

SR 86

**EDH-EDT-
HRE**

Date: 03/31/2010

Committee: Senate Economic
Development and Technology
Senate Education and Housing
Senate Higher Education

Department: Education

Person Testifying: Kathryn S. Matayoshi, Interim Superintendent of Education

Title of Bill: SCR 186/SR 86 Requesting a Status Report and Update on the STEM, Research Experiences for Teachers – Middle School, Project Environmental and Spatial Technology, and Robotics Programs Within Public Schools

Purpose of Bill: Requests a status report and update on the STEM, Research Experiences for Teachers – Middle School, Project Environmental and Spatial Technology, and robotics programs within public schools.

Department's Position: The Department of Education (Department) supports SCR 186/SR 86 and will provide a status report and update on the STEM, Research Experiences for Teachers – Middle School, Project Environmental and Spatial Technology, and robotics programs within public schools to the 2011 Legislature. The Department appreciates the support and endorsement of the Legislature for science, technology, engineering, and math (STEM) initiatives to build capacity for teachers and provide STEM-related programs for students.



**DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT & TOURISM**

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Statement of

THEODORE E. LIU
Director

Department of Business, Economic Development, and Tourism
before the

**COMMITTEES ON EDUCATION AND HOUSING, ECONOMIC DEVELOPMENT
AND TECHNOLOGY, and HIGHER EDUCATION**

March 31, 2010

1:15 p.m.

State Capitol, Conference Room 016

in consideration of

SCR 186 and SR 86

**REQUESTING A STATUS REPORT AND UPDATE ON THE STEM, RESEARCH
EXPERIENCES FOR TEACHERS – MIDDLE SCHOOL, PROJECT
ENVIRONMENTAL AND SPATIAL TECHNOLOGY, AND ROBOTICS PROGRAMS
WITHIN PUBLIC SCHOOLS.**

Chairs Sakamoto, Fukunaga, and Tokuda, Vice Chairs Kidani, Baker, and Sakamoto and Members of the Senate Committees on Education and Housing, Economic Development and Technology, and Higher Education. The Department of Business, Economic Development, and Tourism (DBEDT) is pleased to provide an overview of the STEM programs supported by Acts 111 and 271, SLH 2007 and some of the other STEM activities that have taken place since 2007.

In January 2007, Governor Linda Lingle announced the Innovation Initiative that would be a key component of the Administration's legislative package designed to transform Hawaii's economy to one reliant on the development of human capital. Innovation and the importance of a strong STEM education were featured in her State of the State address. The Innovation Initiative included the Innovation in Education companion bills with seven proposals to improve Hawaii's ability to deliver an enhanced STEM education to all public school students. Governor Lingle's strong commitment was demonstrated by her personal appearance to testify on behalf of the bills. The proposals included:

- Creation of 14 Hawaii Excellence in Science & Technology (HiEST) Academies in volunteer high schools which would provide a rigorous science and math curriculum, teacher training and support, and laboratory furniture, equipment and supplies provided through the Center for Occupational Research and Development (CORD).
- Creation of the Fostering Inspiration and Relevance through Science & Technology (FIRST) Pre-academy program to expand robotics, the Research Experience for Teachers (RET) program, and other contextual learning opportunities in middle schools.
- Funding for professional development of in-service teachers.
- Funding for attracting STEM professionals to teaching through the Transition to Teaching program.
- Funding for increasing STEM internship/mentorship opportunities.
- Creation of a STEM scholarship program for students completing HiEST academies.
- Creation of a State fund to match private contributions for establishing STEM chairs at the University of Hawaii.

The Legislature strongly supports STEM education and included versions of the first five initiatives in one of their education bills, resulting in the passage of Act 111, SLH 2007.

- HiEST: Act 111 provided \$261,020 per year for two years to Kauai Community College (KCC) for a pilot program. KCC elected to use the funds to improve their math capacity. A limited pilot program at Waipahu High School for the 07-08 SY was also started. For the 08-09 SY, \$1,923,330 was expended to continue the program in Waipahu High School and establish HiEST Academies in six new schools (Baldwin on Maui, Kau on the Big Island, and Campbell, Kahuku, Olomana, and Waiialua on Oahu), reaching over 500 students. For 09-10 SY \$1,256,402 in federal stimulus funds and \$1.9 million for the 10-11 SY will fund an expansion of the program to 15 more schools.
- FIRST: Act 111 appropriated \$1,402,230 for FY 08 and the same sum for FY 09. Robotics was awarded \$314,925 in each year of the biennium, and the Research Experience for Teachers (RET) program received \$734,805 for each year. The FIRST Pre-academy program was effective in expanding robotics to more participating schools, reaching over 1,300 students. The RET program expanded from 4 to 25 schools, encompassing 65 teachers with access to over 14,000 students. In addition, the College of Engineering established the STEM Intercommunity Portal (SIP) to connect UH researchers with teachers and students. Maintenance funding was requested as part of the 2009 Administration budget, but was not appropriated. Fortunately Federal stimulus funds are available and \$3.1 million will be used over the next two years to fund FIRST pre-academies in every public middle school by SY2012.
- Professional Development: Act 111 provided \$175,000 for each year of the biennium to the UH College of Education. FY 08 funds provided intensive training to 20 elementary and 6 secondary math teachers, and 175 elementary and 75 secondary science teachers, impacting an estimated 3,800 elementary and 7,800 secondary students. FY 09 funds trained 111 math teachers and 125 science teachers, reaching 5,280 elementary and 11,200 secondary students. The Department of Education is encouraged to continue this

training. It is worth noting that Race to the Top gives points to those school systems which include STEM training as an on-going part of their training programs for classroom teachers.

- Transition to Teaching: Act 111 provided \$175,000 for each year of the biennium to the UH College of Education. Fifteen students were supported in the first year with tuition stipends, Praxis™ support, professional development workshops and mentorships with experienced teachers.
- Internships/Mentorships: Act 111 provided \$110,000 for each year of the biennium to DBEDT for this program. These funds were leveraged by supplementing an existing contract with the University of Hawaii for EPSCoR matching funds to establish the UH STEM Workforce Development Program. Working with the Sustainable Saunders (now Sustainable UH) program a Sustainability Internship Program was developed. With funding from a grant submitted to the State Energy Division for ARRA funds, it is estimated that 1000-2000 students will be served this year.

The STEM Workforce Development Program Office also created a mentoring agricultural pilot project in vertical farming techniques with the UH College of Tropical Agriculture and Human Resources. Fourteen schools received growing systems and teacher training and 300 students participated.

In addition, the 2007 Legislature passed Act 271 providing \$1.1 million to the Economic Development Alliance of Hawaii to maintain existing Project EAST (Environmental and Spatial Technology) programs in schools on the Neighbor Islands and expand the program to four schools on Oahu. This program provides students with equipment and training to carry out self-directed contextual learning programs aimed at providing community support. At the current funding level, it serves about 600 students annually.

When Governor Lingle announced the Innovation Initiative in January 2007, she also announced that she had secured a commitment from NASA for \$1 million to hold a regional competition of the FIRST Robotics Competition in Hawaii for four years, beginning in the Spring of 2008. Governor Lingle had been inspired by meeting Dean Kamen, co-founder of FIRST. She immediately recognized the potential of robotics to capture the imagination of students and take the fear out of math and science while clearly demonstrating the relevance of these subjects. Excerpts from a 2009 Governor's Press Release indicate how integral robotics has become to Hawaii's STEM efforts:

“The impressive number of students participating in robotics competition underscores the growing popularity of robotics education in Hawai'i's schools as a highly effective way for students to have fun while learning,” said Governor Linda Lingle. “Students who engage in robotics, with the support of teachers and mentors from their schools and around our community, are gaining critical thinking skills that will help them in their education as well as their future careers. Through robotics, we are building the

next generation of innovators who will find solutions to complex challenges facing our state and nation.”

.....

Robotics is a critical component of the Lingle-Aiona Administration’s Hawai‘i Innovation Initiative because it engages students in science, technology, engineering and math (STEM) education. The competition also fosters students’ teamwork, communication, critical thinking, and problem-solving skills that will better prepare them to enter the work force, regardless of what career they choose.

“We are committed to expanding robotics programs to every school in our state,” said Lt. Governor Aiona. “Robotics is a fun and exciting way for Hawai‘i students to excel at science, technology, engineering and math. These young people are learning how to solve tomorrow’s problems today.”

Participation in robotics has expanded dramatically in the past three years, with support from the Governor’s Office, DBEDT, Act 111 funding, the University of Hawaii, NASA, the Robotics Organizing Committee, BAE Systems and other industry sponsors, and the hundreds of teacher advisors, industry mentors, parents and other volunteers that give tirelessly of their time, expertise, and funds. In January 2007, there were 95 programs. Today there are 422 programs in public, charter and private schools throughout the State, with many schools participating in more than one of the six major programs: FIRST LEGO League (FLL); Underwater Remote Operating Vehicle (ROV); VEX Robotics; Botball; FIRST Robotics Competition (FRC); and Micro Robotics.

Hawaii continued its STEM momentum by becoming one of the six states to successfully compete for the prestigious STEM Grants from the National Governors Association. Hawaii’s proposal was supported by the Administration, the Department of Education, the University of Hawaii, the Hawaii State Legislature and key industry leaders. One of the key benefits of the State’s selection has been the ability to interact with other STEM grantee states and exchange information and support.

The three deliverables included an Outcomes Accountability System to assess the effectiveness of STEM programs, professional development for teachers to acquaint them with new STEM opportunities, and a STEM web portal to broadly provide information on the importance of STEM and STEM activities in Hawaii. The grant concluded on March 15, 2010 and the final report is being prepared

Creativity Academies

In 2008, DBEDT’s Creative Industries Division took the lead in developing a cooperative effort between the UH Community Colleges, the Department of Education and science, technology and arts industries to engage students in STEM education via a fusion of creative disciplines into STEM course study. DBEDT provided seed funding of \$370,000 matched by DOE Career & Technical Education (CTE) program and support from Kapiolani Community

College to launch the pilot program, which included developing the curriculum to create a dynamic contextual learning module that engages a broader spectrum of Hawaii students in STEM education through the integration of animation, game design, creative writing and digital media for middle through high school. The core standards of the first curriculum modules for Creativity Academies (CA) program are Art 112 and Physics 100; both courses are in the process of being fully articulated within the DOE and UH systems. Thirty-three teachers and from 26 schools participated in the pilot CA program for 2009. Federal stimulus funds in the amount of \$1.9 million for FY10-11 have been designated to continue and expand the program to 35 schools statewide.

Real World Design Challenge

Hawaii also demonstrated its commitment to STEM education leadership by signing on as one of the 10 states participating in the inaugural Real World Design Challenge (RWDC). The RWDC is an annual competition sponsored by the National Aeronautics and Space Administration (NASA), the Federal Aviation Administration (FAA), the U.S. Department of Energy, Cessna, and PTC that provides high school students with the opportunity to apply the lessons of the classroom to important energy and environment technical problems currently encountered in the engineering field. The purpose of the RWDC is to ensure the future of our Nation's economic competitiveness by inspiring today's students to become tomorrow's engineers. State coordination has been provided by the UH STEM Workforce Development Coordinator (funded by DBEDT contract with UH for EPSCoR and Act 111) and the DBEDT Office of Aerospace Development.

Each participating school received free professional engineering design software, licenses and training from PTC worth about \$1 million. Mastering the software and the physics needed to solve the challenge is very rigorous and requires a stretch for all students. The theme for the inaugural 2009 Challenge was "Aviation and Fuel Consumption." Hawaii's first place winner, an all-girl team from Iolani School, took first place at the national competition. The 2010 national competition, with 20 state winning teams vying for the best design, was held in Washington, D.C. March 26 and 27. Hawaii's winning team, again from Iolani School, represented Hawaii well, taking second place and also winning the prestigious Design Notebook Quality Award.

Career and Technical Education

In January 2009, the Department of Education and the University of Hawaii Community College System entered into a formal agreement called the "Career and Technical Education (CTE) Dual Credit Articulated Program of Study (DCAPS)." DCAPS enables high school students who successfully master the specified standards/student learning outcomes common to both secondary- and postsecondary-level CTE programs of study to receive credit for college courses. Four of the six CTE career pathways are STEM-related. In addition the growing statewide enthusiasm for robotics is also building within the CTE program's Industrial Engineering & Technology (IET) pathway. Alignment is being developed between robotics and CTE standards to assist teachers in IET programs.

College and Career Ready Graduation Standards

In October 2009, Governor Lingle, Superintendent of Education Patricia Hamamoto, and UH President M.R.C. Greenwood signed the historic Memorandum of Agreement (MOA) to Significantly Improve Student Achievement in Hawaii by Using American Reinvestment and Recovery (“ARRA”) Resources to Advance Education Reform. Key objectives of the MOA include adopting common core standards for math and language arts; ensuring that curricula, supporting materials and assessments are aligned to college-and-career-ready standards; focusing on teacher quality; establishing a Pre-K to College and Career tracking system and using internationally benchmarked standards to measure performance; and closing the achievement gap between Hawaii’s bottom and top performing schools.

Aerospace and STEM

Also, in October 2009, DBEDT’s Office of Aerospace Development (OAD) organized the statewide Aerospace in Hawaii Week celebration in conjunction with World Space Week, whose 2009 theme was “Space for Education.” Special emphasis was given in Hawaii to programs that underscore opportunities to enhance STEM education with a broad range of community outreach programs in STEM education, including an aerospace industry lecture series at the State Capitol, public aerospace displays/demonstrations at community centers statewide, astronaut presentations at both public and private schools, and weeklong broadcasts of aerospace programs on the DOE’s Teleschool network.

Other STEM education opportunities related to aerospace are coordinated by OAD and its partners, including:

- NASA Professional Mentoring Programs to provide K-12 students with unique space-related mentoring programs with professionals in the aerospace industry. In 2009, this program focused primarily on NASA’s LCROSS (Lunar Crater Observation and Sensing Satellite) Program, and trained over 30 teachers to lead teams of students to monitor and receive/analyze data from the LCROSS Satellite.
- Aerospace Student Design Competition: This annual Hawaii event challenges both university and high school students statewide to develop credible designs for future human habitats on the Moon with the help of mentors from NASA and various aerospace companies nationwide.
- University/K-12 Aerospace Education and Training involves undergraduate seminars and teleconferences introducing students to basic skills in aerospace, as well as providing unique opportunities to directly interact with aerospace professionals at NASA centers and aerospace corporations nationwide.

The DOE recently entered into a partnership with Discovery Education (DE), promoting 21st Century Learning through a Discovery Networks program. All K-8 students, schools, and their teachers are able to access Discovery Streaming, the largest library of digital content correlated to the HCPS III standards, and Discovery Education Science, the online instructional

service supporting science inquiry with content developed for and tied to state science standards. Discovery Education can be explored at www.discoveryeducation.com

These are just some of the STEM programs and initiatives that can be found in Hawaii and the list is not meant to be comprehensive. The NGA grant sponsored MySTEM Hawaii web portal (www.mystemhawaii.org) will serve as the gateway to all the programs that have been in existence for a number of years or are started as the enthusiasm for STEM increases and spreads. Robotics classes are being incorporated into the curriculum at several schools and robotics is reaching down into the elementary grades. There are several STEM charter schools. STEM is becoming infused into much of our education system and the ultimate goal is to integrate STEM into the curriculum and provide all Hawaii students with a sound foundation in STEM skills.

Regarding the request for information on tracking growth of emerging industries, DBEDT's December 2009 report, "Benchmarking Hawaii's Emerging Industries," is available on the DBEDT web site at (http://hawaii.gov/dbedt/info/economic/data_reports/emerging-industries/EmergIndyBchmrkSummary.pdf)

Thank you for the opportunity to testify on this resolution.

**Personal Testimony Presented Before the
Committee on Education and Housing
Committee on Economic Development and Technology
Committee on Higher Education**

March 31, 2010 – 1:15 p.m.
Conference Room 016

By

Peter E. Crouch, Dean

College of Engineering, University of Hawai'i at Mānoa

**SCR186 and SR86 – RELATING TO REQUESTING A STATUS REPORT AND UPDATE
ON THE STEM PROGRAMS**

Chair Senators Sakamoto, Fukunaga, Tokuda and Members of the Committees

My name is Peter Crouch, Dean of the University of Hawaii College of Engineering. I appreciate the opportunity to provide testimony **in support of SCR 186 and SR 86** requesting a status report and update on the STEM, Research Experiences for Teachers – Middle School, Project Environmental and Spatial Technology and Robotics Programs within Public Schools.

The UH College of Engineering is an active participant in K-12 outreach in the areas of science, technology, engineering, and mathematics (STEM) in Hawaii. We clearly recognize the critical importance of attracting student interest for pursuing courses of study which lead to postsecondary access and STEM careers.

In 2007 Governor Lingle introduced in her Innovation in Education Package, including the Pre-Academy: Fostering Inspiration and Relevance through Science and Technology (FIRST). The State of Hawaii 24th Legislature then passed ACT 111 to establish the Pre-Academy. Programs such as FIRST Pre-Academy strengthen the technology pipeline through early intervention in the educational process, by providing challenging enrichment activities and opportunities to interact with university researchers and industry partners, thus: heightening the technology knowledge and skills of our teachers, and boosting student interest and achievement in STEM subjects and their associated careers.

Of particular interests to this resolution are the Research Experiences for Teachers - Middle School Program (RET-MS) and Robotics. RET-Middle School is a teacher driven model for advancing science and technology in middle schools. It brings the knowledge of engineering and technological research innovation into classrooms and programs through the active involvement of teachers, faculty, graduate and undergraduate students and industry. At this time I will present a short update on the FIRST Pre-Academy Program.

In closing, I'd like to say that we continue to be encouraged by the State's commitment to STEM learning and look forward to extending the educational pipeline through the postsecondary level.

Thank you for the opportunity to testify. We appreciate your interest and continued support for the University, Hawai'i's premier institution of higher learning.

Presentation – testimony before Committee on Education and Housing;
Committee on Economic Development and Technology; Committee on Higher
Education

March 31, 2010
Room 016

Pre-Academy: Summary Update

FOSTERING INSPIRATION AND RELEVANCE THROUGH SCIENCE AND TECHNOLOGY

Peter Crouch, Dean
College of Engineering, University of Hawaii at Manoa



College of Engineering's Role

Part of the College's Vision:

Workforce Engine – A College that delivers a growing proportion of Hawaii State's engineering and construction workforce needs, across a broad spectrum of engineering disciplines and helps attract and retain high wage jobs and companies.



Innovation in Education

- **January 2007 - Governor Lingle introduces the Pre-Academy:** Fostering Inspiration and Relevance through Science and Technology in her Innovation in Education Package.
- **2007 - State of Hawaii 24th Legislature** passed ACT 111 to establish the Pre-Academy, committing \$1.4 M for FY07-08 and FY08-09 including 9 FTE positions.
- **December 2009 - Governor Lingle issues a Notice of Authorization to Expend Federal Grant Funds (ARRA-SFSF Part B) to UH for Pre-Academy expansion**



Pre-Academy: Summary of Goals


- Serve middle school students with **experiences in Science, Technology, Engineering, and Mathematics (STEM)**
- **Encourage partnerships** with other relevant programs within the UH system, DOE, and public and private agencies
- Motivate and **engage students in STEM**
- Support the development of additional problem-based and applied learning experiences in STEM for **middle school teachers**
- Develop **evaluation measures**



Approach

- **Capitalize** on the creators of leading edge technology from one of the nation's top 25 public research universities . . .
- **Leverage** exciting and mutually beneficial partnerships and funding opportunities.
RET leveraged funding support:
- The University and Pre-Academy Schools secured grants totaling **\$1,004,800** to support the program
 - National Science Foundation
 - U.S. Department of Education – PID
 - AT&T Foundation
 - Hawaii State Federal Credit Union
 - Target





ADVANCING STEM EDUCATION THROUGH PARTNERSHIP

science technology engineering mathematics

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THE SIP TEACHER CONNECTION

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STEM Intercommunity Portal

a networking web portal developed to advance STEM and STEM education in Hawaii.

- SIP allows teachers, researchers, industry and students to **share ideas** and **collaborate** on STEM activities and projects

Website URL: <http://sip-hawaii.org/home>

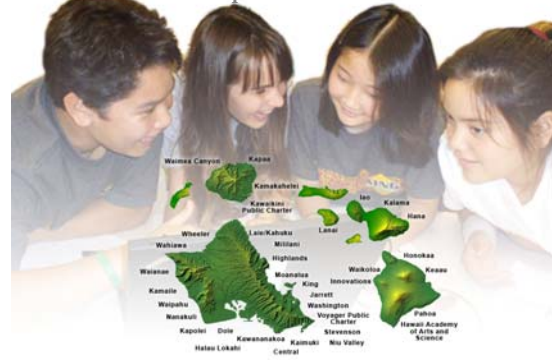
Research Experiences for Teachers Middle Schools



"A teacher driven model for advancing engineering, science, technology and mathematics in Hawaii's Middle Schools"



First Pre-Academy Current Participants: 36 middle schools



RET Program Accomplishments



- Delivered laptop computers, measurement probes, and other leading-edge technologies to participating middle schools
- Provided technical assistance with hands-on lessons and multimedia covering a wide range of relevant STEM topics
- Developed teacher-driven lessons and activities using leading-edge technology
- Coordinated Mini Workshops to cover a range of teacher directed STEM topics
- Conducted workshop and training sessions in science and applied technology



- A **PDA Workshop** was conducted in Sep 2009
- Provided overview of wireless technology and applications, including a how-to demonstration of the PDA and its many applications was provided.



lao Middle School participated from Maui via video conference



- Workshop conducted in Dec 2009
- Robotics research and applications presented by university and industry

Technical Speakers:

Dr. Peter Berkelman, Assistant Professor, Mechanical Engineering, UHM
Dr. Harry Yoshino, Surgeon, Queens Medical Center
Mr. Jason Akagi, Engineer, Spectrum Photonics

Teacher Presenters from:

Jarrett Middle
Mililani Middle
Moanalua Middle
Highlands Intermediate



- Workshop conducted in Feb 2010
- Local and global sustainability issues presented by university faculty
- Hands on laboratories, lesson-plan sharing and collaboration and RET team-building by teachers

Speakers:

Dr. Kenneth Kaneshiro, Dir., UH Center for Conservation Research & Training
Dr. Chittaranjan Ray, Professor, UH Civil & Environmental Engineering
Ms. Maxine Burkett, J.D. Assoc Professor, William Richardson School of Law
Dr. Adam Asquith, Extension Faculty, UH Sea grant College Program

Teacher Presenters

Kawananakoa Middle
King Intermediate
Washington Middle
Dole Middle
Mililani Middle

RET – Curriculum and Programs

- RET program has helped the teachers to develop new STEM based curriculum covering a broad range of topics such as:

- Water quality testing
- Robotics
- Electromagnetics
- Wireless Sensors
- Erosion and Climate Study
- PDAs



JARRETT MIDDLE SCHOOL

striving to reach the highest



- Mr. Jeffrey Lim, a teacher at Jarrett Middle School has set up a Robotics Curriculum using the Lego Mindstorm kits and laptops to design and run robotics experiments and activities.
- Mr. Lim's Robotics curriculum and other activities at Jarrett Middle School are set up as a dedicated group on the STEM Intercommunity Portal.



RET MIDDLE SCHOOL Dole Middle School

...piko of Kalia



- Teachers at Dole Middle have developed a multi-disciplinary (Language Arts, Social Studies, Science and Math) RET initiative for 8th graders.
- Students demonstrate their science and math skills in the field by using technology tools to collect, record, transmit, interpret and document water quality data at Kawainui Marsh and Kokua Kalihi Valley.
- In these field trips, students learn about Native Hawaiian sustainability, the Kalihi watershed and invasive species, and participate in service learning activities (clearing mangroves, removing invasive species, stumping lo'i).
- Dole Middle received an AT&T *Wireless World* grant to support the activities developed through their RET initiative.

KING INTERMEDIATE SCHOOL | RET MIDDLE SCHOOL

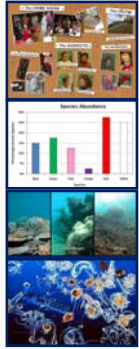
accelerate • collaborate • evaluate • success



- Teachers at King Intermediate have designed new curriculum in the field of environmental science including: watershed study, tsunami and water quality, and environmental health lessons.



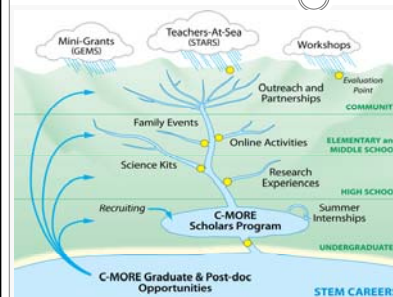
C-MORE Program Accomplishments



- Provided teacher training for C-MORE science kits, and delivered kits to participating middle schools
- Delivered hand-on lessons covering a wide range of science topics
 - e.g. Ocean Acidification, Random Sampling, Plankton
- Held Ocean FEST family events for middle school students and parents with activities covering a range of STEM topics
 - e.g. Surface Tension, Global Climate Change, Pressure, Density, Ocean Properties, Microbes



C-MORE Career Pathway



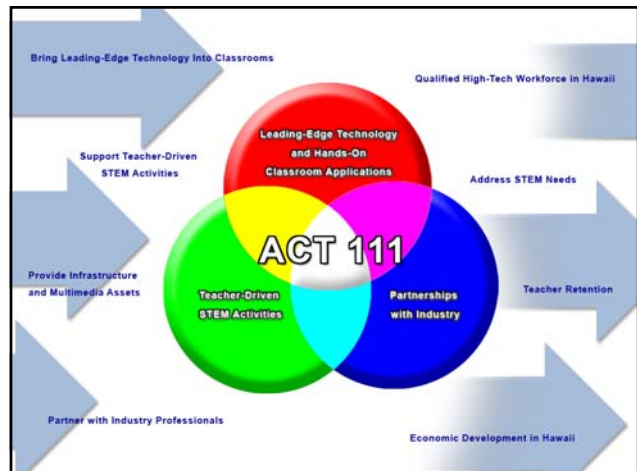
- Created a K-Career pathway for students to gain educational experiences in STEM careers
- Partner with Pre-Academy to expand middle school participation in science



Creative Media Program Accomplishments



- Expanded digital media mentor training programs for teachers and students at participating middle schools
- Helped develop and enhance digital media programs throughout the state focused on providing teachers and students with digital media training and equipment
- Developed interactive learning environments for students in media and technology programs
- Established a common media lab through hardware and software



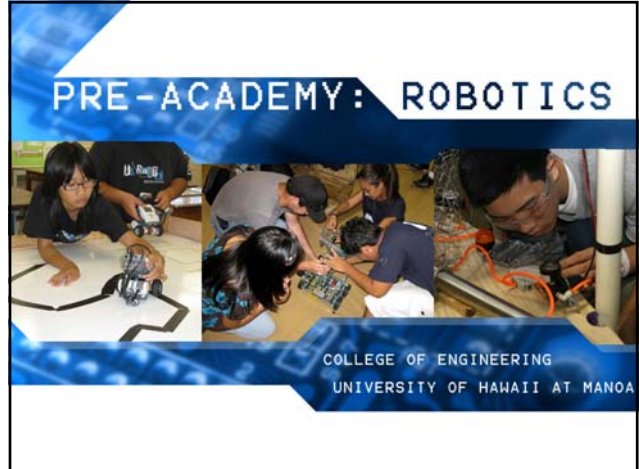
RET
What's New....

Expanding the technical and support base for teachers through private sector participation....

Example of new partnership

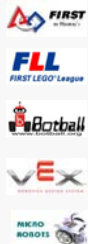
New Horizons of Hawaii will:

- Provide technical and real world support and experiences
- Participate in workshop (s)
- Provide financial support for requests such as mini-grants
- Encourage other business to join the program



Scholastic Robotics Competitions

Competitions supported by ACT111 funding:



- HI Underwater Robot Challenge – 20 teams (30+ total)
- Big Island ROV Regional – 15 teams (20+ total)
- Botball – 20 teams (40+ total)
- VEX – 50 teams (100+ total)
- FIRST Lego League – 53 teams (130+ total)
- FIRST Robotics Competition – 7 teams (37 total)
- Micro Robot Maze Competition – 4 teams (63 total)
- Robofest – 30 teams (50+ total)

These are annual national and international competitions.

Seed Programs and Mentor Training

- **Teacher, Mentor, & Student Workshops:**
 - FRC Workshops for 52 public school teams
 - VEX workshop for 42 teachers and over 60 students
 - Two day Botball workshop for team mentors and students for 38 teams
 - Big Island ROV teacher and student workshop
 - FIRST Robotics Competition mentor and teacher workshops
 - First Lego League Workshop – 20 teachers & 60 students
 - Coordinated robotics personnel and robotics program leaders for mentor visits in schools



Robotics program continues to:

- Expand the reach and impact of scholastic robotics competitions
- Partner with DBEDT and Hawaii Space Grant to identify and support under represented and under served school complexes
- Collaborate with project stakeholders to broaden development of robotics outreach via presentations, demonstrations and mentorships

Statement of Impact!

The overall goal for the Robotics Program of ACT 111:

- > to enhance student interest in K-12 STEM curriculum by maximizing HI State participation in national and international scholastic robotics tournaments
- > to significantly increase the science and engineering workforce within the State and the nation



Increased current interest and participation has directly impacted the number of students who have gone on to engineering programs.

**Personal Testimony Presented Before the
Committee on Education and Housing
Committee on Economic Development and Technology
Committee on Higher Education**

March 31, 2010 @ 1:15 p.m.
Conference Room 016

By
Song K. Choi, Assistant Dean
College of Engineering, University of Hawai'i at Manoa

**SCR186 and SR86 – RELATING TO REQUESTING A STATUS REPORT AND UPDATE
ON THE STEM PROGRAMS**

Good afternoon and aloha Chairs Sakamoto, Fukunaga, and Tokuda and Members of the respective Committees.

My name is Song K. Choi, Assistant Dean of the University of Hawaii College of Engineering.

I appreciate this opportunity to provide testimony **in support of SCR 186 and SR 86** requesting a status report and update on the STEM, Research Experiences for Teachers – Middle School, Project Environmental and Spatial Technology and Robotics Programs within Public Schools.

As you are well aware, the UHM College of Engineering has been involved in robotics programs since 1999 as mentors for the Waialua and McKinley schools, and more recently, as the coordinating and funding entity for the FIRST Lego League (FLL), VEX, Robofest, FIRST Robotics Competition (FRC), Botball, Underwater ROVs (BIRR & HURC), and Micro Robots using the ACT 111 funds.

In 1991, when I first returned to Hawaii and enrolled as an engineering doctoral student at UHM, my lab became engaged in engineering outreach by demonstrating tele-operated robotic manipulators, underwater vehicles, and graphic simulation systems. These caught the curiosity and interest of a “few” K-12 students, but never in large numbers as there was a shortage of physical interaction... In 1998, Dr. Tep Dobry and I began teaching robotics workshops to O’ahu central district teachers to incorporate into their curriculum to interest and excite students while teaching physics, mathematics, and engineering concepts through reading, solving, and building. This began well, but without the ‘full’ support of the schools, community, and industry, it was a continuous struggle.

With the introduction of Hawaii regional tournaments around 2005 and with the State’s initiation of the ACT 111 funds in 2007, a catalyst was created where these tournaments began generating exponential growth in student interest in robotics and STEM (science, technology, engineering, and mathematics). In the past four years, we have increased numbers of students, teams, and school involvement from several hundred (2006 – approximately 300 students) to several thousand (2010 – approximately 3000 students)!

More importantly, these tournaments have given many schools and communities new goals and hope for many of their youth. For example, in 1999, the UHM College of Engineering did not receive any application from Waialua High School; and ten years later in 2009, we had received 20+ applications. Another example is in Kauai where the school, local government, industry, and community have come together to create a giant synergy to continuously push and support students involved in robotics... Maui has come together with extreme support for robotics. The Big Island, not only the Hilo side, is now extremely successful with Kohala, Honoka'a, and even Kau sponsoring and mentoring robotics teams that were present over the past weekend at the Stan Sheriff Center. There were seven (7) Hawaii teams that qualified to participate in the FRC Championships in Atlanta, GA in two weeks. This is five (5) public schools, one island team with 3 public schools and a private school, and one private school. This is potentially a group of 150 students who will have an opportunity to venture "outside the white box" and experience something that may truly change their perspective and life...

However, this is not enough, as we have not reached everyone. We need to be able to provide an opportunity for participation to all interested students. We have recently had participation from the islands of Lanai and Molokai by their younger FLL teams. These may be new areas of success in the next few years, but your continued support is imminent...

Thank you for this opportunity to testify.

**Personal Testimony Presented Before the
Committee on Education and Housing
Committee on Economic Development and Technology
Committee on Higher Education**

March 31, 2010 1:15 p.m.
Conference Room 016

By
Justin Akagi, FIRST Pre-Academy Program Manager
University of Hawai'i at Mānoa

**SCR186 and SR86 – RELATING TO REQUESTING A STATUS REPORT AND UPDATE
ON THE STEM PROGRAMS**

Chair Senators Sakamoto, Fukunaga, Tokuda and Members of the Committees

My name is Justin Akagi, FIRST Pre-Academy Program Manager at the University of Hawaii. I appreciate the opportunity to provide testimony **in support of SCR 186 and SR 86** requesting a status report and update on the STEM, Research Experiences for Teachers – Middle School, Project Environmental and Spatial Technology and Robotics Programs within Public Schools.

As a product of the State of Hawaii public school system at all levels, from kindergarten through graduate school, I have personally experienced and witnessed how meaningful curriculum can motivate and educate students. For myself, I carried a strong interest in math and science throughout elementary and middle school. However, my first meaningful classroom experience was at the high school level in a course that included hands-on activities, such as: bridge building, catapult launchers, robotics competitions. Although I was fortunate to have this experience which inevitably motivated me to pursue undergraduate and graduate degrees in engineering, I understood that many other students did not have the same opportunity, since the course was taught at a single school by a single teacher.

I am very appreciative for and supportive of FIRST Pre-Academy, which promotes at the state-wide level, the same educational model that motivated me to pursue multiple degrees in engineering. This legislation will allow the University of Hawaii to expand the program to many schools and classrooms throughout the state, and provide teachers with much needed classroom support.

In the few months that I have been involved with the program, I have witnessed a strong interest at participating FIRST Pre-Academy schools to continue to develop the project models at their schools, and by non-participating schools who see the potential of the program's model in motivating and teaching their students more effectively.

I believe that the FIRST Pre-Academy program can impact many more teachers and students. Please support SCR186 and SR86.

Thank you for the opportunity to testify.

**Personal Testimony Presented Before the Committee on Education and Housing
Committee on Economic Development and Technology Committee on Higher
Education**

March 31, 2010 Conference Room 016

By
Candy Suiso

**SCR186 and SR86 – RELATING TO REQUESTING A STATUS REPORT AND
UPDATE ON THE STEM PROGRAMS**

Chair Senators Sakamoto, Fukunaga, Tokuda and Members of the Committees

My name is Candy Suiso and I am the Program Director for Searider Productions – a multi-media program at Wai`anae High School. I appreciate the opportunity to provide testimony **in support of SCR 186 and SR 86** requesting a status report and update on the STEM, Research Experiences for Teachers – Middle School, Project Environmental and Spatial Technology and Robotics Programs within Public Schools.

Many of you are familiar with the success our program. We feel that we have validated the fact that digital media education programs can reach Hawaii's youth, even the most at-risk and disaffected, and prepare them for success in higher education and the workplace. We thank all of you who have helped us in the past with previous bills that have supported digital media education in Hawaii.

Recently, we've been given the opportunity to train students and teachers from Wai`anae Intermediate, Nanakuli High & Intermediate, Chiefess Kamakahele Middle school on Kauai (to train Waimea Canyon, Ka, as well as Maui School. In return, our goal is to have these schools go back into their communities to train the feeder schools within their districts. We want this training to become viral. We believe that by providing our youth these types of experiences, we are preparing them to become leaders in making Hawaii's diverse innovation-based economy a reality.

We plan three more similar training sessions: April 24 & 25 on Kauai, June 14-18 for Kauai (to train Waimea Canyon, Kapaa Intermediate & High School, and Kauai High School); Maui (to train Maui Waena & Lokelani), Wai`anae Intermediate; June 28-July 16 for Nanakuli High & Intermediate, Campbell & Kapolei High Schools.

While our experience and successes have been with creative media production, we believe the same type of success can occur in engineering programs where students both explore problems and design solutions using technology, scientific inquiry, and mathematical analysis. In our case, we leverage the innate human desire to tell stories and share ideas with others. But we also believe that the innate human desire to solve problems and understand the world around us is just as powerful a motivator for success. We see many parallels between the successful technology-based engineering programs, such as robotics, and digital media production programs such as ours. A true innovation economy allows a broad range of creative human endeavors to flourish, whether one is telling a story in a new way or coming up with an innovative solution to a vexing problem. And to build this diverse, strong economy for Hawaii in the 21st century, we must encourage our youth to leverage their creative interests, whether those interests involve creative media production, designing engineering solutions, or solving scientific problems.

Thank you for the opportunity to testify.

March 31, 2010

The Honorable Carol Fukunaga
Chair, Education and Housing Committee

LATE

The Honorable Rosalyn Baker
Vice Chair, Education and Housing Committee

RE: SCR 186, Status Report

Dear Chair Fukunaga and Committee Members:

Thank you for the opportunity to submit a status report on the 3T's/EAST funding provided by the State Legislature. I do apologize for not testifying in person, but I am currently in the mainland presenting at a National Service Learning Conference.

EDAH was honored to receive appropriations from the State Legislature to facilitate the expansion of the EAST program into four new Oahu high schools, and a second Big Island school. In addition, existing EAST schools were able to augment their existing hardware and software. This infusion of monies allowed the EAST programs to bring their labs up to the high end specifications required for a successful high tech program.

To date, we have served over 3,500 students with a total of fifteen schools throughout the state that have integrated the EAST program into their class offerings. The schools include Maui High, Baldwin High, King Kekaulike High, Kihei Charter, Lahainaluna High, Roosevelt High, McKinley High, Mililani High, Farrington High, Kauai High, Chiefess Intermediate, Molokai Intermediate, Molokai High, Kealakehe High, and Kea'au High.

In addition to this letter, I have also attached the final report submitted to DBEDT. Several key components are highlighted in the final report which when combined provide the winning mixture for success – professional development for both teachers and students, project design/development, internship opportunities, real world activities/exposure, and the program survey.

We continue to work as a team with the University of Hawaii's Engineering School, Creative Academies, Robotics, RET, and the other stellar STEM programs throughout the State of Hawaii. Your investment has truly made a difference in the education of our Hawaii students.

Please join us in celebrating STEM at the Hawaii STEM Conference on April 9 & 10th, 2010 that will attract student EAST teams from across the state to showcase and share their technology savvy in advancing environmental stewardship and making a difference in their respective communities (<http://www.womenintech.com/HawaiiSTEMConference>).

It has truly been an honor to facilitate the States investment in the Project EAST program.

Mahalo,

Isla Young
Program Manager, Women In Technology
EAST Statewide Manager

Project EAST/3T's (Contract Number 56901)
A Project of EDAH
Final Report

The Economic Alliance of Hawaii (EDAH) working in partnership with the Department of Education, the High Tech Industry, Legislators, DBEDT, teachers, students, and parents successfully implemented the statewide expansion of the EAST program. The EAST Initiative model has been recognized nationally as an innovative, relevant, and successful approach to education. EAST is unlike any other class in today's middle and high school curriculum. In Hawaii, EAST is a project-based, service-learning oriented class that provides students with the most current, high-end technologies available in some of the most progressive fields in the world. EAST is more than a class offering and much more than a "computer class". At its heart, EAST is a coordinated attempt to provide today's students with an educational atmosphere that allows them to gain insight into their own abilities to acquire and use information, solve problems, and gain valuable experience in using this technology.

EAST students routinely interact with hardware and software in animation, computer aided design, engineering design, visualization, database design, webpage design, programming, office automation, global positioning systems, and geographic information systems. The students, working in teams, tackle sophisticated service-oriented projects. In the process of solving these problems, they learn to become creative, intuitive, adaptable learners who can solve unpredictable, real-world problems. The EAST program provides real world exposure to science, tech, engineering, and math (STEM) in Hawaii, and the exciting career paths available for our island students.

To date, we have served over 3,500 students with a total of fifteen schools throughout the state that have integrated the EAST program into their class offerings. The schools include Maui High, Baldwin High, King Kekaulike High, Kihei Charter, Lahainaluna High, Roosevelt High, McKinley High, Mililani High, Farrington High, Kauai High, Chiefess Intermediate, Molokai Intermediate, Molokai High, Kealakehe High, and Kea'au High.

In 2008, EDAH was honored to receive appropriations from the State Legislature to facilitate the expansion of the EAST program into four new Oahu high schools, and a second Big Island school. In addition, existing EAST schools were able to augment their existing hardware and software. This infusion of monies allowed the EAST programs to bring their labs up to the high end specifications required for a successful high tech program.

Several key components are highlighted in the final report which when combined provide the winning mixture for success – professional development for both teachers and students, project design/development, internship opportunities, real world activities/exposure, and the program survey.

EAST Professional Development/Software Training:

During the expansion of the EAST program a substantial amounts of opportunities were provided for both the teachers and students for professional development and software training. Over **25 training sessions** were provided, empowering over **400 teachers and students** with a solid foundation in both the EAST program and software applications available for use.

The professional development training offered to the new facilitators is a key factor in the programs successful expansion. While participating in the three phase training sessions Facilitators were immersed in the EAST philosophy; inquiry based teaching methodologies, hands-on software activities, and networking opportunities.

Software training in several programs such as CAD, Dreamweaver, Photoshop, Garage Band, Gaming, and more were offered to the EAST students. This intense time of focused training allowed for the program participants to develop a basic foundation needed for successful use of the software programs. Both teachers and students are tasked with sharing the information gained during the training sessions upon their return to their home EAST lab. This model allowed for cross mentoring and relationship development between both teachers and students. Continued training will take place as the program continues to grow and develop.

EAST Project Development:

EAST students are encouraged to discover what they are passionate about in their communities. As the students become immersed in the EAST program, they are tasked with identifying a problem/opportunity in the community, creating a project design to address the issue, testing their solution, developing a partner relationship, actual delivery, and maintaining the partnership. The following are some of the projects that were developed throughout the state of Hawaii.

- **Project Title: Global Warming and its impact on Kauai's coastal erosion**
Software used: ArcMap, Argos, Powerpoint, Elluminate
Community Partners: County of Kauai (GIS Users Group, Planning Department), Diana Papini (Women in Tech)
Project Scope/Outcome: Student is applying analytical GIS in projecting prospects for how Kauai will be impacted by continued global warming effects. Student has been asked to participate in a Mayor's Task Force to contribute ideas to discussions relating to the island's coastal erosion.

- **Project Title: Classroom Awareness, Safety, and Health**
 Software: Video, Adobe Premier
 Project Summary: Students at McKinley were concerned about the classroom environment, and whether it had an impact on student concentration, performance, and attendance. Students visited classrooms, created checklist, and a survey. With the gathered info a promotional video was created to reach out to the teacher and students emphasizing a healthy and clean classroom environment.
- **Project Title: Baldwin High School First Responder Database**
 Software: Database management software
 Project Summary: The Maui Police Department approached the Baldwin EAST lab requesting help in creating a database of the entire campus. The police in case of emergency would like to know locations of classrooms, hot/dangerous areas, and escape routes. This information is key to helping the first responders react in a proactive and efficient way.
- **Project Title: A Different Look at KHS**
 Software used: Adobe PhotoShop
 Community Partners: KHS faculty
 Project Scope/Outcome: Student is trying to promote school spirit by influencing people's perspective of our school campus. Focusing on what's unique and beautiful and communicating those images through photography, the student is developing a series of photos applying different techniques in lighting, focusing, and angles/levels. By December, the student was able to complete her first series and managed to print 120+ photos which were used as holiday greeting cards for KHS staff members.
- **Project Title: Make a Wish for Seniors**
 Software: Dreamweaver, Flash, Photoshop
 Project Summary: A website was created to raise awareness for our often forgotten elderly. In partnership with Maui Girl Scout Troop 993, Girl Scout Council of Hawaii, and the Kahului Hale Makua allowed for the website to be approved and linked to other websites for more publicity. Several wishes were able to be granted due to the website and generous donations from the community. www.makeawishforseniors.org.
- **Project Title: Kauai High Library Design**
 Software: SketchUp, 3D CAD
 Project Summary: Students at Kauai High worked to design and plan a new library. Mentor, Collin Kobayashi helped the team finalize their design. Once completed, the team presented their work to the local Architecture firm who will be handling the job.

- **Project Title: McKinley Cafeteria Renovation**
 Software: SketchUp
 Project Summary: McKinley High schools cafeteria is over fifty years old, and has not been renovated since the 80's. EAST students have designed a new model to accommodate the expanding student population. Meetings were held with the Cafeteria Manager and students to gather pertinent information. A SketchUp design was created, and a presentation will be provided for the schools administration.
- **Project Title: Renewable Energy Project**
 Software: GIS, GPS, Google Earth, ArcMap, Programming
 Project Summary: As the State of Hawaii becomes more aware of renewable energy and its possibilities for a sustainable future, Maui High EAST is working on a renewable energy website focusing on solar energy. The website will offer key information on photovoltaic systems, ideal system placement on homes, and local company information.
- **Project Title: Mililani Podcast**
 Software: Video, iMovie
 Project Summary: EAST students were asked to help develop and promote the EAST/Business classes at Mililani High. As a part of the annual curricular fair EAST students created podcast highlighting the different classes, why students should participate, and uploaded onto their onsite teacher tube.com.
- **Project Title: Refurbished Computers for the Needy**
 Project Summary: Roosevelt EAST students noticed "old" computers were being disposed of on their campus. Inquires went out asking if it would be possible to refurbish the computers as opposed to disposing of them. The EAST students refurbished five computers and gave them to needy students who did not have a computer at home. Research was done online to find the best and most economical way to refurbish the computers. The lucky student recipients were so thankful and are now able to complete work at home.
- **Project Title: FHS Sports Logo Design**
 Software: PhotoShop, Dreamweaver
 Project Summary: Farrington EAST students were asked to re-design all of the athletic logos for the school. The new logo designs were placed on the student athletes uniforms. In addition, a website with the updated athletic schedule was developed to keep students, teachers, and parents informed.

- **Project Title: Diverted Stream Comparison**
 Software: ArcMap, GPS Pathfinder Office, and GPS Trimble remote.
 Project Summary: As the water issue continues to grow studying diverted streams, analyzing and comparing differing quality of streams, and surveying for animals, plants, and weather were some of the components to this important project. In partnership with the Department of land and Natural Resources a better understanding of the streams were provided and shared to improve our native ecosystems.
- **Project Title: Bishop Museum Design Project**
 Software: PhotoShop
 Project Summary: Farrington EAST students have developed a partnership with Bishop Museum to design all of the signage for the displays. Student work will be engraved in Koa and placed throughout the museum.
- **Project Title: Virtual Walkthrough of Future Media Center**
 Software used: Sketchup, Powerpoint, Architectural AutoCAD
 Community Partners: KHS Administration, Esaki Surveying & Mapping, General Dynamics, Lloyd Sako
 Project Scope/Outcome: This is a continuing multi-year project.
 Year 1 - students were given the opportunity by our school administration to design/propose ideas for a future media center. Students were able to dream-build and using sketchup, created their proposal.
 Year 2 - after consulting with various contractors/architects, school administration challenged year 2 students to re-think their proposal. Instead of dream-building, draft a proposal and present their ideas by working on renovating an existing building. Students used Architectural AutoCAD to draft the floor plans for what they could envision becoming the future media center on campus. Presentations were made to school admin and our collaborating architect and preliminary draft blueprints of the building renovation began.
 Year 3 - students felt that creating a virtual walkthrough of the proposed media center would be helpful in soliciting volunteers/sponsors/etc. Students used SketchUp to rework the floor plans for the building and extruded the walls to create the 3Dimensional feel.

EAST Internship Program:

EAST students in partnership with EDAH, the Women In Technology project, the County of Maui, the Maui County Farm Bureau, and the Kauai Economic Development Board were given the opportunity to participate in EAST internships with several local high-tech and agricultural based companies during the summer of 2009. A total of *twelve interns* were placed. As an organization, we have provided college internships for Hawaii based students over the last seven years through several internship programs – Akamai Internship, KEDB Internship, HIEDB Internship, and the Ke Alahele Internship program. Many of the employers and

participating companies are comfortable with returning college students, but it took some convincing to assure the participating companies that the high school EAST interns would be both mature, and perform at an elevated level. Much time was spent with each company developing a meaningful and dynamic summer project for each intern.

Participating companies included Kauai Elementary Schools, Akimeka, Kupuhou Organic Farm, Maui High Performance Computing Center (MHPCC), Maui Electric, Hawaiian Commercial & Sugar (HC&S), Makawao Mushroom, Kupa'a Farms,

EAST Summer Internship Survey Results:

At the conclusion of the 2009 summer internship, interns were given a survey to gauge the effectiveness of the summer internship experience, and to allow for suggestions for improvement. The following is the survey results.

- 100% of the interns found the work experience successful.
- 100% of the interns plan on attending college.
- 100% of the interns thought the work performed was a good learning experience.
- 100% of the interns felt the mentor was available if they had questions.
- 100% of the interns felt the mentor provided constructive feedback.
- 85% of the interns felt this experience helped them make a choice for their career goals.

Some thoughts from the summer interns about their summer internship...

"Some personal strength that resulted from this internship would have to be professional work ethics, being on time, and speaking and communicating with fellow co-workers."

"I discovered I have persistence to complete a job to the best of my ability. This internship was very encouraging, because I was working hands-on at a company doing real tasks!"

"I discovered I can be creative and come up with unique and aesthetically appealing ideas. I always considered myself a more technical non-creative person, but this internship showed me when called to do so, I can be very creative."

REAL WORLD ACTIVITIES/EXPOSURE:

Providing a creative and stimulating STEM environment for our Hawaii EAST students is an important link to developing the next generation of Hawaii STEM professionals. Much effort is provided to connect the dots between the software tools available in the classroom, and the real world application. Over the last year a number of connections were made for the students. From coordinated Industry Day tours to community outreach activities, EAST students were provided with many

opportunities to intersect with STEM professionals and activities happening right here in their backyards.

Some of note include...

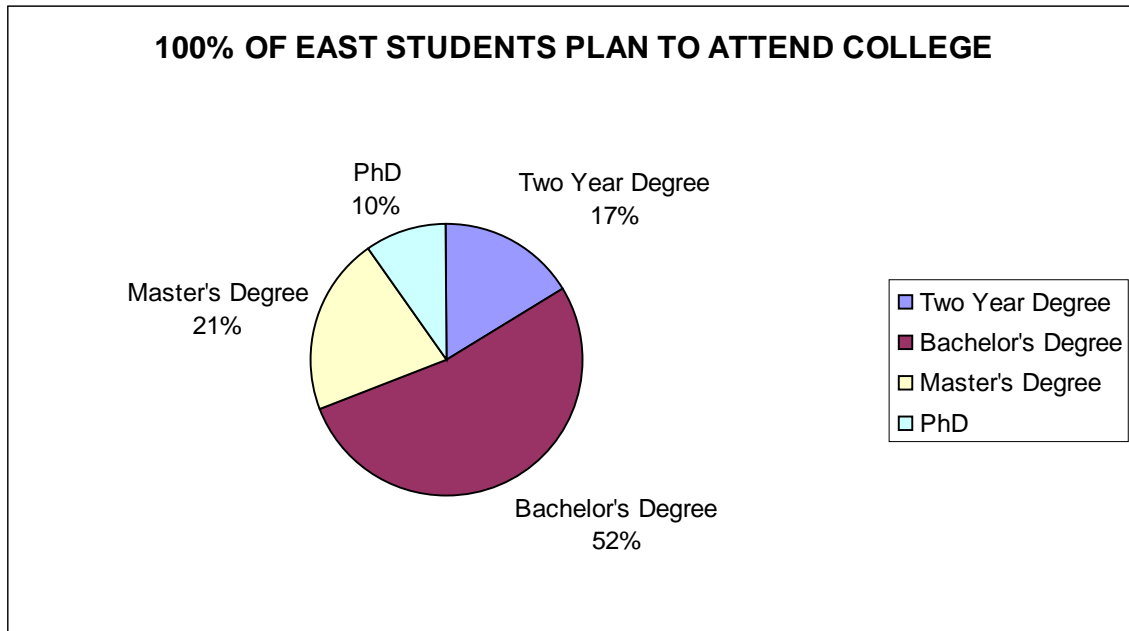
Farrington High EAST and Engineering Academy Induction, Hawaii ESRI GIS Statewide Licensing Agreement, EAST National Partnership Conference, 2009 NASA/BAE Systems FIRST Regional Robotics Competition, Senator Inouye visits Maui High EAST and FIRST Team, Science and Tech Day at the State Capitol, Maui Robotics First Lego League (FLL) Qualifier, 2009 VEX Robotics Championship, University of Hawaii Engineering Expo, National GIS Day, Creative Academies Teacher Professional Development, Project EAST Industry Day, Dreamweaver, Photoshop, 3D AutoCAD, and Gaming Summer Software Camps, and Statewide EAST Software Training.

EAST Survey Results:

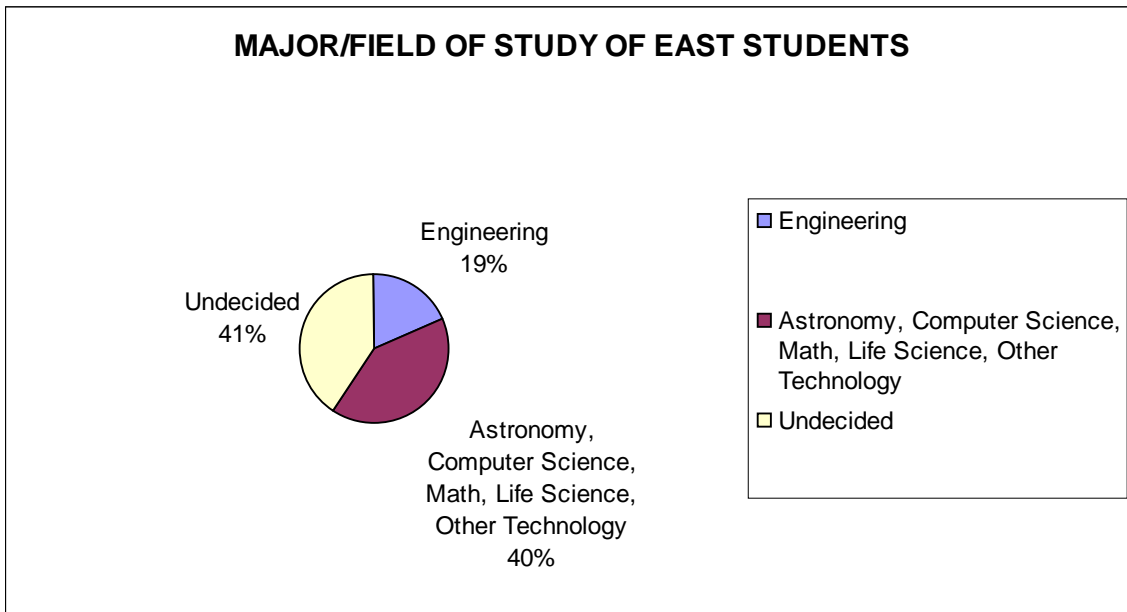
EAST students participate in an annual survey to gauge their involvement, EAST program effectiveness, and ways to improve the program to better serve the students and community.

The following is the results from the EAST program survey:

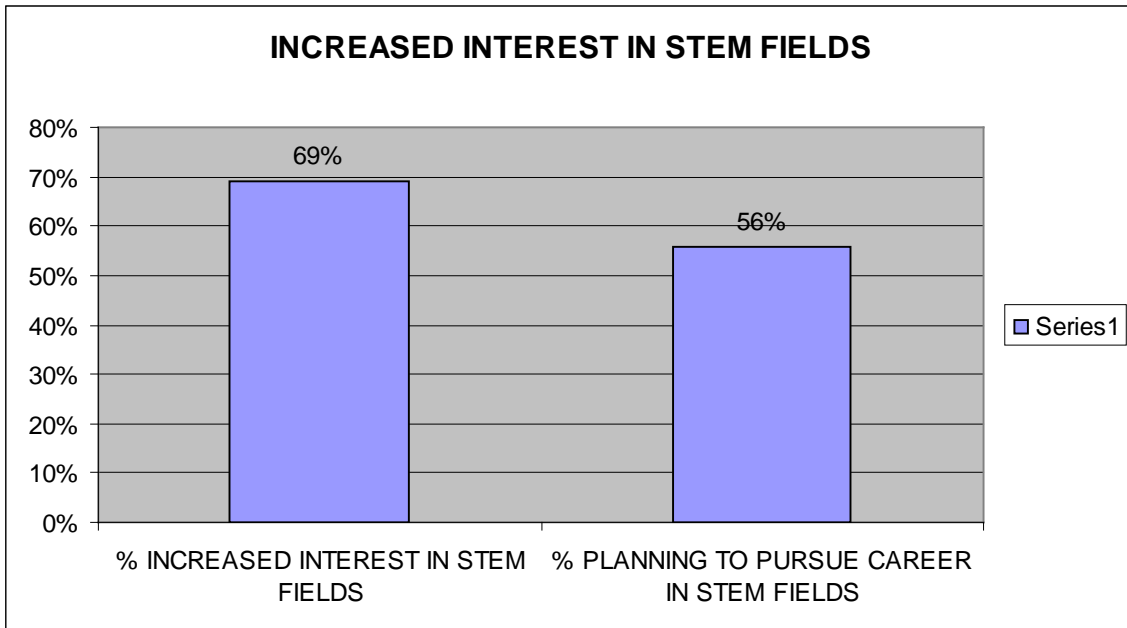
To date nearly 100% of EAST students plan on attending college after completing high school. When asked what degree they plan on completing nearly 17% answered their two year degree, 54% a bachelor's degree, 22% a Master's, and 10% their PhD.



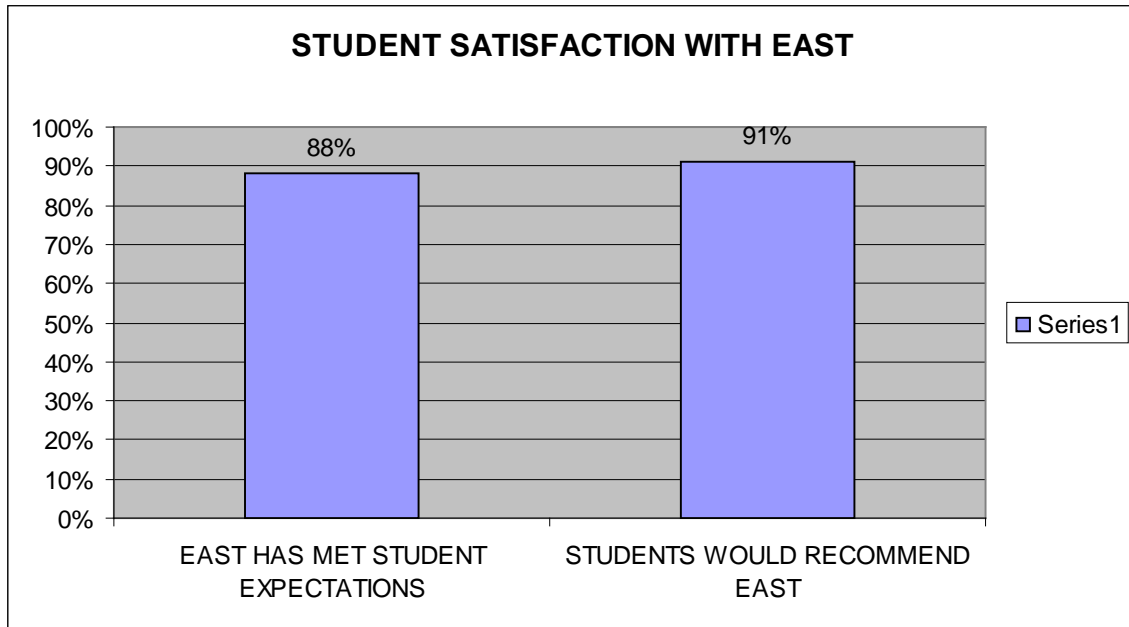
In response to what major/field they planned to study nearly 16% chose engineering, 35% astronomy, computer science, math, life science, and other technology fields. Nearly 35% were still undecided.



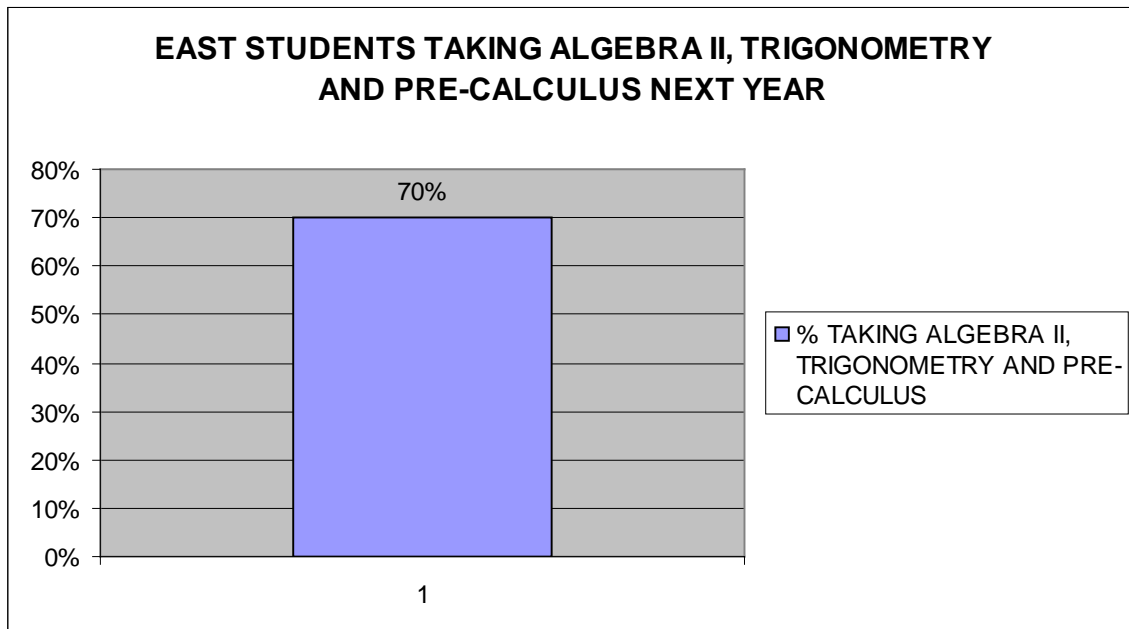
Participation in EAST has increased nearly 69% of the student's interest in the STEM fields, with over 56% planning to pursue an actual career in the STEM fields.



When asked if EAST has met their expectations an overwhelming 88% said yes. Over 91% said they would recommend the EAST program to a friend.



Nearly 70% of EAST students will be taking Algebra II, Trigonometry, and Pre-Calculus the next school year.



The gender breakdown this was 60% males and 40% females. Continued measures are in place to increase female participation.

