UNIVERSITY OF HAWAIʻI SYSTEM REPORT

REPORT TO THE 2011 LEGISLATURE

REPORT BY THE UNIVERSITY OF HAWAIʻI AT MĀNOA
ON THE ECONOMIC VALUE OF EXPANDING
WORKFORCE DEVELOPMENT CAPACITY
AND STEM INITIATIVES

HOUSE CONCURRENT RESOLUTION 297
S.D.1 C.D.1 (2010)

November 2010

FOSTERING INSPIRATION and RELEVANCE THROUGH SCIENCE and TECHNOLOGY – PRE-ACADEMY (ACT 111):

H.C.R. NO. 297 S.D.1, C.D. 1

Legislative Report FY 2009 – 2010

ON STEM INITIATIVES

Continued Funding per Memorandum of Agreement
between
The Governor of the State of Hawai'i
and
The University of Hawai'i
regarding
American Recovery and Reinvestment Act (ARRA)
State Fiscal Stabilization Fund (SFSF), Government Services – Part B

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PRE-ACADEMY (ACT 111)

The Fostering Inspiration and Relevance through Science and Technology (FIRST) Pre-Academy was established through Act 111 of the 2007 Legislature for *Innovation in Education*, and is administered by the University of Hawai'i College of Engineering. Its mission is to provide additional resources and expertise to stimulate the interest and achievement of students in science, technology, engineering, and mathematics (STEM) skills and to address the State of Hawai'i's growing pipeline shortage of qualified individuals in STEM related professions.

FUNDING FROM THE STATE OF HAWAII: ARRA – SFSF Part B

The American Recovery and Reinvestment Act (ARRA) State Fiscal Stabilization Fund (SFSF), Government Services – Part B, for the Fostering Inspiration and Relevance through Science and Technology (FIRST) Pre-Academies authorizes State funding for elementary and secondary education and public institutions of higher education, and to meet and make progress on the Assurances contained in Hawai'i State's SFSF application to the federal government as pertaining to education.

A Memorandum of Agreement (MOA) between the Governor of the State of Hawai'i and the University of Hawai'i established the allocation of $3,063,000 of Part B SFSF funding for the budget period 07/01/09 to 06/30/11 for the purpose of paying expenses associated with the FIRST Pre-Academies as established pursuant to Act 111 of 2007, and to expand the FIRST Pre-Academies to every public middle school by school year 2012.

HCR 297

House Concurrent Resolution No. 297 of House of Representatives of the Twenty-fifth Legislature of the State of Hawai'i (2010), requests that a report on the economic value of expanded workforce development capacity be provided by the Department of Business, Economic Development, and Tourism (DBEDT). An update on STEM initiatives in Hawaii schools shall include Research Experiences for Teachers – Middle School, Project EAST, Hi-EST, FIRST academies, and other robotics.

The following report, provided by the University of Hawai'i College of Engineering, presents the status of our ongoing STEM initiatives and activities.

Our goal is to attract an increasing number of the State's K-12 students to the University of Hawai'i's STEM and related programs and lead them to better employment options in our economy's increasingly technology driven industries. As of June 30, 2010, FIRST Pre-Academy programs have exceeded projected goals, affirming our belief that these initiatives successfully address urgent STEM needs in our community.

EXECUTIVE SUMMARY

An important tenet of the *Innovation in Education* initiative is to improve education and career opportunities for underserved segments of the Hawai'i population by nurturing adaptability and learning skills, and increasing awareness of niche opportunities in the growing market for individuals with technology training, beginning with students of middle school age or younger.

The FIRST Pre-Academy represents the College of Engineering and University of Hawai'i System's commitment to develop Hawai'i's future high technology workforce through intervention in middle school education at the teacher level. Its programs heighten the technical knowledge and research-based skills of middle school educators across a broad spectrum of science, technology, engineering and mathematics disciplines, thus boosting student interest and achievement in STEM subjects and their associated careers from early in the pre-college process. By integrating traditional classroom education with hands-on field experiences, Pre-Academy teachers can provide students with a deeper understanding of STEM and its relevance to the real world in which they live and will someday work.

The success of the FIRST Pre-Academy is strongly supported by its multilateral teacher-driven approach. Teachers are held accountable for meeting standardized curriculum benchmarks and obtain best results when they can integrate STEM content and technology into their own lessons. University and industry mentors respond to specific teacher needs and help design and implement curriculum tailored to individual programs: 1) in special focus workshops; 2) in the classroom, 3) with online technology and technical counsel, and 4) with science kits.

During FY 2010, the FIRST Pre-Academy held more than twenty professional development workshops and teacher-training sessions on a wide range of STEM-related themes including data collection and analysis, robotics, sustainability, 3D modeling and fabrication, and topics in microbial oceanography. Such special focus events expose teachers to state-of-the-art technologies, research areas and applications via direct interaction with industry professionals and university researchers. Powerful teacher-mentor relationships are enabled, and provide the backbone for new and relevant curriculum. The workshop series was supplemented with in-service campus visits, and online support via a public internet portal.

In support of teacher-driven curriculum, FIRST Pre-Academy is working to establish an ongoing base of STEM mentors from academia and industry. Included are university faculty and students from the College of Engineering, the Center for Microbial Oceanography Research and Education (C-MORE) and other relevant departments in the University of Hawai'i system, as well as industry and community professionals interested in *pro bono* support of middle school level STEM education.

FY 2010 Priority Areas

FIRST Pre-Academy identified the following priorities for FY 2010:

- Support middle school teachers who will: (a) provide students with problem-based, applied learning experiences in STEM pursuant to Act 111 of 2007, and (b) motivate and engage students in STEM.

- Provide technical support to Pre-Academy teachers in the development and implementation of complementary and enhanced problem-based, applied learning projects and curriculum in STEM, which address benchmarked standards.

- Expand the program to all interested public non-charter and public charter middle schools within the State of Hawaiʻi.

- Establish partnerships with other relevant programs within the University of Hawaiʻi system, Hawaiʻi Department of Education and appropriate public and private agencies to provide expanded and continuous support for teacher-driven development of problem-based and applied learning experiences in STEM.

- Provide an online web portal and data system to document program outcomes, problem-based and applied learning curriculum, disseminate materials, articulate and collaborate on projects, and facilitate teacher support.

Statewide Participation

Figure 1. FIRST Pre-Academy participating schools
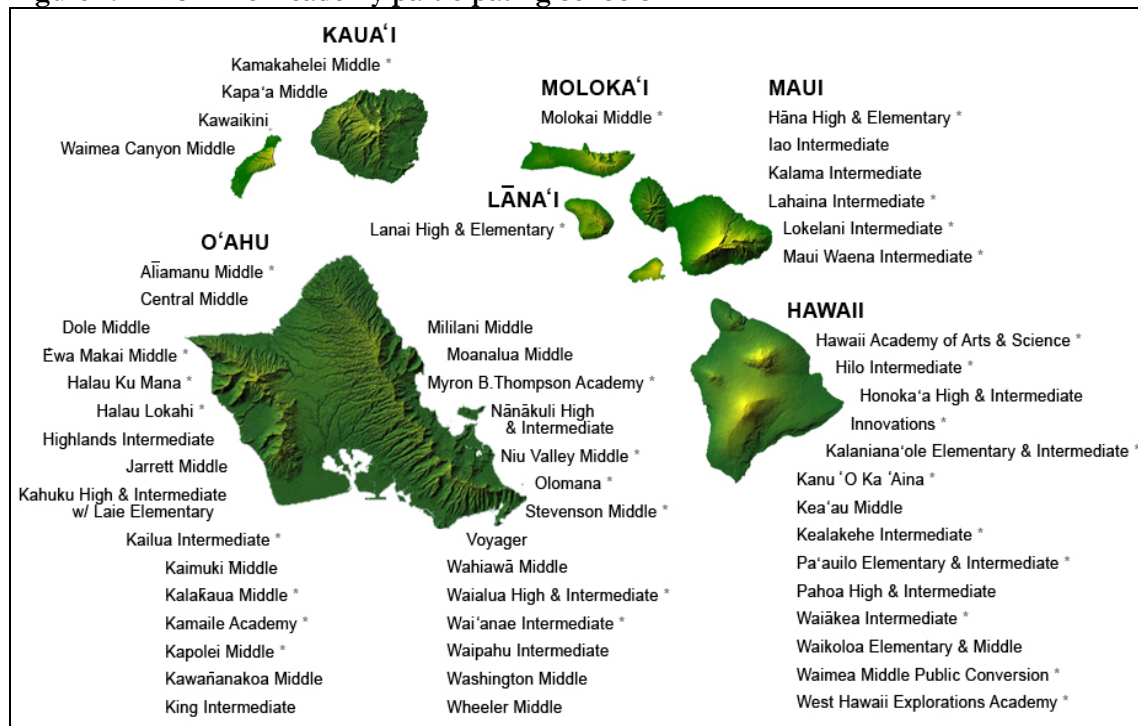
By the close of FY 2010, FIRST Pre-Academy achieved 70% participation statewide, including 56 public middle schools on six islands: Oʻahu (30), Hawaiʻi (14), Maui (6), Kauaʻi (4), Molokaʻi (1), and Lanaʻi (1). This benchmark far exceeded the projected target of 40

schools by the end of June 2010. Figure 1 displays a map of current FIRST Pre-Academy schools; new schools are listed in boldface font.

FIRST Pre-Academy currently represents 45 of 54 public non-charter middle schools (80%) and 11 of 26 public charter middle schools (42%) statewide. At the end of FY 2010 participants numbered 174 teachers and 4,460 students*. These figures are itemized by school, district and type of participation in Appendix A.

*Note: These tallies should be considered minimums; double counting was avoided by using the largest number of students involved in a single activity at each school.

Program Tracks

During FY 2010, FIRST Pre-Academy further developed three existing program strands which address key STEM research and training areas. As described in the sections below, these include:

- Research Experiences for Teachers – Engineering, Technology & Mathematics
- Research Experiences for Teachers – Science: Microbial Oceanography
- Applied Learning: Creative Media & Technology

An update on overall FIRST Pre-Academy management and these three program tracks is presented in the following sections.

PRE-ACADEMY ADMINISTRATION AND COORDINATION

Planning, coordination and oversight for the Pre-Academy were performed by the Office of the Dean, College of Engineering and administrative and fiscal support provided by the Office of the Vice-President for Research. It was uncertain at the outset of FY 2010 if program funds would be available; however Pre-Academy programs continued at various levels of implementation. SFSF Part B funds in the amount of $1,032,500 became available in March 2010.

The College of Engineering maintained an interface between the university and public and private stakeholders, and supplied additional support such as project management, development, and reporting.

STEM INTERCOMMUNITY PORTAL

The STEM Intercommunity Portal (SIP) is a website which intends to enhance the FIRST Pre-Academy program by improving information exchange, outreach and interaction among STEM community members, and to facilitate technical and logistical support for Pre-Academy teacher and student participants. The SIP addresses unique needs of STEM stakeholder groups (teachers, industry/academia, and students) that together contribute the problem-based and applied learning activities essential to the Pre-Academy program. Participants have uninterrupted access to an online forum where they can process and archive ideas for innovative STEM projects and curriculum. The SIP is being developed in collaboration with Referentia Systems, Inc., a Honolulu-based firm.

2010 SIP Highlights

1. Generate Interest and Membership among Teachers & other STEM Stakeholders
2. Enhance Interaction among STEM Stakeholders via
   a. Real-time dissemination of curriculum materials, resource/technical content, and STEM opportunities
   b. New collaboration tools including messaging
3. Facilitate Technical Support for Pre-Academy Participants
4. Enable and Promote Autonomous Participation of SIP Members

2009-2010 Implementation

1. <u>Generate Teacher Interest and Membership</u> – In FY 2010 the SIP successfully attracted significant new membership. New discussion groups were formed and traffic increased as members implemented new online resources such as document, curriculum and photo sharing. A messaging tool allows direct collaboration among invited participants.

2. <u>Enhanced Interaction among STEM Stakeholders</u> - A landing page, www.sip-hawaii.org/pre-academy presents key information about the FIRST Pre-Academy and invites site visitors to register as members. Highlights include a brief overview of the FIRST Pre-Academy initiative, featured discussion groups, upcoming and recent events, and currently participating middle schools. A tag cloud provides links to related topics on other pages. Content administrators can post announcements and related material from workshops, invite teachers to participate in person or online in future activities, and provide links to archived content from past workshops. After a workshop takes place, teachers can post images, videos and documents and create groups for online collaboration.

Figure 2. SIP Screenshots

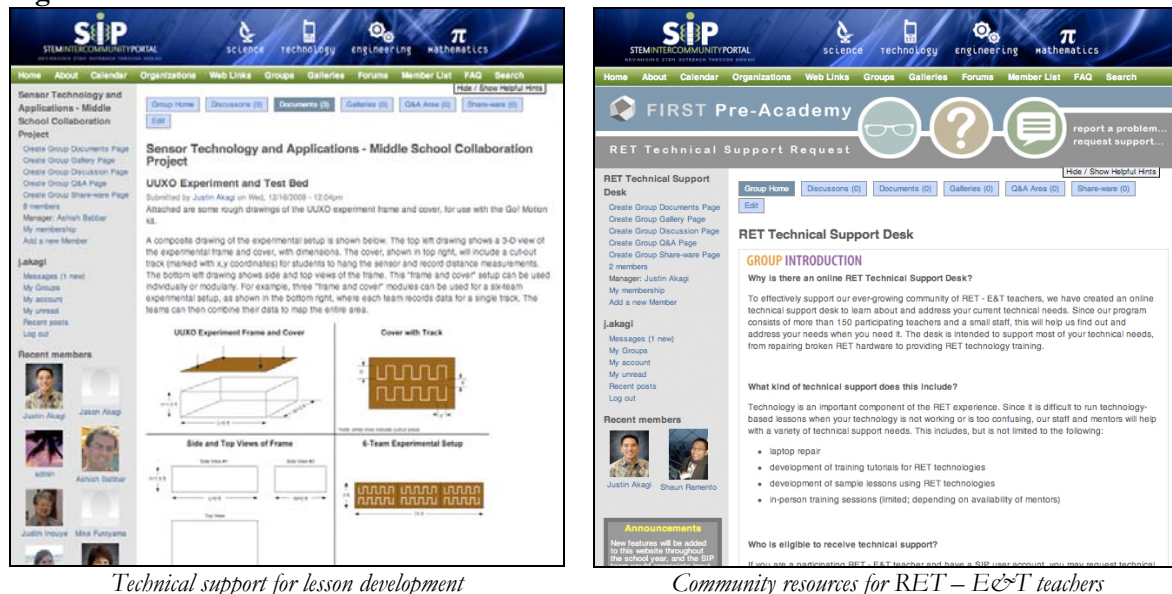*FIRST Pre-Academy landing page*
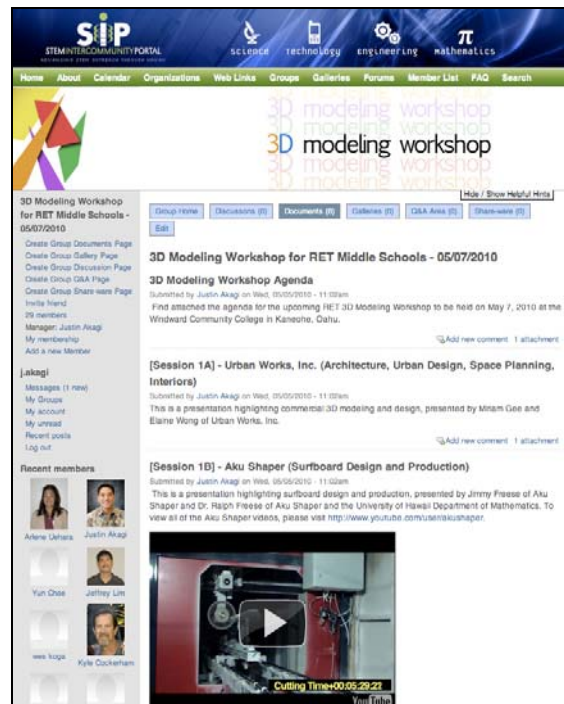
Sample teacher workshop group

The SIP fosters organic interaction by disseminating teacher needs, concerns, STEM curriculum and activities through a conveniently accessible website. By virtue of its public nature, the SIP also affords the benefit of showcasing the FIRST Pre-Academy program to future participants among teachers, researchers and stakeholders from government and industry. SIP resources are available any time and place that internet access is available.

3. <u>Facilitate Ongoing Support for Pre-Academy Participants</u> - An important SIP function is to facilitate technical and logistical support for Pre-Academy teacher participants. FIRST teacher participation effectively doubled from FY 2009 to FY 2010 while support staff remained essentially the same. Online support became key to economize personnel, resources and time. New support features were developed and tested in FY 2010.

Figure 3. Screenshots of SIP website.

Technical support for lesson development   *Community resources for RET – E&T teachers*

The FIRST Pre-Academy pairs RET teachers and schools with mentors from academia and industry who can guide them through research and technical challenges. Mililani Middle School was the first to utilize the SIP for curriculum development and collaboration with university mentors. Figure 3 shows user-created focus groups, such as the *Sensor Technology and Applications – Middle School Collaboration Project.* Teachers can interact with each other and their technical mentors online even when real-time communication is not feasible.

During FY 2010, the demand for technologies to support hands-on STEM activities greatly increased. In order to meet the growing need for equipment to perform short-term classroom and field experiments, technology tools were pooled and housed as community resources for participating teachers. The SIP enabled teachers to monitor availability of resources and reserve them via an online system.

4. <u>Enable and Promote Autonomous Participation of SIP Members</u> – New online tools such as messaging, that permit instantaneous dissemination of curriculum materials, STEM opportunities, and technical content immediately resulted in more spontaneous use of the SIP as a networking resource. Participant activity will be closely monitored and encouraged in FY 2011.

Forward Planning and Implementation

Major SIP initiatives launched during FY 2010 will be further refined in FY 2011. Real-time service support has become logistically challenging due to the rapidly increasing number of Pre-Academy participants, and teachers will depend increasingly on the SIP to communicate with each other, program staff and mentors. As a preemptive measure, program staff is investing time and effort now to help teachers make full use of SIP capabilities and tools such as file sharing, online collaboration and messaging.

Interaction among STEM stakeholders will be greatly enhanced through refinement of the FIRST Pre-Academy landing page. Plans are to render the SIP more intuitive by improving site design and navigability, and to integrate website capabilities that directly support online collaboration and user communication.

RESEARCH EXPERIENCE FOR TEACHERS (RET) – MIDDLE SCHOOLS

ENGINEERING, TECHNOLOGY AND MATHEMATICS

The Research Experiences for Teachers – Engineering Technology and Mathematics (RET – ET&M) program track intends to assist public and public charter middle school teachers by enhancing their knowledge of current technology and research across a broad range of STEM disciplines. Participating teachers receive technical support from academic and industry mentors, and hardware/software technology support to explore and develop new curriculum and activities. ET&M technical and technology support is specifically targeted to promote teacher ideas for hands-on, STEM-related lessons and activities. Collaboration among teachers and between teachers and mentors is strongly encouraged, as such interactions help stimulate professional interest and generate new curriculum ideas.

FY2010 Highlights

- RET – ET&M hardware/software and technical support helped teachers develop and implement more than 150 STEM-related lessons, projects and hands-on activities.
- Participation increased from 26 schools, 62 teachers and 3,470 students to 40 schools, 158 teachers and 4,224 students.
- A technology-focused workshop series facilitated interaction for teachers from 27 middle schools statewide with university researchers and industry professionals.
- Educational 3D modeling software and a fabrication tool were introduced and made available to improve understanding of basic geometry and engineering concepts.

Program Planning, Coordination and Implementation

The RET – ET&M program track was coordinated by the Office of the Dean, College of Engineering (CoE).

Technical mentors, including CoE students and volunteer research engineers provided additional support for teachers during FY 2010.

Major Initiatives

1. Technology-Specific Teacher Workshops

2. Teacher-Developed Curriculum & Activities

3. Ongoing Technical Support

FY 2010 Implementation

1. <u>Technology-Specific Teacher Workshops</u>
Four technology-specific ET &M workshops were held in FY 2010. Each half-day session focused on a particular area of teacher interest and enabled participants to share implemented STEM curriculum and best practices with their mentors and peers. Close attention was given to the impact of these activities on student engagement and achievement relative to mandated benchmark standards.

Speakers from academe and industry presented state-of-the-art technology and STEM research relevant to the workshop topics. These lay-friendly demonstrations provided an excellent complement to the teacher-teacher interactions and were enthusiastically received. Participants could learn directly from university researchers and industry professionals how middle school curriculum applies to cutting-edge research and real-world applications.

Following are brief summaries of the four technology-specific teacher workshops.

I. September 2009, PDA Workshop – Manoa Innovation Center
A Research Corporation of the University of Hawaiʻi systems engineer and several middle school teachers presented on wireless technology and applications and demonstrated the PDA and its various data collection applications, including real-world uses in aerospace, medicine, entertainment and education. Teachers led hands-on PDA training, and shared interactive classroom and field activities using PDAs. Shared activities included: lava toe and vesicle measurement, water chemistry testing, rainforest field guides, and social science surveys. 12 teachers from 10 Oʻahu and Maui middle schools attended in person or via videoconference.

II. December 2009, Robotics Workshop – Manoa Innovation Center
Invitees from UH Manoa Department of Mechanical Engineering, The Queen's Medical Center and Spectrum Photonics presented ongoing medical robotics research, and demonstrated a medical robotics application used at a local hospital, and other robotics based real-world engineering applications. Teachers shared relevant classroom and extra-curricular activities such as a week-long robotics experience culminating in a field trip to the UH College of Engineering, and a sequence of year-long courses in structures, simple machines and robotics. 24 teachers from 10 Oʻahu, Maui, Kauaʻi and Hawaiʻi middle schools attended this workshop in person or via videoconference.

III. February 2010, Sustainability Workshop – Honolulu Community College
UH speakers from Pacific Bioscience Research Center, Water Resource Research Center and Sea Grant College Program presented on sustainability science, material flow analysis, climate change, renewable energy, and biochar carbon sequestration. They highlighted the environmental impact of increasing demand for natural resources, and introduced current research to improve global sustainability through conservation and renewable resources. Teachers shared implemented hands-on activities and lessons on sustainability and

renewable energy. 35 teachers from 17 Oʻahu, Maui, Kauaʻi and Hawaiʻi middle schools attended this workshop in person or via videoconference.

IV. May 2010, 3D Modeling Workshop – Windward Community College
Speakers from Urban Works, Aku Shaper, Rapid Technology and UH Department of Mathematics presented digital modeling and fabrication tools, and 3D printing and rapid prototyping applications. The presentations showcased technology used to design and create 3D architectural renderings of building plans, how Aku Shaper integrates math principles into surfboard design and manufacturing, and the capabilities of digital prototyping tools used to produce 3D models such as human skulls, body armor, and gear assemblies. Teachers shared self-developed mathematics lessons using educational 3D modeling and fabrication tools. 50 teachers from 23 middle schools on Oʻahu, Maui, Kauaʻi and Hawaiʻi attended this workshop in person or via videoconference.

The FY 2010 workshop series was attended by teachers from 27 middle schools statewide., Steadily increasing registration numbers indicate that the workshops resonated strongly with participating RET – E&T teachers. Attendees shared STEM-related curriculum and implementation methods. As example, after the 3D modeling workshop, teachers from a dozen schools began planning hands-on lessons to teach geometry concepts using the FabLab ModelMaker software and 3D modeling tool. Academic and industry professionals introduced cutting-edge research and real-world applications that apply to classroom topics. Teachers were excited by math equations used in surfboard design and rapid prototyping technology used to produce body armor for Hollywood blockbuster movies, as students easily relate with such tangible applications. Several teachers attended a follow-up site tour of the Rapid Technology facilities to learn more about the digital 3D prototyping process.

2. Teacher-Developed Curriculum & Activities
During FY 2010, RET – E&T teachers developed and implemented many hands-on activities to complement the traditional STEM classroom curriculum. FIRST Pre-Academy strongly supported this work with expertise and technology (hardware) matched to specific lesson ideas. This approach encouraged teachers to innovate, and provided them with the technical support necessary to implement new lessons and activities in their classrooms.

A selection of Pre-Academy supported lessons and activities presented in the teacher workshop series stimulated interaction and collaboration among RET – E&T teachers and

led to the development or adaptation of many additional activities. This initiative proved effective in generating teacher collaboration and innovative STEM-related curriculum.

The FIRST Pre-Academy was instrumental in helping teachers identify and address existing curriculum areas that could be complemented with hands-on lessons and projects. Each teacher was allowed the leeway to integrate activities that would most effectively serve students in their unique classrooms and/or teaching environments.

A majority of the implemented hands-on activities fall within two topic areas covered at the teacher workshops:

Environmental Studies – Water Quality
Teachers implemented a variety of hands-on experiments using digital water quality sensors to measure pH, temperature, turbidity, dissolved oxygen, nitrate content and phosphate content in local streams, ponds, watersheds and rainfall. These technologies helped students collect, store and transmit data from remote locations while on environmental study field trips, and allowed them to analyze their data to gain a basic understanding of factors that affect water quality. Nine schools implemented water quality activities, including: Dole, Honokaa, Iao, Kawananakoa, King, Mililani, Pahoa, Waikoloa, and Washington.

Mathematics – 3D Modeling
Teachers developed hands-on lessons about three-dimensional geometric shapes, surface areas and volumes, and digital modeling using the educational FabLab ModelMaker 3D modeling software. Students could tactilely experience 2D nets and digital models by constructing three-dimensional models from paper. Twelve schools stated their intention to use the digital modeling software during the 2010-11 school year, including: Central, Ewa Makai, Innovations, Kapaa, Keaau, Lahaina, Lokelani, Maui Waena, Moanalua, Waimea Canyon, Waipahu, and Wheeler. Hawaii is the first state in the nation to use this software statewide in its public middle schools.

Although sustainability and 3D modeling were the topic areas of highest interest, teachers also implemented hands-on lessons and projects in a variety of other areas, including:

- **Physics**
  Investigations: force, motion, electricity, magnetism, electromagnetic, waves, wireless theory, thermal transfer, periodicity

- **Life Science**
  Investigations: photosynthesis, diffusion, cell theory, E. Coli, oxygen and carbon dioxide concentration

- **Earth/Space Science**
  Investigations: GIS technology, sea level rise, global warming, reef studies, GPS technology, global climate variation, ocean floor mapping, UVA/UVB radiation

- **Engineering**
  Design Projects: bridge building, roller coaster design, solar car design, Newton's Laws of Motion, simple machines, robotics, solar oven design
  Investigations: Unexploded Ordnance (UXO) mapping

FIRST Pre-Academy staff and volunteers supported more than 150 RET – ET&M activities in FY 2010. The number and variety of new lessons, projects and activities demonstrate the buy-in of middle school teachers for technical and technology support to stimulate professional and student interest and greater STEM-related achievement.

3. <u>Ongoing Technical Support</u>
Ongoing technical support was provided to RET – E&T teachers based on articulated needs. Since teacher interest is the driving factor behind lesson development, a teacher facilitator acted as an interface between participating teachers and technical support personnel, and coordinated technical support for teachers. Program staff, engineering students and volunteers offered a combination of informal technology training sessions, collaborative lesson development, training tutorials, and sample lessons.

Technology Training Sessions and School Visitation
Program staff and volunteers provided in-service training as needed for teachers and students to perform hands-on lessons and activities using RET – E&T technologies. Several training sessions are described below:

- Iao Intermediate: Program staff taught teachers how to run water quality experiments (pH, temperature, dissolved oxygen and turbidity) using two differing sensor configurations: 1) PDA, Vernier LabPro and Vernier sensors, and 2) Apple iPod Touch, Pasco AirLink and Pasco sensors. This session provided teachers with the training needed to lead a 300-student stream water observation field trip at Kahakuloa on Maui.

- Dole Middle: An RCUH engineer volunteered to demonstrate and supervise water quality experiments (pH, temperature, dissolved oxygen and turbidity). This session provided in-field training to 80 students and their teachers on a water quality excursion to Kokua Kalihi Valley.

- Mililani Middle: Program staff showed how to use the FabLab ModelMaker tool to manipulate 3D shapes, learn basic geometry concepts (vocabulary, sides, faces, surface area, volume), and construct 3D models. This session provided hands-on training for a dozen students and teachers on STEM Night at Mililani Middle School.

Collaborative Online Curriculum Development
Program staff worked with Mililani Middle to introduce a collaborative online curriculum development concept using the SIP website as an interface. Staff mentors helped the Mililani teacher develop a new lesson and experiment on sensor technology for underwater unexploded ordnance (UXO) mapping. As a pilot, this concept was deemed successful in enabling mentors to interact with teachers across the island and when schedule conflicts prevented regular face-to-face meetings. Additional online collaboration using the SIP will be supported during FY 2011, as described in the section on RET – E&T *Forward Planning and Implementation*.

Undergraduate Student Mentors
CoE undergraduate students were selected as mentors based on their interest in supporting a program that engages students and motivates them to pursue careers in STEM-related fields. Among the mentors are graduates of Hawaii high schools who feel that teacher and mentor

support made the difference that inspired them to pursue higher education and careers in STEM.

Training Tutorials and Sample Lessons
During the summer school break, program staff and four undergraduate students developed tutorials and sample lessons on 3D modeling and water quality testing, the highest-interest topics from FY 2010: 1)A printable tutorial for the FabLab ModelMaker software includes a short overview of its capabilities, and describes step-by-step how to fabricate 3D models using the software and an accompanying tool. 2) Undergraduate student mentors helped a teacher from Jarrett Middle School develop a set of video water quality tutorials. The videos provide detailed instructions for experiments using digital water quality sensors, and several sample lessons on water quality and related sustainability topics.

These materials were created to improve technical support in topic areas that will become challenging to service through one-on-one training, due to high teacher demand and limited mentor availability. Teachers can access the tutorials via a discussion group on the SIP site.

Industry-Based Support

During FY 2010, industry partnership support was explored. This initiative encourages active *pro bono* involvement from local industry through workshop presentation, financial, and technical support. Since an overarching goal of this program is to engage students in STEM-related education and teach them about possible career opportunities, industry participation provides an important component to the FIRST Pre-Academy program.

As example, industry representatives supported the May 2010 teacher workshop on 3D modeling by showing samples of digital modeling and fabrication tools used in local enterprise. The presentations highlighted current industry applications and technologies, and emphasized the importance of STEM-related curriculum to these real-world applications. After the workshop, Rapid Technology hosted several teachers at their facility to share more about 3D printing technology and its applications, and offered to provide continued assistance to middle schools in the area of 3D modeling and prototyping.

Workshop presenters provided an important contribution to teacher workshops, however the new industry partnership concept seeks more substantial commitment. New partners are asked to volunteer the following:
- Technical and real world support and experiences (mentorship)
- Participate in workshop(s)
- Financial support for requests such as mini grants
- Encourage other business to join the program

New Horizons Computer Learning Centers of Hawaii was the first company to embrace the industry partnership concept. In addition to providing technical support, New Horizons made the initial donation to support mini-grants for RET – ET&M programs, introduced additional funding opportunities from business associations, and offered to promote the concept to other companies.

Evaluation
Throughout the FY 2010 workshop series, attendees completed surveys to evaluate the effectiveness of the workshop format, presentations and training sessions. Results showed

that more than 90% of the attendees felt the workshop format was effective and provided them with useful information on the various STEM topics. More than 80% of respondents plan to implement ideas from the workshop in their classrooms.

Based on year-end survey responses from Pre-Academy schools, all participating teachers (100%) feel that the hardware and software technology resources provided by the program have positively impacted student learning. Nearly all survey responses indicate that STEM content provided via workshops and mentor support positively impacted student learning.

FY 2011 evaluation will incorporate both process and product/outcome components:

1) Process evaluation will include pre- and post- assessment of resources, implementation, participation, number and kind of mentoring activities, and response to teacher needs.

2) Product/outcome evaluation will be conducted externally by the Institute for the Integration of Technology into Teaching & Learning (IITTL), led by Director Gerald Knezek. This component will consider pretest/baseline data and pre-post development trends in teacher participants. Data will be compared across Hawai'i DOE and to the same instruments in other U.S. programs. In addition, studies will infer: a) indications of teacher comfort level with technology; b) changes in the course of the school year; c) changes as a result of participation over time (first, second, third year), and d) components of the program most likely to yield successful outcomes in the future, with special regard to student interest and engagement in STEM careers.

Forward Planning and Implementation
Extension of FY 2010 Initiatives
Based on successes demonstrated in FY 2010, RET – ET&M initiatives will be further developed during FY 2011. Forward planning will address teacher needs for hardware/software and technical support as follows:

Technology-Focused Teacher Workshops - Technology-focused teacher workshops will continue during FY 2011. Each workshop will focus on a specific topic or technology. Academic and industry guests will share state-of-the-art technology and STEM research. Teachers will learn from their peers, and directly from university researchers and industry professionals how middle school curriculum applies to cutting-edge research and real-world applications.

Teacher-Developed Curriculum & Activities - FIRST Pre-Academy will continue to support teacher development and implementation of STEM-related curriculum and activities. The two highest-interest topic areas from FY 2010 (water quality, 3D modeling and fabrication) will be well supported in the upcoming year: 1) Additional sets of water quality sensors and kits will be made available as a shared community resource for participating Pre-Academy schools, and tutorials and sample lessons will be available to interested teachers via the SIP; 2) FabLab ModelMaker software licenses, fabrication tools and tutorials will be available to interested teachers at all public and public charter middle schools throughout Hawai'i.

At the end of FY 2010, program staff compiled a comprehensive list of teacher interests for new curriculum and activities. The list spans a variety of STEM themes, including: physics, renewable energy, energy conservation, GIS mapping, ocean science, and environmental science. Some of these topics may be covered in the FY 2011 teacher workshops.

Ongoing Technical Support - Hardware/software and technical support needs will be addressed on a case-by-case basis to accommodate curriculum plans in each school. Based on teacher stated interests and needs, program staff, undergraduate students and volunteers will provide ongoing technical support via collaborative online lesson development, training tutorials, sample lessons, and technology training sessions using the process described below:

**Identify Teacher Needs for Technology and Technical Support - ** Program staff will contact teachers: to discuss specific curriculum plans and assess material and technical support needs; schedule hardware/software availability and/or coordinate technical support with mentors.

Collaborative Online Curriculum Development - Use the SIP to establish mentor support for teacher needs using online messaging and collaboration capability to interact with teachers. The online system will allow teachers to interact with technical mentors whose availability is limited. The online collaboration process was tested successfully during FY 2010.

Training Tutorials and Sample Lessons - Program staff will continue to develop training tutorials and sample lessons for high-interest topic areas such as 3D modeling and water quality testing, in order to mitigate technical needs where demand is high and material and mentor support are limited. Tutorials and sample lessons will be available via the SIP.

Technology Training Sessions and School Visitation - University student technical mentors will provide in-service training for hands-on lessons and activities using RET – E&T technologies in order to provide instruction as well as direct access to information about higher education and careers in STEM-related fields.

Industry-Based Support
The RET – ET&M program track will continue expanding the industry connection concept to recruit *pro bono* support from local STEM industry. Based on teacher interests for 2011, local companies from various industry sectors will be invited to present at teacher workshops and provide technical and financial support.

According to a 2008 report by the Hawaii Science & Technology Institute 1,964 science and technology companies and organizations employed 31,106 workers in 2007. A wide range of industry sectors includes: Agricultural Biotechnologies, Astronomy, Biotechnology/Life Sciences, Defense/Aerospace, Digital Media, Engineering/Professional Services, Environmental, Information and Communications Technology, Ocean Sciences, and Renewable Energy.

RET – Middle Schools ET&M seeks industry support in areas of high teacher interest:
- Sensors: Environmental Science, Natural resource management, Air & Water Quality, Visible & infrared light, Geological science, Global warming, Sustainability, Energy savings, Wind Energy, Motion Detectors
- Sustainability & Renewable Energy: Energy conservation, Weather & weathering, Frog building analysis, Wind energy.e
- 3D Modeling: Design contest, Urban planning, Conservation, School building design models, Energy efficient building design.

- GPS/GIS: Ancient civilizations, How technology is used by scientists
- Electromagnetics and Underwater Photography

Industry partners will be asked to make technical, workshop presentation and financial commitments as established in FY 2010:
- Provide technical support and real world experiences
- Participate in workshops
- Provide financial support for requests such as mini grants
- Encourage other business to join the program

Partnerships between industry and education create mutual benefit for both sides, and support a legacy for future growth.

RET – MIDDLE SCHOOLS
SCIENCE: OCEANOGRAPHY

The RET – Science: Oceanography program track assists public and public charter middle school teachers by creating and sharing self-contained, hands-on lessons that introduce students to oceanography and enhance teacher knowledge of current research and educational material through a combination of research experiences and training workshops, and providing extra-curricular educational outreach activities for middle school students and teachers. A key area of focus for this program track is microbial oceanography, because of the critically important roles of microbes in climate change, ocean acidification and the marine food web.

Educational staff and researchers at the Center for Microbial Oceanography: Research and Education (C-MORE), a National Science Foundation sponsored Science and Technology Center, have created seven types of science kits for teachers to borrow and implement in their classrooms. The kits include lessons and activities about marine science topics, such as: nautical knots & careers, marine debris, marine mystery, plankton, ocean acidification, random sampling, and the ocean conveyor belt. C-MORE science kits are aligned with Hawaii Content and Performance (HCPS III) Standards and national Ocean Literacy Principles. Teachers new to the program are encouraged to attend regular training workshops and presentations to learn how to use the various kits in their classroom.

This program track also provides opportunities to learn about microbial oceanography and research outside of the classroom environment. During FY 2010, selected teachers participated in a research cruise aboard a tall ship to gain first-hand experience in oceanographic research and techniques. Program staff held various outreach events to stimulate student interest in STEM, and to develop literacy in microbial oceanography.

Highlights

- By the end of FY 2010, 25 middle schools participated in this program track, an increase of 15 schools from the beginning of the year.

- During this official pilot year, six different science kits were borrowed at least 66 times by middle school teachers to teach hands-on lessons on microbial oceanography topics.

- A seventh science kit, entitled Ocean Conveyer Belt, was developed to expand the collection of teaching resources.

- The science kits are currently being used in a teacher-training course organized by the Hawai'i DOE.

- A research cruise aboard a tall ship was held to provide teachers from 13 middle schools with a first-hand introduction to oceanographic research and techniques.

- A detailed evaluation plan based on pre- and post- surveys for the science kits was developed in consultation with professional evaluators.

Program Planning and Coordination
The RET – Science: Oceanography program track was coordinated by the Center for Microbial Oceanography: Research and Education (C-MORE). During FY 2010, primary support personnel included four part-time positions: Research/Academic Program Coordinator, Northwestern Hawaiian Islands Outreach Specialist, and two Educational Assistants.

Major Initiatives
1. C-MORE Science Kits
2. STORI Research Cruise and Workshop for Teachers
3. Outreach Events

FY 2010 Implementation
1. C-MORE Science Kits
Background - During FY 2009, C-MORE educational staff created and tested science kits covering six topics: nautical knots & careers, marine debris, marine mystery, plankton, ocean acidification, and random sampling. The kits provided complete lesson plans and materials for hands-on science activities in a self-contained format, including background information and supplies necessary for teachers to implement a lesson on a particular topic in microbial oceanography. Ten sets of science kits were produced and field-tested in elementary, middle and high school science classrooms throughout the state and other educational venues.

Statewide Usage of C-MORE Science Kits - In FY 2010, the field-tested science kits were distributed statewide to eleven public schools and other educational venues that were selected as science kit hosts. Host sites on O'ahu, Maui, Kaua'i and Hawai'i were chosen to facilitate easy access to the kits. Since any interested teacher in Hawaii was allowed to borrow these kits free of charge, hosts were fully trained in the use of the kits and served as lending librarians and local experts who could provide training support for teachers in their local area. In total, 66 middle school teachers and an estimated 2,800 students used the science kits in FY 2010. Table 1 provides details on kit usage during the official pilot year, including the number of teachers that used each kit.

Table 1. Usage of C-MORE science kits during official pilot year (FY 2010)

C-MORE Science Kit	Minimum* number of teachers who borrowed each kit	Minimum* number of middle school teachers who borrowed each kit
Nautical Knots & Careers	9	5
Marine Debris	28	16
Marine Mystery	22	10
Plankton	34	16
Ocean Acidification	37	14
Random Sampling	12	5
Total	**142**	**66**

*Note: Only teachers who reserved kits through C-MORE's online reservation system are included in this table. Other teachers may have borrowed the kits from local area hosts without officially reserving them; the numbers above should be considered minimums.

New Science Kit on Ocean Conveyor Belt - During FY 2010, C-MORE expanded its array of science kits by developing a new kit focused on the Ocean Conveyor Belt. Like its predecessors, this C-MORE science kit is hands-on and aligned with Hawaii Content and Performance Standards (HCPS III) and national Ocean Literacy Principles. The Ocean Conveyor Belt kit uses hands-on and computer based experiments to engage students in exploring ocean circulation, nutrient cycling, and variations in the chemical, biological, and physical properties of seawater. Four lessons use experimenting, creating models, downloading data from online scientific databases and using Excel to graph, analyze and interpret the data. During FY 2011, an extension to this kit will be developed to include a Fluorescence-Temperature-Depth instrument specially designed and created in-house with the assistance of an undergraduate engineering intern.

In December 2009 a professional development workshop was held at UH Manoa to train 25 teachers in the use of this kit. Eight of the 25 teachers were middle school teachers. Valuable teacher feedback led to significant improvements in the kit.
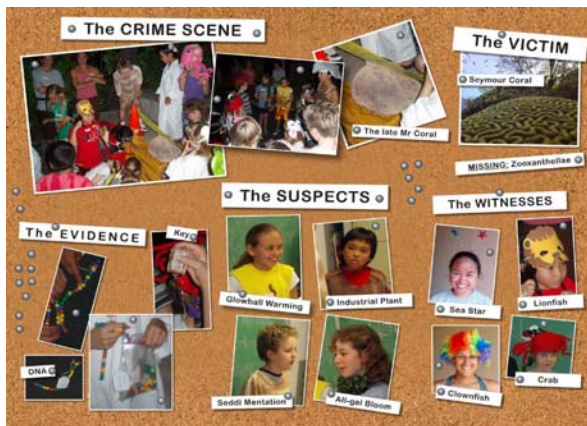
Teacher-training Workshops for Science Kits - In order to improve teacher confidence and increase kit usage, fifteen teacher-training sessions were held. The two different formats for these training events were formal teacher-training workshops, and informal presentations for small

groups of teachers. Table 2 provides details on each event, including the number of teachers that attended. A total of 104 teachers from 20 middle schools attended science kit workshops or presentations.

Table 2. Workshops and Presentations on C-MORE Science Kits

Event Date	School / Group	Number of Teachers	Middle School Teachers
9/2009	Waianae Intermediate	5	5
9/2009	Stevenson / Math Science Partnership	15	7
10/2009	South East Oahu	4	1
10/2009	Hawaii Science Teachers Association	13	3
10/2009	Waikiki Aquarium	124	60
10/2009	Kailua Intermediate	1	1
11/2009	Kamehameha Middle	4	4
12/2009	UH Institute for Teaching Excellence	16	-
12/2009	Stevenson / Math Science Partnership	20	9
12/2009	UH Manoa – Ocean Conveyor Belt	25	8
2/2010	Chaminade U/ pre-service teachers	15	-
2/2010	UH College of Ed/ pre-service teachers	17	6
2/2010	Kamakau Public Charter School	11	7
3/2010	Kaiser High School	2	0
4/2010	Waianae High School	9	0
	Total	**267**	**104**

Ongoing Technical Support
In addition to the group teacher-training workshops, technical support was provided by "local expert" kit hosts and an online discussion forum. Training support was provided at the following venues: University of Hawai'i at Mānoa, Stevenson Middle, Mililani Middle, Waialua High & Intermediate, Laie Elementary, King Intermediate, Castle High, Kapolei Middle, Innovations, Mokupapapa Discovery Center, Kauai High, and Kalama Intermediate.

An online discussion forum was created to facilitate technical support and promote interaction between teachers and university researchers. This forum allows sharing among teachers using C-MORE science kits, suggested improvements and fixes, and technical questions to C-MORE scientists and educators. Additional information and resources not contained in the kits are also provided in the online discussion forum. The science kit forum is accessible on both the C-MORE web site (http://cmore.soest.hawaii.edu/education.htm) and the STEM Intercommunity Portal (http://www.sip-hawaii.org).

2. STORI Research Cruise and Workshop for Teachers
In May 2010, the RET – Science: Oceanography program track held a research cruise aboard a tall ship for teachers from 13 middle schools to learn about oceanographic research and techniques directly from university researchers and scientists, and perform oceanography research on an actual research vessel. A follow-up workshop was held in August 2010.

Although Hawai'i's future depends heavily on the oceans, the ocean is still a poorly understood environment. The *School Teachers: Oceanographic Research Introduction (STORI)* research cruise and workshop provided teachers with an introduction to oceanographic research and techniques that researchers use to unravel the mysteries of the deep, and an opportunity to investigate O'ahu's coastal waters.

In preparation for the cruise, the selected teachers completed an online learning module designed to familiarize them with the ship, sailing terms, and research equipment. While on board the tall ship SSV Robert Seamans, they learned how to conduct a plankton tow and deploy a Conductivity-Temperature-Depth (CTD) instrument with a carousel for water sample collection. They analyzed plankton using onboard microscopes, recorded a depth profile using the CTD in real time, and performed oxygen titrations to learn about the geochemistry of the ocean.

In total, 24 K-12 teachers and 8 C-MORE/SOEST scientists and educators participated. 15 of the 24 were middle school teachers representing 13 middle schools statewide. Participating middle schools included: Chiefess Kamakahelei Middle, Hawaii Academy of Arts & Science, Kailua Intermediate, Kalama Intermediate, Kapolei Middle, Lanai High and Intermediate, Waialua High and Intermediate, Waikoloa Middle, Waimea Middle and Waipahu Intermediate.

To directly impact student learning, teachers were required to prepare a presentation highlighting one aspect of the research cruise and share it with other participants and their students. In August 2010, participants followed up by sharing presentations and lesson ideas, and learned about other teacher resources related to the RET – Science: Oceanography track. Motivated teachers were encouraged to apply for further support through C-MORE's Grants for Education in Microbial Science (GEMS).

3. Outreach Events
A variety of outreach events held during FY 2010 were designed to increase literacy in microbial oceanography and stimulate student career interest in oceanography and related STEM fields. Some of these events are listed in Table 3, below.

Table 3. C-MORE Outreach Events

Outreach Event	Date	Estimated Number of Participants	Middle School Participation
Boys and Girls Club, Honolulu	6/2010	40	Yes
Boys and Girls Club, Kailua	6/2010	75	No
Imiloa Family Science Night	5/2010	100	No
Mililani Middle STEM Night	4/2010	75	Yes
Oceanography Merit Badge	4/2010	50	Yes
Hawaiian Ocean Expo	2/2010	400	Yes

Evaluation
During FY 2010, program staff worked with a professional evaluation team to develop and field-test various evaluation instruments. After developing the evaluation model, two instruments were selected: one for students and one for teachers. Students will answer a

series of content questions prior to using the science kit ("pre-survey") and answer these same questions at the conclusion of the lesson ("post-survey1"). Two weeks later, they will answer the questions again ("post-survey2") to assess retention. Teachers will be asked to complete a survey at http://www.surveymonkey.com/s/CMORE-kit-evaluation to describe their usage of the science kits and any feedback on science kit content. Human subjects approval from the Institutional Research Board (IRB) has been secured to use these evaluation instruments. Data collection will be conducted during FY 2011.

Forward Planning and Implementation
RET – Science: Oceanography initiatives will be further developed during FY 2011 by building on previous activities, and launching two new initiatives.

<u>Extension of FY 2010 Initiatives</u>

C-MORE Science Kits: Teacher-Training Workshops - During FY2011, at least one teacher-training workshop will be held on each of the following islands: Oʻahu, Maui, Kauaʻi and Hawaiʻi. These workshops will train teachers in the use of the newly revised science kits, and be publicized to both in-service and pre-service teachers.

C-MORE Science Kits: Evaluation - During FY 2009 and FY 2010, seven C-MORE science kits covering a variety of ocean science topics were developed, field-tested, refined and distributed. Six of these kits have been fully updated and evaluation instruments in the form of student pre- and post- surveys and teacher evaluations have been created. During FY 2011, in consultation with a professional evaluation team from UH's Social Science Research Institute, a formal evaluation of these kits will be conducted. Three C-MORE education office staff will go into classrooms to teach lessons and administer surveys. As a corollary to this evaluation, teachers will be exposed to these kits, which will likely increase kit usage.

Outreach Events: Career Nights in Oceanography - Feedback received on the *Nautical Knots and Maritime Careers* kit, which introduces students to marine science careers, suggests it needs to include diverse career profiles that are more relevant to Hawaiʻi students. During FY 2011, we plan to recreate this kit, and offer at least three career nights where students can perform hands-on science and learn more about marine science careers.

<u>New Initiatives</u>

Research Cruises for Teachers and Students - During FY 2011, C-MORE will offer ten day-cruises to introduce students and teachers to hands-on deck sampling and analysis. Oahu tours will use the Honu Kai and conduct sampling near Coconut Island, followed by laboratory analysis in their new education center. C-MORE is currently investigating facilities on other islands, as this program is intended for implementation statewide.

Virtual Oceanographic Field Trips - SEA-IT-LIVE, a C-MORE initiative currently under development, will bring students on virtual oceanographic field trips. SEA-IT-LIVE will use high-quality video to share the excitement of scientific research conducted by any team of scientists anywhere, any time. During FY 2011, video will be collected on several research cruises, including the C-MORE Fall 2010 cruise, which departs off the coast of Chile.

RET MIDDLE SCHOOLS
APPLIED LEARNING: CREATIVE MEDIA

The Applied Learning – Creative Media program track provides assistance to public middle schools by enhancing the technological knowledge and professional training of creative media teachers and students. Teachers and students receive technical support from peer, academic and industry mentors, as well as hardware/software technology support to implement and improve creative media programs at their respective schools. A key philosophy of this program track is peer mentorship. In this spirit, a core group of students is trained on a regular basis by Searider Productions staff and students; these students, in turn, provide technical training and mentorship at participating middle schools in their local districts.

Highlights

- During FY 2010, nine digital media workshops provided students and teachers from five middle schools with hands-on skills training in digital media production.
- Students at Waianae High, Chiefess Kamakahelei Middle and Maui High were trained as mentors; these students provided creative media mentorship to students at middle schools in their local areas.
- Digital media training sites were set up to improve mentorship infrastructure at the following schools on O'ahu, Kaua'i and Maui: Waianae High, Waianae Intermediate, Chiefess Kamakahelei Middle, Maui High, Lokelani Intermediate, Maui Waena Intermediate and Waimea Canyon.
- Digital media training curriculum was standardized so teachers and peer mentors could lead training sessions at their respective schools and other middle schools in their local areas.
- Creative media programs were established at Olomana and Stevenson Middle.

Program Planning and Coordination

The Applied Learning – Creative Media program track was coordinated by Searider Productions and the UH Academy for Creative Media.

Major Initiatives
1. Improvement and Expansion of Training Sites
2. Skills and Mentorship Training Workshops
3. New Creative Media Programs

FY 2010 Implementation

1. Improvement and Expansion of Training Sites
Infrastructure Improvement and Expansion - Existing digital media training sites on O'ahu, Kaua'i and Maui at Waianae High, Waianae Intermediate, Chiefess Kamakahelei Middle, and Maui High were upgraded. Hardware and software, such as video cameras, microphones, and computers, were purchased and distributed to support advanced training and production

activities for the digital media programs at these schools. The improvements enabled students to create commercial-quality video projects for public access television and state and national competitions. To ensure consistency at the training workshops, all sites received the same equipment and digital editing software.

New Maui and Kaua'i training sites were established at Lokelani Intermediate, Maui Waena Intermediate and Waimea Canyon Middle. Equipment was provided to help beginning digital media students create basic video projects, and is similar to the equipment used in media training workshops at the advanced training sites.

Standardized Curriculum - Digital media training curriculum was standardized so teachers and student mentors could consistently apply techniques and lessons at their local training sites. Topics include: basic photography, composition, audio, storytelling, story structure, sequencing, and interviewing.

The training curriculum was aligned to meet state and national learning outcomes and standards, including the State of Hawai'i Department of Education's General Learner Outcomes (GLOs). Evidence of GLOs is demonstrated at the training workshops through observable student behaviors. The six GLOs addressed by this curriculum are:

- **Self-directed Learner** - Able to be responsible for one's own learning
- **Community Contributor** - Understands that it is essential for human beings to work together
- **Complex Thinker** - Able to demonstrate critical thinking and problem solving
- **Quality Producer** - Able to recognize and produce quality performance and quality products
- **Effective Communicator** - Able to communicate effectively
- **Effective and Ethical User of Technology** - Able to use a variety of technologies effectively and ethically

Student instruction and learning in the workshops meets several Hawai'i Content and Performance Standards (HCPS) III benchmarks in Language Arts and Career & Technical Education:

- **Language Arts – Standard 4: Writing: Conventions and Skills**
  Students learn research skills, how to write interesting leads, organize information, include appropriate facts and details, provide closure to their reports, and how to storyboard their projects. This standard helps students learn to use the writing process and conventions of language and research to elicit meaning and communicate effectively for a variety of purposes and audiences.

- **Language Arts – Standard 6: Oral Communication: Conventions and Skills**
  Students taking the role of reporters and anchors follow the oral communication standard. Students are evaluated on pronunciation, grammar, and use of nonverbal language to engage audience, volume, pitch, pacing, and eye contact. With this standard, students apply knowledge of verbal and nonverbal language to communicate effectively in various situations for a variety of purposes.

- **Career and Technical Education Standard 1: Technological Design**

Students assess their own videos as well as other student videos and try to modify their work based on the suggestions of other students or professionals. With this standard, students not only apply technology to create a video package, they also obtain feedback from other students and professionals to improve their projects.

The standardized digital media training curriculum addresses the six National Educational Technology Standards:

1. **Creativity and Innovation** - Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
2. **Communication and Collaboration** - Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
3. **Research and Information Fluency** - Students apply digital tools to gather, evaluate, and use information.
4. **Critical Thinking, Problem Solving, and Decision Making** - Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
5. **Digital Citizenship** - Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
6. **Technology Operations and Concepts** - Students demonstrate a sound understanding of technology concepts, systems, and operations.

2. Skills and Mentorship Training Workshops

Nine digital media training workshops were held at Waianae High, Chiefess Kamakahelei Middle and Maui High to prepare students for higher education, employment and entrepreneurship in digital media industries. Students gained technical skills in aspects of digital media production, including: composition, story structure, photography and video editing. Training sessions incorporated important native Hawaiian values, artistic and technical skills, and teamwork through various hands-on, applied learning experiences.

Middle and high school students who attended these workshops were also trained as peer mentors so that they could use the standardized training curriculum to mentor students at their own and other participating middle schools in the area of digital media production.

August 2009 – News Production Workshop - Students learned news production skills such as basic photography, composition and story structure. By the end of the workshop, students were expected to produce a 2-minute feature video. Attendees included 55 students from Waianae High, Maui High, Chiefess Kamakahelei Middle, and Waianae Intermediate.

September 2009 – Video Production Workshop - Students learned video production skills such as basic photography, composition and story structure. By the end of the workshop, students were expected to produce a 30-second public service announcement. Attendees included 35 students from Waianae Intermediate, Waiʻanae Elementary and Leihoku Elementary.

October 2009 – Final Cut Pro Workshop - Students learned to edit videos using Final Cut Pro software. This workshop involved 10 students from Leihoku Elementary, and 5 Waianae Intermediate student mentors.

February 2010 – News Production Workshop - 38 students from Maui High, Chiefess Kamakahelei Middle and Waianae Intermediate, and 10 Waianae High student mentors attended a two-day workshop on news production. By the end of the workshop, students were expected to produce a 2-minute news feature video.

March 2010 – Composition Workshop - 33 students from Maui High, Maui Waena Intermediate and Lokelani Intermediate, and 4 Waianae High student mentors were given lessons on basic photography, composition, audio, story structure/sequencing and interviewing. By the end of the workshop, they were expected to create their own two-minute video incorporating composition, sequencing of shots, story structure (beginning, middle and end), natural sound and music selection.

April 2010 – Hiki No Program Workshop - 10 students from Maui Waena Intermediate, and 5 Maui High student mentors attended a workshop for assistance with a 90-second video about their school/community for the upcoming PBS Hawaii Hiki No Program.

April 2010 – Composition Workshop - 24 students from Kauai High, Waimea High, Kapaa High, Chiefess Kamakahelei Middle and Waimea Canyon Middle, and 4 Waiʻanae High student mentors were given lessons on basic photography, composition, audio, story structure/sequencing and interviewing. By the end of the workshop, students were expected to create a 30-second public service announcement incorporating composition, sequencing of shots, story structure (beginning, middle and end), natural sound and music selection.

May 2010 – Hiki No Program Workshop - 10 students from Maui Waena Intermediate, and 5 Maui High student mentors received assistance with their 90-second video about their school/community for the upcoming PBS Hawaii Hiki No Program.

June 2010 – Digital Media Camp - 87 students from Waianae High, Waianae Intermediate, Maui High, Maui Waena Intermediate, Lihikai Elementary, Moanalua High and Chiefess Kamakahelei Middle, and 6 college mentors were trained in basic video production skills such as basic photography, composition, audio, story structure/sequencing and interviewing. Advanced students worked one-on-one with guest speaker Les Rose, an Emmy Award winning photojournalist for CBS News bureau in Los Angeles to learn interviewing techniques, story development, writing copy, script structure, shot composition and camera techniques. By the end of the workshop, beginning students were expected to create their own 60-second video demonstrating composition, story structure and sequencing. Advanced students created a two-minute news feature about a person living in Waiʻanae. Many of these feature stories will be aired by PBS Hawaii on the Hiki No program. The completed projects will be used as models and examples at future training sessions and camps.

3. <u>New Creative Media Programs</u>
The Applied Learning – Creative Media program track built on the proven success of the Searider Productions model for engaging Hawaiʻi's youth through digital media. In FY 2010 ACM established new creative media programs at middle schools and supported additional schools that demonstrated a strong need to enhance their existing programs. Consideration was given to schools servicing some of our most challenging or at risk student populations.

Lokelani Intermediate, Maui Waena Intermediate, Waimea Canyon Middle, Olomana, Stevenson Middle, and Waialua Middle and High were selected to receive hardware and software technology support, and digital media training opportunities. Prior to FIRST Pre-Academy support, two of the five schools (Olomana and Stevenson Middle) had extremely

limited media equipment for video production or animation, and few of the schools participated in benchmark programs such as Olelo's Youth Xchange.

In FY 2010, Olomana and Stevenson Middle received start-up resources to establish new creative media programs; Waialua received funds to enhance its existing Creative Media department. The resources were used to buy hardware and software, including HD cameras and computers, to train students in broadcast journalism, computer animation, visual effects, production of public service announcements (PSAs) and music videos, including composing original music on computer software. Students and faculty from Waialua, and from Baldwin High School (Maui) attended the October, 2010 Waianae Seariders Production "Boot Camp". Teachers and students in these programs will receive training and technical support from Searider Productions mentors and staff in FY 2011.

Evaluation
Teacher and student participants unanimously (100%) found the Applied Learning – Creative Media program track worthy of recommendation to others. Initiatives implemented throughout FY 2010 generated positive teacher and student impact in areas such as student engagement, student achievement, and professional development for teachers. Students commented that they found the workshops extremely helpful because they became better communicators and learned good work ethic and digital media skills. Teachers found the workshop content pertinent to [middle school] standards and class objectives, personally and professionally enriching and inspirational. All participants found instructors and student trainers to be knowledgeable and able to engage student interest. Students 'become teachers', gain confidence, and are respected as experts in the classroom.

Forward Planning and Implementation
Skills and Mentorship Training Workshops: In FY 2011, program staff plans to expand the statewide impact of digital media training workshops through collaboration with PBS Hawaii's *Hiki No* multimedia educational initiative. *Hiki No* middle schools will be invited to attend future RET – Creative Media training workshops. *Hiki No*, which means "can do" in Hawaiian, will be the first statewide student news network in America. Currently, approximately 60 middle and high schools are interested in participating. In future workshops students will produce 90-second to two-minute videos about their schools or communities for broadcast on PBS Hawaii. This collaboration will help students develop professional quality videos that meet the broadcast standards of PBS Hawaii.

Additional planning includes training workshops to provide students with hands-on skills training in digital media production and mentorship training. The training will take place throughout the school year and summer of FY 2011, and will continue thereafter.

Based on the success of a week-long training at Waianae High in June 2010, another week-long workshop is planned for October 2010. Students from at least ten Oahu middle schools will learn basic video production including: photography, composition, audio, story structure, sequencing, and interviewing. By the end of the workshop, beginning students are expected to create a 60-second video demonstrating composition, story structure and sequencing skills. Advanced students will be expected to produce a two-minute news feature.

In FY 2011, four two-day workshops at schools on Hawaii, Maui and Kauai are planned at Hilo High, Maui High, Baldwin High and Chiefess Kamakahelei Middle. Current Applied Learning – Creative Media participants and non-participating middle schools will be invited.

In June 2011, Waianae High will host a second week-long workshop for new in-training student mentors from Chiefess Kamakahelei Middle, Maui High, Hilo High and Waianae Intermediate. Students will receive in-depth training to prepare them as mentors at their respective schools and other participating middle schools in their local districts. Students and faculty from Baldwin High (Maui), Olomana, Waialua, Stevenson Middle and 5 additional schools on different islands will also attend.

Improvement and Expansion of Training Sites: In FY 2011, with the new addition of Hilo High, mentor training sites will have been established on all major islands in the state, including Oʻahu, Kauaʻi, Maui and Hawaiʻi. Hilo High media teacher Byron Kapali has agreed to host future digital media workshops at his school, and to help expand this program track in Hilo by inviting other local middle school teachers and students to scheduled events.

Professional Development Training: The Applied Learning – Creative Media program track will expand its technical support base by working with the new UH West Oʻahu campus to add creative media instruction to their teacher education degree programs. Program staff will work directly with DOE Acting Superintendent Kathy Matayoshi and DOE Acting Deputy Superintendent Ronn K. Nozoe to enhance professional development of existing faculty in the DOE through Searider Productions program and facilities, and with UH West Oʻahu Chancellor Gene Awakuni, UH West Oʻahu Vice Chancellor for Academic Affairs Linda Randall and Chris Lee, Founder and Director of the Academy for Creative Media to develop curriculum for creative media instruction degrees at UH West Oʻahu.

ROBOTICS

funding from Temporary Assistance for Needy Families (TANF) Block Grant

A TANF Block Grant in support of Scholastic Robotics Program Implementation provided $88,000 for the period July 1, 2009 – June 30, 2010 by agreement between the University of Hawaiʻi at Mānoa College of Engineering (CoE) and the Department of Business, Economic Development, and Tourism (DBEDT). The account was established March 9, 2010, thus considerably shortening the true performance period to March 9, 2010-June 30, 2010.

It was decided to focus attention of three Hawaiʻi DOE Complex Areas: A) East Oʻahu Region; B) West Hawaiʻi Island Region, and C) Windward Oʻahu Region. The existing funding structure was redesigned to provide broader impact across the K-12 educational spectrum. Dr. Song K. Choi, Assistant Dean of CoE, coordinated efforts to establish contact at the elementary, middle and high school levels with complex area teachers, mentors and representatives, to recruit volunteer and fundraising assistance, and to procure and distribute educational robotics kits for students to use in state and national robotics programs and competitions. VEX, Underwater SeaPerch, Lego Mindstorm and Letry were chosen as the robotics kits that would enable the most students to participate at the least expense, and ensure the greatest continuity between grade levels. In FY 2010 more than 1400 (K-12) students benefitted from robotics activities in the State of Hawaiʻi. The abbreviated performance period resulted in some carry-over kits which will be used in FY 2011.

CONCLUSION

The Fostering Inspiration and Relevance through Science and Technology (FIRST) Pre-Academy, established through Act 111 of the 2007 Legislature for *Innovation in Education*, and administered by the University of Hawai'i System and University of Hawai'i College of Engineering, is entering its fourth year of program implementation and is well on track to achieve its goal of statewide participation of all interested schools by 2012.

In FY 2010, funding from the American recovery and Reinvestment Act (ARRA) State Fiscal Stabilization fund (SFSF), Government Services – Part B, enabled expansion of existing initiatives as well as dissemination to new and underserved areas of the State.

We anticipate that with continued funding, academic and industry support, the FIRST Pre-Academies will exert considerable positive impact with regard to STEM subjects and their associated careers, by attracting an increasing number of the State's K-12 students to higher level studies in STEM and related programs and leading them to better employment options in our economy's increasingly technology driven industries.

Appendix A: FIRST Pre-Academy -- Program Participation

FIRST PRE-ACADEMY ALL PROGRAM TRACKS July 1, 2009 - June 30, 2010 All Schools	District	Start Year	Participating Students**	Participating Teachers**	RET - E&T	RET - Science: Oceanography	Applied Learning - Creative Media
Aliamanu Middle	Central	2010	0*	1	Y		
Central Middle	Honolulu	2009	240	2	Y		
Chiefess Kamakahelei Middle	Kauai	2010	20	1		Y	Y
Dole Middle	Honolulu	2005	250	20	Y		
Ewa Makai Middle	Leeward	2010	0*	4	Y		
Halau Ku Mana	PCS	2010	1	1		Y	
Halau Lokahi	PCS	2010	1	1		Y	
Hana High & Intermediate	Maui	2010	0*	4	Y		
Hawaii Academy of Arts & Science	PCS	2010	1	1		Y	
Highlands Intermediate	Leeward	2008	220	4	Y		
Hilo Intermediate	Hawaii	2010	0*	3	Y		
Honokaa High & Intermediate	Hawaii	2006	110	3	Y		
Iao Intermediate	Maui	2008	300	9	Y		
Innovations	PCS	2010	1	2	Y	Y	
Jarrett Middle	Honolulu	2008	30	3	Y		
Kahuku High & Intermediate	Windward	2008	130	3	Y	Y	
Kailua Intermediate	Windward	2010	0*	1	Y	Y	
Kaimuki Middle	Honolulu	2008	150	2	Y		
Kalakaua Middle	Honolulu	2010	20	7	Y		
Kalama Intermediate	Maui	2008	150	4	Y	Y	
Kalanianaole Elementary & Intermediate	Hawaii	2010	0*	3	Y		
Kamaile Academy	PCS	2010	1	1		Y	
Kanu o ka Aina	PCS	2010	0*	4	Y		
Kapaa Middle	Kauai	2007	450	4	Y		
Kapolei Middle	Leeward	2009	0*	1		Y	
Kawaikini New Century PCS	PCS	2008	19	1	Y		
Kawananakoa Middle	Honolulu	2008	145	3	Y		
Keaau Middle	Hawaii	2005	198	4	Y		
Kealakehe Intermediate	Hawaii	2010	1	1		Y	
King Intermediate	Windward	2008	300	6	Y	Y	
Lahaina Intermediate	Maui	2010	0*	3	Y		
Laie Elementary***	Windward	2008	75	1	Y		
Lanai High & Elementary	Maui	2009	1	1		Y	
Lokelani Intermediate	Maui	2010	0*	11	Y		Y
Maui Waena Intermediate	Maui	2010	0*	2	Y		Y
Mililani Middle	Central	2009	100	2	Y	Y	
Moanalua Middle	Central	2008	450	6	Y		
Molokai Middle	Maui	2010	0*	6	Y		
Myron B. Thompson Academy	PCS	2010	1	1		Y	
Nanakuli High & Intermediate	Leeward	2008	260	3	Y	Y	
Niu Valley Middle	Honolulu	2010	1	1		Y	
Olomana	Windward	2010	0*	1			Y

Appendix A: FIRST Pre-Academy -- Program Participation

FIRST PRE-ACADEMY ALL PROGRAM TRACKS July 1, 2009 - June 30, 2010 — All Schools (Continued)	District	Start Year	Participating Students**	Participating Teachers**	RET - E&T	RET - Science: Oceanography	Applied Learning - Creative Media
Paauilo Elementary & Intermediate	Hawaii	2010	0*	5	Y		
Pahoa High & Intermediate	Hawaii	2008	158	2	Y		
Stevenson Middle	Honolulu	2009	1	1		Y	Y
Voyager PCS	PCS	2008	49	1	Y		
Wahiawa Middle	Central	2008	120	3	Y		
Waiakea Intermediate	Hawaii	2010	0*	3	Y		
Waialua High & Intermediate	Central	2010	1	1		Y	Y
Waianae Intermediate	Leeward	2010	15	1		Y	Y
Waikoloa Elementary & Middle	Hawaii	2008	200	1	Y	Y	
Waimea Canyon Middle	Kauai	2008	120	1	Y		Y
Waimea Middle Public Conversion	PCS	2010	1	1		Y	
Waipahu Intermediate	Leeward	2008	45	5	Y	Y	
Washington Middle	Honolulu	2008	120	4	Y	Y	
West Hawaii Explorations	PCS	2010	1	1		Y	
Wheeler Middle	Central	2008	55	4	Y		
TOTAL			**4512**	**176**	**40**	**25**	**8**

Schools Added Since June 30, 2010	District	Start Year	Participating Students	Participating Teachers	RET - E&T	RET - Science: Oceanography	Applied Learning - Creative Media
Aiea Intermediate	Central	2011	0*	2	Y		
Connections	PCS	2011	0*	1			Y
Education Laboratory	PCS	2011	0*	1	Y		
Ke Kula Niihau O Kekaha Learning Center	PCS	2011	0*	1			Y
Kihei	PCS	2011	0*	1			Y
TOTAL NEW SCHOOLS			**0***	**6**	**2**	**0**	**3**

Notes:
* School joined FIRST Pre-Academy after start of Spring 2010 semester. Student involvement numbers are not collected during the first semester that the school participates in the program to allow teachers time to integrate activities into curriculum. This number will be updated for all continuing schools (pre-2010), and schools added
** Number of participants should be considered a minimum; to avoid double counting, the numbers represent the maximum number of participants in any single program track. Also, since the number of students impacted by C-MORE science kits was not tracked during FY 2010, it was assumed that a minimum of one student used the borrowed science kits.
*** Laie Elementary and Kahuku High & Intermediate participate as one team.

MOA Deliverable	FY 2010 Implementation
A. While participation in the FIRST Pre-Academy is voluntary, the goal is to expand the FIRST Pre-Academy program to 40 public and public charter middle schools within the State of Hawaii by June 30, 2010 and reach 80 public and public charter middle schools by January 31, 2011.	FIRST Pre-Academy achieved 70% participation statewide, including 56 public and public charter middle schools on six islands: Oʻahu (30), Hawaiʻi (14), Maui (6), Kauaʻi (4), Molokaʻi (1), and Lanaʻi (1). This represents 45 of 54 public non-charter middle schools (80%) and 11 of 26 public charter middle schools (42%) statewide. At the end of FY 2010, participants numbered 174 teachers and 4,460 students. Sources: 1. *Program Summary – Statewide Participation* 2. *Appendix A: FIRST Pre-Academy – Program Participation* 3. *Appendix C: RET – Engineering & Technology – Program Track Participation* 4. *Appendix D: RET – Science – Program Track Participation* 5. *Appendix E: Applied Learning – Creative Media – Program Track Participation*
B. Provide technical support in the development and implementation of additional problem-based, applied learning projects and curriculum in STEM. Technical support includes expert mentoring through the STEM portal, classroom visits, teacher meetings, field trip support, etc. The program will also facilitate teacher to teacher collaboration and sharing.	Technical support was provided to FIRST Pre-Academy participants through a combination of university/industry mentoring through the SIP, classroom visits, technical training, teacher meetings, workshops, field trip support, and UH-developed tutorials and sample lessons. Sources: 1. *SIP – Enhanced Interaction Among STEM Stakeholders* 2. *SIP – Facilitate Ongoing Support for Pre-Academy Participants* 3. *RET – E&T – Technology-Specific Teacher Workshops* 4. *RET – E&T – Teacher-Developed Curriculum & Activities* 5. *RET – E&T – Ongoing Technical Support* 6. *RET – Science – C-MORE Science Kits* 7. *RET – Science – STORI Research Cruise and Workshop for Teachers* 8. *Applied Learning – Creative Media – Skills and Mentorship Training Workshops*
B.i. Technical support will include industry and university experts.	Industry and university experts provided technical support through the SIP, classroom visits, technical training, workshops, presentations, field trip support, and UH-developed curriculum aids. Sources: 1. *SIP – Facilitate Ongoing Support for Pre-Academy Participants* 2. *RET – E&T – Technology-Specific Teacher Workshops* 3. *RET – E&T – Ongoing Technical Support* 4. *RET – Science – C-MORE Science Kits* 5. *RET – Science – STORI Research Cruise and Workshop for*

	Teachers 6. *Applied Learning – Creative Media – Skills and Mentorship Training Workshops*
C. Procure additional resources including hardware, software, materials and supplies required to implement the teacher driven-developed curriculum and projects. The goals of the activities are to stimulate the interest and foster achievement of students in science, technology, engineering and mathematics skills.	Hardware and software resources were procured to support Pre-Academy activities at participating schools. Sources: 1. *RET – E&T – Teacher-Developed Curriculum & Activities* 2. *RET – Science – C-MORE Science Kits* 3. *Applied Learning – Creative Media – Improvement and Expansion of Training Sites* 4. *Applied Learning – Expand Existing and Establish New Creative Media Programs*
D. Organize four mini-technical workshops per Fiscal Year. Workshop content will also be disseminated through the web portal to ensure maximum reach.	Twenty technical workshops were held for participating Pre-Academy teachers at intervals throughout FY 2010. Sources: 1. *RET – E&T – Technology-Specific Teacher Workshops* 2. *RET – Science – C-MORE Science Kits* 3. *RET – Science – STORI Research Cruise and Workshop for Teachers* 4. *Applied Learning – Creative Media – Skills and Mentorship Training Workshops*
E. Develop program evaluation measures to provide feedback on program effectiveness and impact towards the advancement of STEM in middle schools.	A combination of formal and informal evaluation measures were performed for the three program tracks. Sources: 1. *RET – E&T Workshop Evaluation and Articulation Feedback* 2. *RET – Science – Evaluation* 3. *Applied Learning – Creative Media - Evaluation*
F. Develop an industry-university support base consistent with workforce market needs. The support will include mentoring, classroom presentations, minigrants, field trip support, technical assistance, etc.	Industry partnership support was explored. This initiative encourages active involvement from local industry through workshop presentation, financial, and technical support. Since an overarching goal of this program is to engage students in STEM-related education and teach them about possible career opportunities, industry participation provides an important component to the FIRST Pre-Academy program. Industry/university support based was developed, and provided mentorship, classroom presentations, mini-grant funding, field trip support, and technical assistance for participating teachers.

	Sources: 1. *RET – E&T – Ongoing Technical Support*

G. Create an online Pre-Academy teacher web portal for middle school STEM educators to collaborate with other STEM educators, private industry, university, and community groups to promote innovation in STEM education. First Phase (documentation phase) to be completed by June 30, 2010. Second Phase (collaboration, sharing phase, and data mining tools) to be completed by January 31, 2011 with ongoing upgrades.	The STEM Intercommunity Portal was developed to enhance the FIRST Pre-Academy program by improving information exchange and interaction among STEM community members, and facilitating technical and logistical support for Pre-Academy teacher and student participants. The SIP provides uninterrupted access to an online forum where participants can share, review, research, collaborate and archive ideas for innovative STEM projects and curriculum.
	
	Sources:
	  1. *SIP – General Teacher Interest and Membership*
	  2. *SIP – Enhanced Interaction Among STEM Stakeholders*
	  3. *SIP – Facilitate Ongoing Support for Pre-Academy Participants*
	  4. *SIP – Promote Autonomous Participation of SIP Members*

Appendix C: RET - Engineering & Technology -- Program Track Participation

FIRST PRE-ACADEMY RET - ENGINEERING & TECHNOLOGY July 1, 2009 - June 30, 2010 Continuing Schools	District	Start Year	Participating Students	Participating Teachers	Sep 2009 PDA Workshop	Dec 2009 Robotics Workshop	Feb 2010 Sustainability Workshop	May 2010 3D Modeling Workshop
Central Middle	Honolulu	2009	240	2	0	0	0	1
Dole Middle	Honolulu	2005	250	20	1	4	7	9
Highlands Intermediate	Leeward	2008	220	4	1	1	1	2
Honokaa High & Intermediate	Hawaii	2006	110	3	0	0	0	1
Iao Intermediate	Maui	2008	300	9	1	5	4	2
Jarrett Middle	Honolulu	2008	30	3	3	3	3	1
Kahuku High & Intermediate*	Windward	2008	130	3	1	0	1	0
Kaimuki Middle	Honolulu	2008	150	2	0	0	0	0
Kalama Intermediate	Maui	2008	150	4	0	0	2	1
Kapaa Middle	Kauai	2007	450	4	0	1	1	0
Kawaikini New Century PCS	PCS	2008	19	1	0	0	0	1
Kawananakoa Middle	Honolulu	2008	145	3	1	1	3	1
Keaau Middle	Hawaii	2005	198	4	0	0	1	2
King Intermediate	Windward	2008	300	6	1	0	1	3
Laie Elementary*	Windward	2008	75	1	0	0	1	0
Mililani Middle	Central	2009	100	2	1	1	4	2
Moanalua Middle	Central	2008	450	6	0	6	1	3
Nanakuli Intermediate	Leeward	2008	260	3	0	0	1	1
Pahoa High & Intermediate	Hawaii	2008	158	2	0	0	0	0
Voyager PCS	PCS	2008	49	1	0	0	0	0
Wahiawa Middle	Central	2008	120	3	0	0	1	0
Waikoloa Elementary & Middle	Hawaii	2008	200	1	0	1	0	1
Waimea Canyon Middle	Kauai	2008	120	1	0	0	0	1
Waipahu Intermediate	Leeward	2008	45	5	0	0	2	3
Washington Middle	Honolulu	2008	120	4	1	1	1	1
Wheeler Middle	Central	2008	55	4	1	0	0	1
SUBTOTALS			4444	101	12	24	35	37

Note:

* Laie Elementary and Kahuku High & Intermediate participate as one team.

Appendix C: RET - Engineering & Technology -- Program Track Participation

FIRST PRE-ACADEMY RET - ENGINEERING & TECHNOLOGY July 1, 2009 - June 30, 2010 Expansion Schools	District	Start Year	Participating Students	Participating Teachers	Sep 2009 PDA Workshop	Dec 2009 Robotics Workshop	Feb 2010 Sustainability Workshop	May 2010 3D Modeling Workshop
Aliamanu Middle	Central	2010	0**	1	0	0	0	0
Ewa Makai Middle	Leeward	2010	0**	4	0	0	0	0
Hana High & Intermediate	Maui	2010	0**	4	0	0	0	0
Hilo Intermediate	Hawaii	2010	0**	3	0	0	0	2
Innovations	PCS	2010	0**	2	0	0	0	0
Kailua Intermediate	Windward	2010	0**	1	0	0	0	0
Kalakaua Middle	Honolulu	2010	20	7	0	0	0	5
Kalanianaole Elementary & Intermediate	Hawaii	2010	0**	3	0	0	0	0
Kanu o ka Aina	PCS	2010	0**	4	0	0	0	0
Lahaina Intermediate	Maui	2010	0**	3	0	0	0	0
Lokelani Intermediate	Maui	2010	0**	11	0	0	0	5
Maui Waena Intermediate	Maui	2010	0**	2	0	0	0	0
Molokai Middle	Maui	2010	0**	6	0	0	0	0
Paauilo Elementary & Intermediate	Hawaii	2010	0**	5	0	0	0	0
Waiakea Intermediate	Hawaii	2010	0**	3	0	0	0	2
SUBTOTALS			20	59	0	0	0	14
TOTALS			4464	160	12	24	35	51

Schools Added Since June 30, 2010	District	Start Year	Participating Students	Participating Teachers
Aiea Intermediate	Central	2011	0**	2
Education Laboratory	PCS	2011	0**	1
TOTAL NEW SCHOOLS			0**	3

Note:

** School joined FIRST Pre-Academy after start of Spring 2010 semester. Student involvement numbers are not collected during the first semester that the school participates in the program to allow teachers time to integrate activities into curriculum. This number will be updated for all continuing schools (pre-2010), and schools added during 2010.

Appendix D: RET - Science -- Program Track Participation

FIRST PRE-ACADEMY RET - SCIENCE: OCEANOGRAPHY July 1, 2009 - June 30, 2010 Active Schools	District	Start Year	Attended Science Kits Workshop	Hosted / Borrowed Science Kits	STORI Research Cruise and Workshop
Chiefess Kamakahelei Middle	Kauai	2010	Y		Y
Halau Ku Mana	PCS	2010		Y	
Halau Lokahi	PCS	2010		Y	
Hawaii Academy of Arts & Science	PCS	2010		Y	Y
Innovations	PCS	2009		Y	
Kahuku High & Intermediate	Windward	2010	Y	Y	
Kailua Intermediate	Windward	2010	Y		Y
Kalama Intermediate	Maui	2009	Y	Y	Y
Kamaile Academy	PCS	2010		Y	
Kapolei Middle	Leeward	2009	Y	Y	Y
Kealakehe Intermediate	Hawaii	2010	Y	Y	
King Intermediate	Windward	2009		Y	
Lanai High & Elementary	Maui	2009	Y	Y	Y
Mililani Middle	Central	2009		Y	
Myron B. Thompson Academy	PCS	2010		Y	
Nanakuli High & Intermediate	Leeward	2010		Y	
Niu Valley Middle	Honolulu	2010	Y	Y	
Stevenson Middle	Honolulu	2009	Y	Y	
Waialua High & Intermediate	Central	2010	Y	Y	Y
Waianae Intermediate	Leeward	2010	Y	Y	
Waikoloa Elementary & Middle	Hawaii	2010			Y
Waimea Middle Public Conversion	PCS	2010			Y
Waipahu Intermediate	Leeward	2010			Y
Washington Middle	Honolulu	2010		Y	
West Hawaii Explorations	PCS	2010		Y	
TOTALS			**11**	**20**	**10**

* Active status is denoted for schools that implemented science kits in curriculum and/or participated in research cruise/workshop.

Appendix D: RET - Science -- Program Track Participation

FIRST PRE-ACADEMY RET - SCIENCE: OCEANOGRAPHY July 1, 2009 - June 30, 2010 **Non-Active Schools**	District	Start Year	Attended Science Kits Workshop	Hosted / Borrowed Science Kits	STORI Research Cruise and Workshop
Hilo Intermediate	Hawaii	2010		Y	
Jarrett Middle	Honolulu	2010		Y	
Kaimuki Middle	Honolulu	2010		Y	
Ke Kula o Samuel M. Kamakau Laboratory	PCS	2010		Y	
Kanuikapono Learning Center	PCS	2010		Y	
Kapaa Middle	Kauai	2010		Y	
Waimanalo Elementary & Intermediate	Windward	2010		Y	
TOTALS			**0**	**7**	**0**

Appendix E: Applied Learning - Creative Media -- Program Track Participation

FIRST PRE-ACADEMY APPLIED LEARNING - CREATIVE MEDIA July 1, 2009 - June 30, 2010 Continuing Schools	District	Start Year	Participating Students	Participating Teachers	Aug 2009 Training Workshop	Sep 2009 Training Workshop	Oct 2009 Training Workshop	Feb 2010 Training Workshop	Mar 2010 Training Workshop	Apr 2010 Training Workshop (Maui)	Apr 2010 Training Workshop (Kauai)	May 2010 Training Workshop	Jun 2010 Training Workshop
Chiefess Kamakahelei Middle	Kauai	2009	20	1	17	0	0	17	0	0	13	0	21
Waianae Intermediate	Leeward	2009	15	1	13	16	6	11	1	0	1	0	15
Waimea Canyon Middle	Kauai	2009	3	1	0	0	0	0	0	0	4	0	0
SUBTOTALS			38	3	30	16	6	28	1	0	18	0	36
Expansion Schools													
Lokelani Intermediate	Maui	2010	1	1	0	0	0	0	2	0	0	0	0
Maui Waena Intermediate	Maui	2010	10	1	0	0	0	0	2	11	0	11	8
Olomana	Windward	2010	0*	1	0	0	0	0	0	0	0	0	0
Stevenson Middle	Honolulu	2010	0*	1	0	0	0	0	0	0	0	0	0
Waialua High & Intermediate	Central	2010	0*	1	0	0	0	0	0	0	0	0	0
SUBTOTALS			11	5	0	0	0	0	4	11	0	11	8
TOTALS			49	8	30	16	6	28	5	11	18	11	44

Appendix E: Applied Learning - Creative Media -- Program Track Participation

Schools Added Since June 30, 2010	District	Start Year	Participating Students	Participating Teachers
Connections	PCS	2011	0*	1
Ke Kula Niihau O Kekaha	PCS	2011	0*	1
Kihei	PCS	2011	0*	1
TOTAL NEW SCHOOLS			**0***	**3**

* School joined FIRST Pre-Academy after start of Spring 2010 semester. Student involvement numbers are not all collected during the first semester that the school participates in the program to allow teachers time to integrate activities into curriculum. This number will be updated for all continuing schools (pre-2010), and schools added during 2010.

Appendix F: Sample Lesson Plans

Creative Media

Searider Productions

SEQUENCING PROJECT

EXPORTING VIDEO: Place final video on server
DEADLINES ARE IMPORTANT

PLEASE LABEL CORRECTLY

REMEMBER GET CLOSE UP

Good To Great. Keep It Simple. **Action. Reaction. Emotion.** Compose. Sequence. Story.

Compose - to make up, create, or line up.

Sequence - A series of shots that tell a story.

Story - Beginning. Middle. End.

Task - Create a video using a treatment, shot list and 10 shots.

GUIDELINES

1. PLEASE GET INTO GROUPS

2. TREATMENT

Write a treatment describing your story. There can be **no audio**. Make sure it has a Beginning, Middle, End.

3. SHOT LIST

Create your shot list and review with advisor. An example of what it should look like is on the right.

4. SHOOT

5. EDIT

6. PREMIERE

7. EVALUATE

Reflection : How does sequencing help you tell stories? Did you group work well together? Problems or praise? Did you deserve your grade? Why?

Super-wide hides and reveals details. They also make for a more interesting shot.

No.	Shot	Who	Action

Create a shot list to organize your thoughts.

Get up in there. It just looks better.

Remember one shot can tell a story. Wide. Medium. Close-Up. Extreme Close-Up.

Get close up. Details make it more interesting.

Appendix F: Sample Lesson Plans – CMORE

center for microbial oceanography: research and education

C·MORE SCIENCE KITS

MARINE MYSTERY: A WATERY WHO-DUNNIT!

Grade Level: This kit is appropriate for students in grades 3–8.

Standards: This kit is aligned with state science content standards for Hawaiʻi, California and Oregon, as well as national Ocean Literacy Principles.

Overview: Students learn about the causes of coral reef destruction by assuming various character roles in this marine murder-mystery. As they determine who killed Seymour Coral, students learn the basics of DNA testing. Suspects include global warming, sedimentation, and other threats facing coral reefs today. This activity is designed for 15 students, but can be modified for 12–24 students. A narrated PowerPoint that provides background information on coral reefs can be shared in advance in a separate lesson. The total class time for the PowerPoint, skit, and pre- and post-surveys is about 100 minutes.

Suggestions for Curriculum Placement: This activity can be used as part of a marine, life, or environmental science unit. Two key concepts are addressed: the interdependence of coral polyps and zooxanthellae (the symbiotic algae that lives inside – and provides food for – the coral), and the decline of coral reefs worldwide.
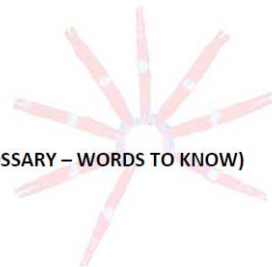
Materials: (Paper materials contained in binder are shown in **BOLD CAPS**)
Front Binder Materials
1. CD, containing Video, PowerPoint, and electronic versions of everything in binder
2. C-MORE *Key Concepts in Microbial Oceanography* brochure
3. C-MORE *Microbial Oceanography: Resources for Teachers* brochure

Marine Mystery Activity
4. Coral Reef (3 pieces)
5. Orange Cones (4)
6. Ziploc Bag with Crime Scene Tape
7. Mailboxes (4)
8. Zooxanthellae in cage
9. Teacher Packet (contains shark hat, evidence bag & clue bag)
10. Student Packets (15 different packets, each containing a different character's ID, script, costume or mask and related items)
11. Extra Costumes packet
12. **TEACHER GUIDE**
13. **POWERPOINT SCRIPT**
14. **CHARACTER LIST**
15. **TEACHER SCRIPT**
16. **TEACHER VERSION OF 3 SCRIPTS**
17. **TEACHER ANSWER KEY to MARINE MYSTERY SURVEY**
18. **HANDOUTS (MARINE MYSTERY SURVEY, ENVIRONMENTAL SUSPECTS and GLOSSARY – WORDS TO KNOW)**
19. **REWARD SIGNS (3)**
20. **SCENE SIGNS (5)**
21. **HOUSE SIGNS (4)**
22. **DNA KEYS FOR EVIDENCE AND SUSPECTS** (for reference only)

Appendix F: Sample Lesson Plans – RET

Sprucing up Kalakaua Middle
SEEKING JUNIOR ARCHITECTS

| Summer, 2010 | Seeking Junior Architects |

Kalakaua Middle School will be sprucing up its library with renovations for the next school year. The designers are seeking junior architects to measure, draw, and build a scaled three-dimensional model of the school campus including all major buildings to be displayed in the school library.

Phase 1

Each team will measure one type of building and make a linking cube model **representation** of it.

Building types include:
1. Administration
2. Library
3. Cafeteria
4. Two-Story Classroom Building (R, N, O, E, L)
5. Portable Classrom (P6, P7, P8, P9, P11, P12)
6. Elective Classrooms (U101, U102, K102, K101)

Phase 2

Each team will draw **building plans** to include:
1. Front view
2. Right view
3. Base outline

Each team must also draw an **isometric view** of the building.

Phase 3

In the final stage, teams will draw a **two-dimensional net** of the building using the FabLab software, cut and assemble the building, and present the completed campus model to the library.

MEASURE · DRAW · BUILD · PRESENT