted on. Faculty is overwhelmed with Internet correspondence on UH Hilo site. Furthermore there is communication amongst STEM faculty participating in EPSCoR sponsored research and related activities.	Developing stage; this needs to be further developed for implementation in Phase II implementation of a chat room for interns and mentors and	Program Manager

			Keaholoa STEM staff.	
Develop a website for dissemination of information about the HCAST program.	Website developed and maintained. Website: http://www2.hawaii.edu/~keaholoa E-mail: keaholoa@hawaii.edu	Done and in place. The Keaholoa website is currently administered and maintained within the Project. Information on the website include: <ul style="list-style-type: none"> • Research opportunities • Application procedures • Links to collaborations • Posting of present and new opportunities for Native Hawaiian students. 	Accomplished. Maintenance and updating/upgrading is always needed and ongoing.	Keaholoa technical staff or technical consultant. Responsibility of PD and Program Manager
Work together with Hawaiian elders and practitioners in teaching Hawaiian middle and high school students through the Outreach Component of the Project.	Engaged <i>kupuna</i> , cultural experts and <i>kumu</i> through collaboration with Nā Pua No'eau. Invite Kumu on faculty field excursions and for in-class discussions (implemented in NSCI 197 (STEM 101), and Archaeo-astronomy courses. NPN's Hawaiian Family affair, Environmental Science Pathway NH <i>kumu</i> and <i>kupuna</i> are involved in both learning and teaching components of the Project.	This item is implemented primarily in our K-12 outreach education activities conducted by Nā Pua No'eau. NPN's new Natural Science Pathways program is specifically designed for Native Hawaiian students interested in a career in STEM areas. The inclusion of elders and practitioners in University level courses is less well developed.	Presently in place for K-12 element. Needs further development at University level but this is seen as requiring more time to ensure careful education to foster buy-in for lasting impact and to establish intellectual merit.	PD, Gail Makuakane-Lundin, David Sing, Toni Mallow, Keaholoa staff
Mentor students and faculty-learners				
Create learning communities.	NSCI 197 (STEM 101) created in 2003 and offered twice with eligibility for General Education credit. 4-week Summer Intensive Mathematics and Chemistry Tutorial bridging course offered annually since 2003. Math and Physics Summer Intensive Tutorial Course offered in 2004 only.	Learning community for NSCI 197 (STEM 101) has not been stable primarily because of shifting faculty participants and general underutilization of the learning community model at UH Hilo. Therefore institutionalization is seen as a challenge. In 2005-6 Keaholoa shifted attention to reinforcing student success in mathematics gate-keeping courses believing that Mathematics truly holds the key to STEM student success. Math/Physics cohort program, funded by Keaholoa, was developed in Summer 2006 to be offered in Fall 2006-Spring 2007. A cohort of Physics/Astronomy and Math majors will take courses in sequence. A grade of C or above automatically accepts the student into the next class of the sequence. The student-centered program provides STEM students with an enriched educational experience that maximizes their success in the STEM major. Similar programs are in discussion but yet to be planned: <ul style="list-style-type: none"> • Fall 2007 – Math/Chemistry cohort 	Redirected course focus from NSCI 197 means assessment of effectiveness will not be completed until at least two years of data obtained. Estimated new completion timeline of 2009.	Keaholoa staff. Participating UH Hilo faculty, in particular Mathematics, Physics and Chemistry

		<ul style="list-style-type: none"> • Fall 2008 – Math/Biology cohort • Fall 2009 – Math/Marine Science 		
Draw in faculty from other disciplines and have the Project people serve as coaches in broadening the impact of their effort.	Conduct: Field trips, workshops, seminars – all include both STEM and non-STEM faculty; invitations extended to faculty of all disciplines within the UH Hilo system. Participate in reshaping the content and style of new faculty orientation program at UH Hilo.	<p>In addition to the regular list of faculty development activities, which because of their nature seemed to have reach saturation point in 2005, outside experts were brought in to present a new approach for promoting student success. The nationally acclaimed “On Course-1” workshop was presented in May 2006 to faculty and appropriate staff. Attendance - 33 faculty and staff from UH Hilo, MauiCC, HawCC and KauaiCC.</p> <p>Participating faculty drawn from a range of STEM, Social Sciences and Humanities departments and from Student Services and Library.</p>	<p>In evaluative stage – effects on faculty teaching yet to be evaluated</p> <p>Future efforts will involve:</p> <ol style="list-style-type: none"> 1. Bring to the campus individuals with expertise in retention and recruitment of students from similar populations. 2. Support attendance of selected faculty at workshops geared to improving pedagogy and education in multicultural settings. 	Keaholoa staff, College of Arts and Science and College of Agriculture (CAFNRM) Admin.
STEM faculty-learners meet regularly with groups of Hawaiian students who have shown interest in one or more of the STEM disciplines available at UH Hilo.	UH Hilo Keaholoa STEM faculty serves as instructors in Super-Saturday learning opportunities.	<p>STEM faculty work with K-12 students in Super-Saturday meetings (approx 3 per semester) and as instructors during two week residential Summer Science.</p> <p>Faculty also interacts one-on-one in their capacity as research mentors. Faculty also guide NH interns in creating scientific reports for presentation at an open forum for faculty and family their end of semester presentations (<i>ho'ike</i>) to larger UH Hilo community integrating of Hawaiian perspectives and science.</p>	Developed, presently implemented, and ongoing as part of the activities that promote student deepening of interest in STEM majors and in post-graduate research. Should offer a faculty-undergraduate student informal STEM discussion session.	<p>Internship Coordinator, Project Manager</p> <p>David Sing, NPN director</p>
Invite Hawaiian students to help with research.	Internship program established in 2003 and continuing with growing student interest.	<p>The internship program began with 4 interns in Spring 2003 when the Keaholoa program began and has grown to 18 interns in Fall 2006. A total of 50 students have participated in the Keaholoa internship program.</p> <p>20 interns have now graduated: five are pursuing STEM graduate degrees and of the majority of graduates are employed in science research or natural resources management professions. The remaining students are in various stages of progress towards graduation.</p> <p>Internships provide meaningful way for students to engage in something that excites them and the membership in a cohort further strengthens students' sense of purposefulness at UH Hilo.</p> <p>Keaholoa encourages and where necessary provides financial support for</p>	Successfully established with growing student interest in STEM research and career opportunities. Annual evaluations show high student satisfaction. Student interest increasing rapidly. Because internships provide a valuable opportunity to support the whole student for STEM success it should	Keaholoa staff and STEM faculty research mentors

		<p>participation in undergraduate STEM experiences including national and international seminars, workshops, courses and internships.</p> <p>Keaholoa also strongly encourages continuation of stem studies beyond the undergraduate degree by presenting opportunities available for financial support in graduate school.</p>	be continued.	
Develop strong links with other units in UH system to foster recruitment into UH Hilo stem majors.	Work with STEM faculty at community colleges to identify pre-requisite courses and establish transfer requirements as well as level of support for incoming transfers at UH Hilo.	UH Hilo Assistant Vice Chancellor collaborating to define transfer requirements for the creation of clear pipelines for students from Kapiolani, Maui and Hawai'i CC into STEM majors. As part of this activity program support is needed at HawCC that does not now have TCUP grant support.	“Pipeline/pathways” building began in 2005 and is expected to be completed in 2007. Need to work more intensively to support mathematics curriculum enhancement at HawCC that does not have a TCUP grant. This process has just started and will need at least three years to implement and evaluate its effectiveness as a recruitment strategy.	VCAA’s office PD, STEM faculty at various CCs
Shepherd Hawaiian students to present research findings at national conventions and to assist in other outreach activities.	<p>June 2004 Intern, Marci Arizumi, assisting in research on endemic Hawaiian snails, presented a paper at a conference in Oaxaca, Mexico. Other research projects are being implemented at the present time.</p> <p>Interns Lori Tango and Shelly Pelfrey co-authored reports and presentations delivered to governmental units and presented at international conference.</p> <p>Students attend SACNAS conference to learn and gain insight into scientific research and build confidence and competency.</p> <p>Students present at poster</p>	<p>Keaholoa interns have either presented posters, given presentations, or served at panelists at the following conferences and outreach activities:</p> <ul style="list-style-type: none"> • Native Hawaiian Educators Association Conference (2-3 students/year) • Hawai'i EPSCoR Conference in Hawai'i (2005) • International Geographers Association meeting at UH Mānoa – Keaholoa intern presented a paper with Geography professor (2006, 1 student) • Hawai'i Conservation Conference – Keaholoa intern served as a panel member on the value of a STEM discipline in higher education (annual attendance since 2003, all participating interns) • SACNAS Conference (2004, 2005, 2 students/year) • Nā Pua No'ēau Summer Institute – Keaholoa interns conducted GPS workshops for Summer Institute (2005, variable) • Nā Pua No'ēau Super Enrichment Saturdays – Keaholoa interns taught K-12 students various elements of “Tsunami” Natural hazard (2005, two interns as instructors) • Marine Science students demonstrated, taught, and hosted Michigan State University students discussed the water quality of estuarine ponds and its influence on public and coastal environment in East Hawai'i at two different locations; Hilo and Kapoho (2006) • Research project presentations to on Public Access Television program <i>UH Hilo Today</i> (2005, 2 students) 	Ongoing and gaining in demand each year	

	<p>sessions.</p> <p>Present research results at Keaholoa “mini conference” and ho’ike at the end of each semester.</p> <p>Work with faculty in analyzing data for reports and presentations.</p>	<ul style="list-style-type: none"> ASLO Marine Science Conference – poster presentation by Kehau Tom (2006). 		
Provide opportunities for all faculty to become exposed to the new HCAST paradigm.	Field trips, lectures, publications, new faculty orientation, website model is being developed for implementation in Spring 2005.	Keaholoa STEM Program brochures have been developed and distributed. In addition, a flyer highlighting each of the HCAST model areas was developed and distributed to faculty throughout the UH Hilo system. Keaholoa also gives a presentation at the new faculty orientation session each fall. Additional promotional materials and information dissemination are needed to ensure lasting impact and demonstrate intellectual merit.	Accomplished through series of meetings during Project initiation phase, but needs attention to information dissemination and feedback.	Keaholoa staff
STEM faculty-learners participate in a broad dissemination of pedagogical information and methods of curricula development to the UH Hilo and HawCC faculties.	Distribute brochures; give presentations to appropriate departments, committees, and administrators.	Brochures have been designed and distributed. More work needs to be done in this area.	Data collection ongoing and at a stage where preliminary conclusions can be made about faculty and student satisfaction. Needs to ensure that wider community beyond UH Hilo is aware of the impact of the TCUP supported initiatives at UH Hilo and in the lives of students.	PD, Project Specialist, David Sing
Once per semester hold a one-day STEM workshop on the UH Hilo campus for the benefit of all UH Hilo and HawCC faculty.	<p>Hold STEM Open House to introduce faculty at UH Hilo and DOE to the new Keaholoa initiative.</p> <p>Sponsor workshops to foster recruitment and retention at regular intervals.</p>	A one-day STEM Open House invitation extended to faculty and staff at UH Hilo and HawCC and others in 2003. Keaholoa interns presented their research projects. Their mentors, when able, attended the presentations.	A series of seminars and presentations have been held. Attention should now turn to inviting resource persons with expertise in recruitment and retention especially amongst students from groups that are underrepresented in STEM professions.	<p>PD, Project Specialist</p> <p>Partner with CAS Dean’s office and Dean College of Agriculture (CAFNRM)</p>
Provide access to STEM project resources (website, syllabi, collected literature) and mentoring	<p>http://www2.hawaii.edu/~keaholoa</p> <p>E-mail:</p>	<p>A Keaholoa STEM Program website is up and running with links to:</p> <ol style="list-style-type: none"> Keaholoa sponsored programs Application forms for internships Announcements of Summer Intensive with application forms 	Online. Maintenance and improvements planned.	UH Hilo webmaster, PD, Project Specialist

by STEM faculty-learners.	keaholoa@hawaii.edu	attached. Summer Intensive is a four-week Math/Chemistry summer bridge course.		
Provide STEM curricula development grants (5 per year) to be awarded by the end of each spring semester.	Provided release time for two faculty to work on curricula development; participation is limited by cost.	Curricula development grants have not been granted with the planned frequency. Funding has been provided to the following departments for curriculum revision in specific courses: <ul style="list-style-type: none"> • Geology – two courses developed by Geology faculty, Ken Hon and Jene Michaud • Math/Physics Program – for the development of the Math/Physics cohort; implemented in Fall 2006 with continuation of curriculum reform efforts over the next two years. 	Implemented and seeking opportunities for future release time.	PD, Philippe Binder, Raina Ivanova
Annual assessment of faculty given release time including: <ol style="list-style-type: none"> Number of faculty involved that were not part of the original faculty-learner group Number of faculty attending TCUP-STEM sponsored activities on campus Number of faculty taking Hawaiian language classes Number of visits to HCAST website Faculty evaluation of quality and effectiveness of STEM workshops and other activities. 		<ol style="list-style-type: none"> There are 15 faculty involved that were not part of the original faculty-learner group that are now part of the Keaholoa STEM Program. 11 TCUP-STEM sponsored activities have taken place on campus. Of these events, one was a weekly meeting that took place over a four-week period. A second event was a three-day On Course I workshop attended by 32 faculty/staff. The workshop focused on student retention and success. All other activities were one-time events with guest speakers and were well-attended averaging 15.1 persons per activity. 46 different faculty members have taken Hawaiian language classes. This has not been completed. Keaholoa staff is working with campus IT staff that can track this. Evaluation forms by faculty show a positive response to STEM workshops. Faculty showed positive response when student success and effective pedagogy was addressed. 		
CURRICULA ENHANCEMENT				
Increase under-represented Native Hawaiian students' engagement in environmental sciences,	Identify the major hindrance to success in STEM courses and majors. Reinstated Math	Keaholoa PD worked with the Math Department to get this course implemented. Four sections of Math 103 offered in Fall 2006. In Spring 2006, Keaholoa funded in-class tutors. Attached is a chart of Math 103 participants with both pre and post-test scores. This class had in-class tutors	Implementation begun. Sufficient time needed to assess effectiveness in achieving increased	PD, James Juvik, Debra Weeks, Denise Luker + in-class peer tutors

physical sciences, and mathematics.	103 - College Algebra course by 2004 after being abandoned for many years. Take action following successful demonstration of effectiveness of Math/Chem Summer Intensive program offered annually from 2003. Offer math MATH 103 on a regular basis with increasing number of sections in subsequent years. Improvement of curriculum of courses in geology, chemistry as faculty obtain transformative Native Hawaiian cultural knowledge.	available to students. The class instructor is providing a baseline class without tutors. Environmental Science and Studies BS and BA degree programs designed and offered beginning 2006-07	retention in STEM gateway courses.	(aim to have NH peer tutors where possible)
Increase exposure to careers in technology, science, and mathematics.	Interns are exposed to career possibilities through interaction with professional STEM research mentors, guest presenters and conference participation.	Native Hawaiians in technology, science, engineering and mathematics careers give presentations to Keaholoa interns at weekly mandatory meetings. Keaholoa also sends out career prospects to both current and past Keaholoa interns. A number of technology workshops held in collaboration with CAS Dean's office. University has fully equipped technology labs for instructional purposes and for student use. Courses incorporate technology in various ways. Keaholoa STEM ensures that students has access to equipment and software and also provides training workshops for students.	Being implemented, successful increase, being evaluated and improved continuously.	PD, Project Specialist CAS Dean's office UH IT office
Increase the number of Hawaiian students working in undergraduate research.		The number of Native Hawaiian students working in undergraduate research has grown from 4 (in Spring 2003) to 18 (in Fall 2006). In Fall 2006 nine (9) faculty mentors are working with 18 interns.	Implemented, working on finding more research opportunities for NH students to meet growing demand.	Keaholoa staff
Increase the awareness of all students not coming from this ethnic background of the sophisticated scientific practices embedded in Hawaiian culture.	First step is to work with faculty learners. This activity begun in 2003 and ongoing. Second seek embracing of new knowledge by STEM faculty and the addition of new information and new	This is slowly occurring. Faculty mentors learn from Faculty Development activities, from their student researchers about Hawaiian scientific practices and an increasing number of faculty members are taking advantage of the opportunity to learn about NH culture through language classes for faculty now being undertaken by Kīpuka.	Collaboration on campus-wide seminars and other activities that are part of Keaholoa's ongoing efforts to advance a new paradigm of stem education at UH Hilo.	Keaholoa staff, UH Hilo Student Services, STEM faculty, NH Student Center

	perspectives in classroom lessons and interactions with all students.			
Develop an interdisciplinary, introductory STEM course (STEM 101) for Native Hawaiian freshman.	Done in 2003 as NSCI 197: Introduction to Natural Sciences and in 2004 as NSCI 197: Watershed Science in Hawai'i.	Two STEM 101 courses have been offered in Fall 2003 and Fall 2005. The course was named Natural Science 197 (NSCI 197). The Fall 2003 offering focused on three modules: <ul style="list-style-type: none"> • Navigation/Astronomy/Physics • Ecology and Ethnobotany • Geology/Volcanology/Hydrology The Fall 2005 offering focused on the Hawaiian Watershed Land Management system.	Completed.	Keaholoa staff, Course instructors: Steven Lundblad, Olga Cordero-Brana, Philippe Binder Ron Amundson
Develop a one-month intensive summer undergraduate Mathematics course for Native Hawaiians.	Implement a mathematics and chemistry learning community program that incorporates culturally relevant examples as of Summer 2003.	A one-month Summer Intensive course, that works as a bridge from high school to university study, has been developed and implemented at UH Hilo. The course has two main emphases: chemistry and mathematics students are in class four days a week from 8:30 a.m. to 3:00 p.m. One day a week students are in the field applying classroom work to practical experience – from theory to practice. In-class tutors aid the instructors.	Developed, implemented with yearly evaluation.	Keaholoa staff, with relevant faculty working in a learning community
Involve local high school students by pairing them with college students that have taken STEM 101.		Keaholoa students have worked with high school students via Nā Pua No'eau opportunities only. This linkage will continue. In 2006 Keaholoa had the first opportunity to implement this item. Keaholoa working with local high school teachers make this item a reality. More work needs to be done in this regard and will occur through leveraged BWET grant for exposing high school students to watershed science. Program involves Keaholoa students.	Developed and being implemented; working with NPN As well as Keaholoa leveraged NOAA BWET grant.	Program Manager Cynthia Phillips, IT and Data Specialist
Create research internships for student involvement with faculty and other scientific agencies.		Keaholoa collaborates with PIPES and REU for student involvement with scientific agencies throughout the state; Keaholoa also funds supplies and materials for field research excursions for interns.	Developed and being implemented.	Keaholoa staff, Carmen Perez-Frayne, Sharon Ziegler-Chong
Organize on-campus STEM seminars focused on Hawaiian science and culture.	See list of seminars	Work needs to continue if this idea is to have broad reach and lasting impact. Faculty assessment generally positive but widespread acceptance requires that Keaholoa more vigorously establish itself as a resource or helping place that can resist or redirect faculty to experts on campus and in the community. The work being done by Keaholoa interns and their presentations at seminars on campus and in the media is one way of highlighting how Hawaiian knowledge and western science can be embraced as a whole. However no large scale campus-wide presentations done.	Undertake a campus-wide seminar program that focuses on Hawaiian culture and science.	Keaholoa staff
Improve the tutoring service by providing additional tutors, specifically tutors in STEM disciplines.	Implementation began in 2003 and continuing by means of tutorial support for STEM gateway courses.	Keaholoa is working with department chairs to provide tutors in gate keeping courses. Tutors were provided in Academic Year 2005-06 in gate keeping courses: Chemistry 124, Chemistry 125, Physics 107, and Physics 170. A Peer Tutor Coordinator was hired, but funding for that position was discontinued and Keaholoa Project Manager has assumed that position in Fall 2006. Working with administration to get this institutionalized.	Planned and being implemented. Goal is to institutionalize peer tutoring for STEM students. Keaholoa STEM seeks to establish a Center for	PD, Project Manager

			STEM Student Success in the future as a means of underscoring the crucial role of peer tutoring in raising the level of acceptance of STEM careers as a real choice for students, especially those students in our target population.	
Annual assessment of faculty including: <ol style="list-style-type: none"> Student participation in research projects Publications with student involvement and authorship Number of conference presentations by students and faculty Student evaluations of the research experience. 		Data are being gathered and collated. Information can be in found in the annual reports.	Ongoing.	PD, Project Specialist, Cynthia Phillips
FACULTY RESEARCH				
Involve Native Hawaiian students, ranging in age from 7 th grade through college, in hands-on field based research projects that provide critical first steps towards developing a sense of curiosity and an understanding of the applications of science, mathematics, and technology.		Keaholoa works with and funds Nā Pua No'ēau in this area through Super Enrichment Saturdays, Summer Institute, Pathways, and Ho'omau (a program focusing on a STEM pathway for high school students).	Keaholoa currently works with NPN providing interns in the Summer Institute and currently working with NPN on Pathways and Ho'omau.	PD, Project Manager, NPN staff, Kīpuka NH Student Center
Demystify science by portraying it as a process in which students can		Being done through K-12 efforts as well as at the university in internship program and student exposure to young scientists from under-represented groups at STEM conferences like SACNAS.	The process of education, and attitude change takes time and	NH scientists and cultural experts, Keaholoa staff

participate in all stages (development, implementation, assessment).			this of necessity has got to be an ongoing endeavor.	
Demonstrate that Hawaiians own scientific knowledge and performed scientific experiments in their cultural practices that should validate rather than alienate Native Hawaiian participation in the sciences.	See faculty development	Field excursions address this with Keaholoa interns. Work needs to be done to bring it to the UH Hilo campus. In Fall 2006 the student interns, faculty, and cultural interpreters will go to Kaho'olawe and be involved in service learning. But much more examples of this needs to be brought to the attention of the community. The local astronomy community conducts annual fairs at which students see the links between traditional Hawaiian knowledge of the universe and contemporary astronomy and navigation.	Being developed in consultation with NH cultural and science experts. Need more time to develop concrete demonstration projects.	Project Specialist, Project Manager, Becky Ostertag, and participating STEM faculty
Annual Assessment including: a. Student participation in research projects b. Publications with student involvement and authorship c. Number of conference presentations by students and faculty d. Student evaluations of the research experience.		Data gathered annually to fulfill requirements of NSF contractor Systemic Research, Inc. – student curricula performance indicators. Additionally data available for all: <ul style="list-style-type: none"> • Faculty development activities • Research Intern assessment of program and experience • Summer Intensive and tutorial programs. 	Annually available based and especially for variables selected by NSF contractor. Other program elements evaluated systematically.	Keaholoa staff, Cynthia Phillips
OUTREACH PROGRAM				
Begin the recruitment of Native Hawaiian middle and high school students.	Nā Pua No'eau, Summer Math-Chemistry Institute Presentations to K-12 science classes IT- presentations to K-12 teachers and classes On campus site visit by K-12 students treated to presentations by Keaholoa interns.	The recruitment has begun and is ongoing. Keaholoa collaborates with a range of on campus partners in this effort. The number of Native Hawaiian students at UH Hilo is increasing slowly as can be seen from the tables provided. In addition to the broad-based participation of students from a variety of schools in the state and from the USA Keaholoa staff engages in outreach presentation to inform students of the opportunities available to students with STEM education. Widespread recruitment efforts for High schools (Kea'au, Paho, Honoka'a, Kapolei, Nanakuli, Waianae high schools have been visited and contacted.	Established and ongoing.	Keaholoa with NH partners on UH Hilo campus as well as partners serving wider population

Increase the number of Hawaiian students matriculating into 2 and 4-year colleges.	Super Enrichment Saturdays, Summer Math-Chemistry Institute	Working with local high schools, and MauiCC and KapiolaniCC. Insufficient staffing makes this a challenge! However, the Keaholoa staff is involved in Science Olympiad, a high school science Olympic event among other activities.	Work in progress but large increase in enrollment not yet realized. Time frame for building foundation done but not sufficient to see growth especially in the number of NH STEM graduates.	Project Manager
Maintain strong community links so that more Hawaiians can easily access and feel connected to the 14 post-secondary campuses.		Keaholoa staff members have attended neighborhood councils where a large Native Hawaiian population resides. This has been done on a limited basis due to staff availability.	Started but not fully developed.	Project Manager
Collaborate with other educational and business partners to increase the success and use of technology by Native Hawaiian students and their families.		Keaholoa currently works with local economic development corporation and increasing its networking with technology firms on the Big Island.	Must work more closely with Advisory Council members and other local politicians and business entities to further shape this element.	Project Manager and PD
Super Enrichment Saturdays – offered annually and increasing to four offerings per year by Project Year 3.		Keaholoa provides funding and intern support at Super Enrichment Saturdays. In Fall 2006 a K-12 mentoring program is being planned with Nā Pua No’eau.	Annual event	Project Manager, NPN’s Toni Mallow and Steven Chin plus Keaholoa interns
Establish suitable channels of communication-establish Websites for communication amongst Super Saturdays and Summer Institute participants, faculty-learners and <i>kumu</i> .		Very little work done on this item.	Links have been made on websites. Phase II would give attention to this item.	Keaholoa staff
Annual assessment including: a. Complete formative and summative program evaluations b. Develop student profiles along with a TCUP-STEM student database		The Annual Report to NSF provides this information. However, Keaholoa has begun to address each of the following: a. We have begun this process by seeking an external evaluator b. This is process has also begun and we developing a TCUP-STEM student database.	This has been started, and continues to be updated, researched, and worked on through each part of the HCAST model.	Keaholoa staff, Cynthia Phillips, UH Hilo partners

<ul style="list-style-type: none"> c. Evidence of increase in number of Native Hawaiian students matriculating into 2 and 4-year colleges d. Document the number of participating students who apply to post-secondary institutions e. Track the number of TCUP-STEM participants that later choosing careers in STEM areas f. Numerical increase of Native Hawaiian students participating in enriching learning activities. 		<ul style="list-style-type: none"> c. We are working with campus partners in gathering data for this item d. We have begun this item and students are providing information of their application and entrance into graduate schools e. A tracking system has been put into place f. Working on this item. 		
---	--	---	--	--