Kapi‘olani Community College’s STEP-UP Program

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STEP-UP Program

GOALS

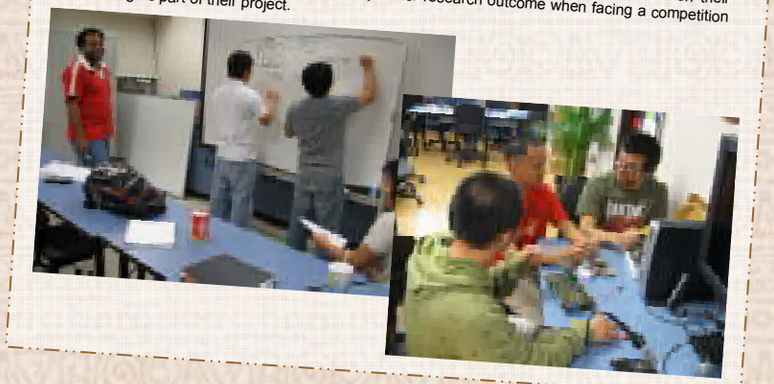
Kapi‘olani Community College's STEP-UP goals are:

1. To increase the number of students in the College's STEM pipeline.
2. To increase the number of Associate in Science in Natural Science (ASNS) degree completers.
3. To increase the number of students matriculating to two collaborating four-year institutions.
4. To institutionalize and provide ongoing support for those STEM students through pre-college recruitment; support of their learning through mentoring, tutoring, and Peer-Led-Unit-Study (PLUS) sessions; and their involvement in research activities.

STRATEGIES

Kapi‘olani Community College's STEP-UP strategies are:

1. Computer-building complemented by telemetry activities (cricketSAT), and/or a Computer-aided project (CAD) using Solidworks. Students are taught how computer hardware and software work and demonstrate these skills through building a brand new computer system, installing the operating system and improving their ability to use it efficiently for academic purposes. In year one, two feeder high schools and 34 students (34 applicants) were impacted. In year two, four feeder high schools and 40 students (61+ applicants) will be impacted by this program.
2. Peer tutors’ and mentors’ helping other STEM students in their learning experience in addition to improving their ability to articulate their ideas and methods to their peers. The number of tutors and mentors increased from 3 to 9, and included Life Science as well as Mathematics.
3. Implementation of Peer-Led-Unit-Study (PLUS) sessions to support STEM students demonstration and applications of newly acquired scientific theories and methods through problem solving exercises. These sessions are conducted by students, for students and supervised by faculty teaching the topics. Students meet once a week and practice problems with the leadership and help of PLUS students.
4. Development of undergraduate research activities. Students perform better in their curriculum when they are exposed to an applied activity related to their field of interest. They also respond positively to being assigned responsibilities from the faculty as they work on their projects. They finally produce significantly better research outcome when facing a competition setting as part of their project.



Implementation Progress

UNDERGRADUATE RESEARCH EXPERIENCE

Undergraduate students respond well to team competition as a strategy for developing the skills needed in STEM undergraduate research. These experiences allow students to work in teams to:

- Design the project.
- Establish a reasonable project timeline.
- Estimate budget requirements.
- Formally recognize project constraints.
- Learn to anticipate factors affecting design.
- Construct and implement the design.
- Test and analyze the design.
- Make formal presentations of project strategy.

Perhaps more importantly, the students learn less tangible skills such as meeting deadlines, responsibility, working independently while supporting a team, developing a project from beginning to end and confidence in their abilities, which then carry over to their academic performance as STEM students, and as a future scientists.

IMPLEMENTATION PROCESS

STEM student participation in undergraduate research begins either by direct interaction with a STEM faculty mentor via a proposal process or by participating in a required one-semester physic laboratory exercise that introduces students to project design, research methodology, cost estimation, and research proposal presentations. Many students decide to implement their ideas the following semester.

STUDENT ENROLLMENT IN UNDERGRADUATE RESEARCH EXPERIENCE (URE) PROJECTS

	Number of Students involved in research	
	Engineering/Physical Science	Life Science
Year one	5	1
Year two	14	4

URE 1. TELEMETRY COMPETITION: CANSAT

Ten STEM students will participate in the 2009 CANSAT Design competition. Their objective is to design and build an airborne telemetry system capable of performing simple communication and telemetry functions, as well as acquiring atmospheric data during a controlled decent from a small, low power rocket. The CANSAT competition is scheduled in June 2009 In Amarillo, TX.

Students are responsible for the design and the construction of their CANSAT under strict requirements and specification provided by the competition organizing committee. The CANSAT must accomplish the following tasks:

- Measure altitude during its ascending flight once propelled by a rocket.
- Measure and control its descending speed with a parachute.
- Resist the landing and measure earth temperature.
- All measured data must be sent to the control station in real time.

See CANSAT website for details:
http://www.cansatcompetition.com/

URE 2. MATE COMPETITION: UROV

Four KCC STEM students will design and build an Under Water Remotely Operated Vehicle (UROV) capable of accomplishing a specifically designed mission that simulates a submarine rescue training exercise with the goal of participating in the MATE UROV international competition scheduled in June 2009 in Buzzard’s Bay, MA, which involves:

- The survey and inspection of a submarine for damage.
- The transfer of emergency rescue pods into the submarine’s escape tower.
- The insertion of airline supply through connecting valves.
- The building and incorporation of a transfer kit into the rescue vehicle.

See MATE UROV website for details:
http://www.marinetech.org/rov_competition/

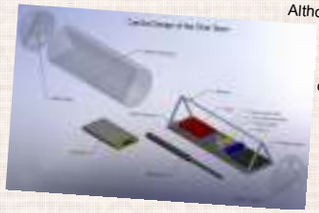
Opportunities and Challenges

OPPORTUNITY: EXPANDING THE URE PROGRAM AT KCC

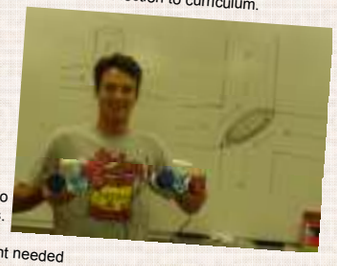
The primary goal of the KCC STEP program is to increase the number of students in the College’s STEM pipeline. In order to achieve this goal and to provide additional opportunities for URE it is essential that more STEM faculty participate in the URE projects as mentors. The URE model has seen much success in engineering and physics and must now be broadened to include research experiences in other disciplines such as chemistry, physiology, biology, ecology, and biotechnology.

Examples of possible future URE projects include the PISCES Lunar Outpost Design Competition for engineering and physiology and the MIT-based Genetically engineered machine competition (iGEM) for microbiology and biotechnology students. These and other similar student competition provide unique opportunities for students to participate in meaningful research experiences while interacting with faculty mentor outside the normal classroom setting.

CHALLENGE: FACULTY ENGAGEMENT



Although many of the science and mathematics faculty at KCC recognize the value of URE many have resisted becoming involved because of workload issues and are unwilling to commit to a project which does not have a clear, well defined connection to curriculum.



MEETING THE CHALLENGE

Several initiatives have been implemented at KCC to encourage faculty involvement in URE projects.

- Provide financial support for initial equipment needed to implement the projects.
- Provide reassigned time from regular teaching requirements to work on URE projects.
- Leverage new funding sources to support the URE initiative.
- Include URE in the job description for new faculty hires in Mathematics and Science.
- Display the outcomes of student research in the College’s STEM Center to be readily available at plain sight as a tool for recruiting new faculty and students.
- Use URE-experienced peer mentors to assist URE participants in day-to-day operations.