UNIVERSITY OF HAWAI'I SYSTEM ANNUAL REPORT

REPORT TO THE 2009 LEGISLATURE

Report on Hawaii Excellence through Science and Technology Academy Pilot Program

Act 111, SLH 2007 (section 8)

November 2008

INTRODUCTION

In session 2007 the Hawaii State Legislature passed SB 885 SD2 HD3 CD1, which appropriated $261,020 to Kaua'i Community College and $26,730 to the Department of Education to collaborate on the establishment of a Hawaii Excellence through Science and Technology Academy pilot program.

The desired outcome of Act 111 is, "…to increase the readiness and motivation of Hawaii high school graduates to pursue post-secondary training and career options in science, technology, engineering, and mathematics disciplines."

The first year of the biennium was designated a planning year and the second year was to be the implementation of activities and beginning the process of measuring results.

BACKGROUND

Planning Principles

In initial planning discussions among Kaua'i Community College, the Kaua'i Complex Area Superintendent and high school principals, one often voiced concern was to build a model which would incorporate and build upon current STEM activities on Kaua'i and not be perceived as a totally separate project, just "another item on the plate" for teachers. Our report to the Legislature for 2007 included a brief summary of current and previous cooperative activities, such as former Mayor Bryan Baptiste's Team Tech efforts and on-going articulation and alignment efforts between the Kaua'i Community College and Kaua'i high schools. A copy of that report is included for reference. (Attachment 1)

Certain planning principles were agreed upon by all parties at the beginning of the planning year and underlay all our efforts. The Kaua'i Complex Area administrators, high school principals, head science and math teachers, our community partner, the Kaua'i Economic Development Board (KEDB), and Kaua'i Community College administrators and science and math faculty leaders set joint goals and agreements.

1. Linkage from 9th grade through 12th grade, with pathways defined to the middle schools for later development. Math and science foundations set in 9th and 10th grade to prepare students for dual credit (college and high school) courses in 11th and 12th.

2. Career and Technical courses as well as general core courses offering dual credit.

3. Contextual and applied learning, STEM skills and concepts will be integrated to reflect real world situations and problems. A theme, such as "Kauaʻi's Sustainable Future" might be selected to tie academy courses together.

4. Common assessment plans will also link dual credit classes and preparatory classes; these are not "high stakes" single exams, but assessment plans with mutually agreed upon content, assessment strategies and evaluation. CORD curriculum and assessment as well as the COMPASS placement test used by the community colleges will/may be part of the assessment plan. Other external tests such as the Apprenticeship exam, pre-Nursing test, Automotive Service Excellence (ASE) tests will be used as resources for both curriculum development and assessment.

5. Current community resources such as Adopt-a-School partnerships and KEDB's Aloha ʻIke will be integrated into the academy.

6. Sustainability of the Academy itself requires commitment to on-going professional development and on-going, collaborative curriculum review, revision and development involving both high school and community college teachers.

7. Focus on "neglected majority" students.

8. The ultimate goal is to produce students prepared to enter and succeed in STEM programs at Kauaʻi Community College and other UH campuses.

RESULTS OF PLANNING PERIOD

The strategy underlying the Kauaʻi STEM activities is to facilitate change in the high school classroom by supporting the high school teacher in that classroom, not by replacing him/her. The College reallocated funds internally to cover the costs of the participation of its own faculty in the project, specifically to retain as much money as possible from the allocation to allow all three high schools (and we later added Niʻihau School) to participate.

The project began by bringing the high school teachers and principals to the table to identify the crucial obstacles slowing student progress to college level STEM courses and to identify the obstacles that kept students from choosing STEM programs in the first place. Difficulty with math was the unanimous finding.

Thus funds were used to bring KCC faculty and high school teachers together, outside of the regular workday, to attack several different tasks, all of which were accomplished in this first year:

1. Articulated the high school Algebra I class with the College's Math 24, elementary algebra class and the high school Algebra II class with the College's Math 25, intermediate algebra class.

2. Developed a set of assessment instruments for Algebra I and Algebra II to be used as the same benchmark tracker instrument at all three public high schools. The assessment tests have been implemented for Algebra I. The Algebra II tests are awaiting the release of funding for year 2, in order to input them into the software.

3. Developed a Memorandum of Agreement to grant a waiver of the COMPASS placement test for math, for high school students who successfully complete Algebra I (grade of B) and achieve an acceptable score on the benchmark tracker tests and end of year exam. (Attachment 2) This MOA will be implemented regardless of the status of funding for year two of the project.

4. Identified specific math applications to connect science classes and math classes in the high schools, e.g., the use of statistical analysis in science classes.

5. Identified math competency expectations in College science classes and developed classroom activities for both high school math and science courses to ensure that students are prepared for college level work, e.g., the application of logarithms to the pH scale.

6. Provided training for high school teachers in applied math and science, using the applications and expectations identified above. Short workshops were developed and presented by Kauaʻi CC faculty. In addition, the University of Hawaiʻi at Mānoa College of Education developed a 400-level course, applicable to a master's program. Part of the second year funding was budgeted to support teachers who wished to take the course. Our community partner, KEDB, is also prepared to provide funding in this area of professional development for teachers.

7. A pilot group of Electronics faculty was added to the working groups, to investigate how we might bring CTE programs and teachers into the mix to further promote an integrated and applied academic approach to STEM curricula. This group worked on articulation of an introductory Photonics course at Kauaʻi High School to one of the College's courses. That course is currently being offered at Kauaʻi High School.

8. Equipped all three public high schools on Kauaʻi and Niʻihau School on Niʻihau with equipment and supplies appropriate to the classroom activities being developed by the teachers in the groups. The groups of teachers at each high school were also charged to ensure that the equipment would benefit multiple classrooms and multiple teachers, beyond those directly involved in the STEM project. High school principals and the Kauaʻi Complex Area administrators have full inventories of purchases and explanations from the teachers of how they intend to use the equipment.

In the spring semester additional teachers from all three high schools were brought on board, bringing the total number working on the above tasks to nineteen (19). Groups were formed based on science and math areas, e.g., Chemistry/Physics, Biological Sciences, to identify articulation possibilities between high school and college courses as well as to expand the identification of specific competencies students need to be successful in college level STEM courses.

Additional positive changes took place at individual schools, e.g., at Kapaʻa High School, the joint meeting of science and math faculty has been so beneficial that Principal Gilmore Yoon decided to provide a coordinated free period to specifically bring the teachers together on a regular basis to align curriculum and to identify cross-disciplinary student issues immediately.

The participation of Niʻihau School teachers in this STEM pilot grew from an on-going project, begun with federal funds and currently supported by a grant from the Office of Hawaiian Affairs. The College has been working with the current teachers on Niʻihau to achieve certification as required under No Child Left Behind. Funding was provided for science lab equipment, to ensure that the students on Niʻihau have similar opportunities to achieve the expected competencies in math and science areas.

The beneficial results of this project can, perhaps, best be seen from the reports of the teachers themselves. Excerpts from their yearend reports are appended at the end of this report and the complete set of teacher comments can be found in Attachment 3.

PROPOSED IMPLEMENTATION PHASE, 2008-2009

Should the funding for the implementation phase be released, the Kauaʻi partnership intends to accomplish the following tasks:

- Implement the COMPASS waiver procedure for ALG II/ Math 25
- Establish a tracking system and track the success of students using the waiver, vs. past student performance.
- Implement classroom hands-on, applied math activities in both math and science classrooms and involve additional CTE teachers from both the College and the high schools.
- Develop additional integrated math/sci activities and share across high schools
- Develop island wide, coordinated STEM activities building on current school specific activities and integrate into the classrooms, rather than only as extracurricular activities.
- Develop island wide, coordinated STEM activities using a Sustainability and Environmental Monitoring theme, including clean, renewable energy building on community interest and business/industry participation, e.g., KIUC, HCEI, KEDB
- Develop place-based science-centered, research/instructional activities at each high school.
- Agree upon performance measures both in high school and KCC to measure student learning outcomes. Develop tracking and reporting mechanism.

EXCERPTS FROM TEACHER REPORTS

Excerpts from some of the yearend reports done by the high school teachers who are part of the Kauai STEM Initiative describe meaningful change not only in individual classrooms, but across the high schools. The complete reports are in Attachment 3. A summary of the CTE pilot is Attachment 4.

> I've been teaching for almost ten years and there isn't a professional group or program that compares to the level of

professional development that I have received through being a part of the STEM math and science collaboration teams on Kauai… Regular meetings between science and math high school teachers and college professors (Dr. Yamamoto and Dr. Kalk) have helped me to facilitate statistical analysis of data from lab activities and science fair projects with students. Last school year, I was able to have my students conduct statistical analysis (mean, mode, standard deviation, T-test) on the data collected from their science fair projects with my Honors biology classes. Because of the support of STEM, this year I will be able to teach all of my biology students how to conduct statistical analysis both on laboratory activities as well as their science fair projects.

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There were several meetings held throughout the year between the faculty at Kauai Community College and the three high schools on Kauai. The meetings allowed us to first, become familiar with the standards and expectations for the curriculum at each school. This allowed us to then align our curriculum to meet the requirements of all parties involved. A common assessment was constructed to use to assess our student's progress. We then worked together to create lessons that could be used in our high school classrooms that taught our students the skills that they needed to succeed in college courses.

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The math and chemistry teachers made a tentative plan to have a project on water. I would like to see this plan come to fruition. It would be interesting to see the similarities and differences of water quality across the island.

One of our STEM math teachers and myself have plans to work with one another so our students will be able to see that math and chemistry really do relate to each other. We asked that our preps be at the same time in order that we could work on our projects and that request was granted.

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I received microscopes with the ability to attach them to a computer. I can share with the entire class microscopic images. We all use mathematics together to calculate magnification, size of specimen, and its biology in ways I had only dreamed of before. With the addition of the “mobile science computer lab”, the students can each plug their own microscope and save their

microscopic images. They can manipulate the image for further understanding. With the "mobile science computer lab" they can collect data and graph their results. It is an excellent opportunity to emphasize mathematics in science.

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The equipment purchases for our school have mainly been quality probe ware, computers, and graphing technology. These technologies have already greatly furthered our cause in making learning fun, and motivating students, and giving them real-life, practical applications for math and science concepts. Lessons and use of statistical analysis brought a whole new level of understanding for students doing science fair projects. Every student in my science classes was able to apply mathematical concepts with data gained through scientific inquiry. In the science fair we had several students able to compete at the state level and beyond. Today, in my Human physiology classes we discussed the application of logarithms to the pH scale. As a science teacher I feel that my own understanding of the content has vastly improved because of my involvement with STEM and I truly believe that this understanding, along with our new technologies, will translate to improved rankings on state standardized tests.

Below is an excerpt from a report by KCC Assistant Professor Francis Takahashi, Electronics on the pilot to create the same relationships between KCC CTE programs and their counterparts in the high schools.

Alfredo Carbonel of Kauai High School is offering an electronics course (TIN 5620) this fall as a precursor to the photonics course in the spring. He has 22 students in his etro course. The Photonics course in the spring is also listed as TIN 5620.

He has to conform to the DOE learning outcomes. Our link is through the NIDA Basic Electronics CAI (computer assisted instruction) program. As the PTF (Primary Training Facility), Kauaʻi Community College pays an annual $1,000 fee to use the NIDA server to link me [Francis Takahashi] to the satellite high schools. The electronics lessons (3 CDs) are loaded on the laptops KHS purchased with the STEM funds. The KCC database stores the results of their work and their quiz scores.

The course that corresponds to Alfredo's course is ETRO 18. We also use the same NIDA Basic Electronics CAI program as an addition resource for our course. Articulation has to be worked out but if we follow the CAI curriculum it would be easy to articulate the courses.