Excite Camp 2004: An Updated Look at Integrating Science and Native Hawaiian Tradition

Leslie Wilkins, Jenilynne Gaskin, Sheryl Hom, Christine L. Andrews
Maui Economic Development Board/Women in Technology Project

Background

Launched in 1999, the Maui-based Women in Technology Project (WIT) is funded by the U.S. Department of Labor as a workforce development project. Its mission is to encourage women and girls to pursue education and careers in science, technology, engineering and math (STEM) in the state of Hawaii. WIT has been successful at creating systemic change by working directly with educators and employers to make them aware of the return on investment of recruiting and retaining a diverse and inclusive skilled technical workforce.

In 2001, WIT approached the U.S. Air Force on Maui to allow student access to its classified asset the Maui Space Surveillance Complex and to partner in an educational outreach program designed to engage native Hawaiian middle school girls in STEM education and careers on Maui. The partnership also involved Kamehameha Schools, a private school funded by the Estate of Princess Bernice Pauahi Bishop to fulfill her desire to create educational opportunities in perpetuity to improve the capability and well being of people of Hawaiian ancestry. Kamehameha Schools provided some seed funding for the project, WIT led the program development including gender equity principles and minority outreach, and the U.S. Air Force offered students the opportunity to visit the Maui Space Surveillance Complex, as well as technical and program development assistance.

The first Excite Camp was held August 1-3, 2001. The three-day event was designed to serve as a model for integrating the scientific traditions of indigenous peoples into current science education. The goals were:

- To provide a venue for WIT to reach middle school girls of native Hawaiian ancestry and other ethnic minorities in Hawaii
- To develop a model workshop/curricular program integrating hands-on math and science learning with exposure to science and technology positions on Maui that will “excite” middle school girls into pursuing careers in these fields
- To provide an opportunity for the U.S. Air Force and growing Maui-based technology companies to share their technology and research with Maui students as part of an integrated education program that demonstrates the relevance of science and technology in the community
- To maximize the impact of this program initiative while achieving cost and time effectiveness for the various partners
The initial Excite Camp was based loosely upon the following model programs.

- Attracting Women into Engineering Summer Workshop, Rowan University College of Engineering [1]
- IBM Excite Camp at Purdue University [3]

Since then, the program has steadily grown in recognition among middle school girls and high tech employers, successfully improving the quality of its native Hawaiian and ethnic minority applicants each year, as well as the creativity and educational value of its program activities and mentor presentations.

Program Approach

Hawaii public schools traditionally rank poorly in math and science compared to the rest of the nation. According to year 2003 findings from the National Assessment of Educational Progress, Hawaii 8th graders rank lower than 31 other jurisdictions in math [4], and rank lower than 36 other jurisdictions in science [5].

A best practices review was made of model programs nationwide designed to encourage middle school girls of under-represented race/ethnic ancestry in STEM. The existing research suggests that girls experience a precipitous decline in interest in math and science beginning with the middle school years, the main barriers being the perception of these subjects as boring, a disconnect with the relevance of these fields, and a sudden decline in confidence in these subjects [6].

Native Hawaiian/Pacific Islanders have been identified as an under-represented race/ethnic group in STEM. Barriers for under-represented race/ethnic groups, according to the research, are focused mostly on lack of equal opportunity to educational opportunities and the resulting lack of academic preparation in math and science [7]. For example, students of under-represented race/ethnicity are more likely to attend schools with teachers not properly trained or certified to teach math and science, and to attend schools where math and science performance is below the national average.

As a means of addressing the dual barriers for native Hawaiian girls, the program goal was to provide the girls with confidence-building exercises in math and science using models that have had demonstrated success, as well as providing the girls exposure to educational opportunities in math and science in which they might not otherwise have the opportunity to participate.

After three years of continual refining, the following strategies have been identified as crucial elements of any STEM program aimed at native Hawaiian and other ethnic minority middle school girls.

- **Hands-on activities** demonstrating math and science principles in a context that made them relevant for the girls.
- **Team-based atmosphere**, as opposed to individual or competition based. Team-based learning has shown to be a more effective catalyst for girls’ education.
- **Mentoring opportunities.** Each student team had a woman mentor who was raised on Maui and was either enrolled in higher education or employed in science and technology. Mentoring has proven to be one of the most successful mechanisms for encouraging girls into these fields.
- **Exposure to science and technology in their communities.** The need for relevance has been identified as crucial for girls to make the connection between math and science as academic pursuits, and math and science as meaningful careers. In order to accomplish this, it was imperative for the girls to see how people working in their community use math, science and technology.

Program development for Excite Camp 2004 reflected an incorporation of program model elements based on the research, evaluation and success of prior years’ camps in 2001, 2002 and 2003. In addition, a review of other model programs was conducted and implemented as new activities, which included:

- Experiments from Try Science (www.tryscience.org)
- Akimeka’s Digital Bus equipment (motion sensors)
- Oceanit’s MOSAIC PVC Telescope Activity

**Recruitment**

To take full advantage of the opportunities and benefits offered by hands-on participation and personal mentoring, the 2004 Camp was limited to 20 girls, the optimal number recommended by the 2002 Excite Camp evaluation. The entire group could then be easily divided up with four girls per mentor.

In 2004, middle school girls of native Hawaiian ancestry and other ethnic minority backgrounds were again targeted for recruitment. Each interested student was required to complete the Registration and Permission form. A total of 20 girls were selected from an applicant pool of 34.

To ensure WIT’s outreach services were equally distributed throughout Maui intermediate schools, selection was also based on securing a spot for a representative from each school. Students represented seven different middle schools on Maui, which included home-schooled students of 7th and 8th grade age.

**Program Agenda**

The primary focus of the program was to introduce the girls to the U.S. Air Force Research Laboratory’s Maui Space Surveillance System. This facility sits atop the summit of 10,000 foot Haleakalā Volcano, and houses the Advanced Electro-Optical System (AEOS) telescope, the nation’s largest optical telescope designed for tracking satellites. Haleakalā Volcano provides some of the best viewing conditions in the world, and is also home to the University of Hawaii Institute for Astronomy.
The program also focused on exposing the girls to the technology companies of the Maui Research and Technology Park and the Maui High Performing Computing Center (MHPCC) which emphasize careers in astronomy, optical imaging, and supercomputing.

In 2004, participating organizations included Maui Community College, Maui High Performance Computing Center, Pacific Disaster Center, Oceanit and Monsanto. As in the previous year, Day One took place entirely at Maui Community College, Day Two at the Haleakala Summit, and Day Three at the Maui Research and Technology Park in Kihei.

Students Teams and Mentors

Students were pre-assigned to teams versus self-selected teams at prior camps. The girls were paired in a team of two, who were then matched with another team to form a group. The methodology used to determine teams/groups included the following criteria:

- Each group was assigned members ranging in age from 11 to 13 so that older girls were teamed with younger girls. This was done to allow the older girls to serve as leaders or mentors to the younger girls.
- Girls who were known to be friends or from the same school were placed on different teams. This was done to encourage the girls to make new friends and minimize “clique” interaction.
- Instead of announcing the team assignments on Day One, each participant was given an envelope that enclosed half of a puzzle piece. They were instructed to find the person (team partner) who had the matching half of the puzzle. All puzzle pieces were strategically made the same shape, a flower, with 5 different colors to designate the 5 groups. However, puzzle pieces were either cut in zig-zags or curves to indicate which team the individual belonged to. When most of the girls found their partners, mentors were placed strategically around the room holding up the signs depicting their colored puzzle piece for their group, which also was their meeting location.

To encourage questions, a question and answer component was introduced, with the girls instructed to ask at least three questions from any of the presenters during the three-day entire camp. At the end of the Camp, the girls’ question and answer forms were collected, and in return, each girl received an “Excite Camp 2004” T-shirt.

Hands-On Activities

*Spaghetti Bridge*
Spaghetti Bridge was an activity introduced to the camp for the first time, in place of the Gum Drop Dome. Students were tasked with building a bridge made from spaghetti and marshmallows by forming two pyramids connected by a piece of spaghetti as the “bridge.” After constructing the bridge, the girls were then instructed to see how many pennies the bridge could hold. In order to do that, they cut a corner of an envelope to form a triangular basket and hooked it onto the bridge with a paperclip. After four tries, they were tasked to hypothesize whether or not the linguine was stronger, and then test the results using linguine noodles.
This new activity appeared to be a huge hit with the girls and was the first hands-on activity of the camp on Day One. The objectives of the Spaghetti Bridge were to: 1) have the girls become acquainted with each other by 2) working together as a team, while 3) both teammates had equal opportunity for hands-on time.

**Computer Disassembly and Reassembly Activity**

The student teams learned to disassemble and then reassemble computers to working order. Disassembly and reassembly included the following steps:

- Opening CPU casing
- Removal and replacement of video card
- Removal of multi-I/O card and port adapter
- Removal and replacement of memory chips
- Removal and replacement of floppy drive, CD drive, and DVD drive
- Identification of BIOS and CPU chip
- Reassembly of computer into working order
- Completing a worksheet about computer disassembly and reassembly

The “test” came at the end when the teams reassembled the computer back to working order and booted it up.

**Astronomy Model — PVC Telescope Activity**

In prior camps, the Planet Venus Project, developed by Future Scientists and Engineers of America (FSEA), was used as the hands-on astronomy project. This year, the Project was replaced by a new hands-on activity called the PVC Telescope Activity developed by Oceanit, a progressive Hawaii-based engineering, science, and research company specializing in optics manufacturing. The activity focused on constructing a telescope from PVC pipes. Oceanit sponsored and presented the activity highlighting important astronomy and physics principles while introducing the girls to the history of optics.

Additionally, the activity was a perfect tie-in to the next day’s Maui Space Surveillance System site visit to see the U.S. Air Force’s AEOS Telescope. The girls were permitted to take home the telescopes to experiment with viewing the moon, stars, and space.

**Indy 100 – Pencil Car (Motion Sensor Activity)**

Another new activity incorporated in 2004 was the “Indy 100 – Pencil Car”. Participating company Akimeka provided the equipment and education specialist who talked to the girls about the use and technology of motion sensors.

The objectives of this team-based activity was to work together to 1) create a race car, 2) measure the velocity of the car using a Motion Detector, and 3) determine the fastest car among the groups. The project required students to perform the following roles when measuring the velocity or speed -- car driver, motion detector operator, computer technician, and data entry specialist.
**Float Da Boat**

Float Da Boat, also known as Das Boat by FSEA, challenged students to design a boat constructed using a single piece of foil that could carry as many marbles as possible before sinking. The concepts of engineering design, buoyancy, and volume (Archimedes Principle of Displacement) were introduced.

**Ice Cream Engineering**

Following last year’s schedule, this activity was inserted to Day Three. Students learned that making ice cream the “old fashioned” way is all about science and engineering. Concepts of freezing temperature and the effect of salt on freezing temperature were demonstrated.

**Site Visits**

**Maui Space Surveillance System**

- *Native Hawaiian Voyaging Presentation.* Prior to the departure to Haleakala, a female UH Astronomy student educated the girls about her experience navigating aboard the *Hokule’a*, a double-hulled canoe authentically duplicating the original Hawaiian voyaging canoe. She discussed how native Hawaiians used the stars to navigate and predict weather patterns, and gave a brief history about zodiac signs. It was such a positive experience for the girls to see that young, cool local girls are intelligent and can be passionate about science and astronomy. On post-event surveys, four girls stated that they wanted to become astronomers, in part because of this presentation.

- *Advanced Electro-Optical System (AEOS) Telescope.* With U.S. Air Force personnel conducting the tour, the students were able to view up close the AEOS Telescope, learn about its functions, and why Haleakala summit is considered one of the best telescopic viewing sites in the world.

**Oceanit**

Students were presented an overview of Oceanit and its diversified research and development activities. After the PowerPoint presentation, students were treated with demonstrations at the newly opened Maui Optical Systems and Imaging Center (MOSAIC) of Oceanit.

**Monsanto**

Students learned that Monsanto is a leader in biotechnology research with genetically-engineered corn crops on Maui. In addition to the PowerPoint presentation, students were taken out to the crop fields to see firsthand what they had learned in the meeting room.

**Pacific Disaster Center Presentation**
Pacific Disaster Center provides applied information and research and analysis support for disaster management. Students learned how Global Positioning System (GPS) modeling could be used to analyze and contain Dengue Fever on Maui.

**Maui High Performance Computing Center – Visual Lab**

Students learned about satellite and aerial photography, and enjoyed a demonstration of how the Center’s 3-D imaging technology is used for research.

**Maintaining Company/Presenter Participation and Relationship**

As a follow-up to the event and to continue positive relationships with Excite Camp 2004’s hosting companies and presenters, parents were asked to encourage their daughters to write thank you letters to two companies/presenters. The companies and presenters were pre-selected in advance for each student based on the highest company ratings each provided on her own survey.

Eighty percent of the participants completed this request. Each company and presenter received two or more letters from the students. All were extremely pleased and expressed appreciation for this gesture. This approach helped WIT maintain and improve its relationships with existing partners while allowing the Project to compile tangible results of the program.

**Cultural Elements**

Persons of native Hawaiian or part-native Hawaiian ancestry make up approximately 25% of the population of Maui County [8]. Therefore, it is appropriate to the community that certain cultural aspects of the program maintain their relevance to native Hawaiian girls.

- Native Hawaiian female students from the local community college’s computer networking degree program are sought as mentors and role models for the event.

- The visit to Haleakala includes presentations by two female native Hawaiian cultural experts. One of the women talks about the cultural, environmental and religious significance of Haleakala Volcano, including its role in Hawaiian creation myth. The other woman highlights ancient Native Hawaiians who explored and populated the Pacific with seafaring canoes using traditional navigation techniques and astronomy.

- Finally, tours of tech companies showcase the role of female and male native Hawaiian employees, as well as women of other ethnicities. One tour is led by a female native Hawaiian technician. Students also meet female interns at MHPCC, who make up over 33% of the summer interns.

**Program Evaluation**

Like its name, Excite Camp’s mission is to expose the girls to math and science in their community in a way that they would perceive as exciting, fun, and relevant. In doing this, a
balance needed to be struck between the educational objectives of the event and the need to keep it engaging for the girls.

Based on their ranking of and comments on Excite Camp overall, the 2004 event continued to be successful in achieving this balance.

- Eighty-five percent of the students rated the overall program content and format as “excellent.” (Excellent is the highest rating.)
- An overwhelming majority of 95 percent responded “yes” when asked if Excite Camp had “raised” their awareness of technology-related job opportunities in Maui County. Fifty percent indicated they were already aware of technology-related jobs in Maui County prior to the Camp.
- When asked if they would consider a career in science, math, engineering or technology prior to and after the camp, the number of students interested in STEM careers increased by 52 percent after the camp.
- A majority of 90 percent responded positively when asked if they would recommend Excite Camp to other female students.

Recommendations

1. **Qualify the selection process.** Excite Camp is currently open to all seventh and eighth grade girls of native Hawaiian ancestry and other underrepresented ethnic backgrounds throughout Maui county. However, due to the Camp’s overwhelming popularity and limited enrollment, the selection process has become increasingly difficult.

Recommendation:

- In addition to contacting parents to inform them of limited space, the selection process, and additional requirements (i.e. US Citizenship, disclosure of health conditions, etc.), student applicants should be asked to describe why they are interested in attending and what they hope to get out of the camp.
- This information will help further qualify the applicants and ensure a diverse group from different backgrounds who can interact well with each other.
- Since we have begun “interviewing” the parents over the phone this year, we have received positive comments from companies about the high motivation and interest of the students and the great questions that are being asked. A presenter who participated in all past Excite Camps commented that this was “the best group they ever had”.

2. **Encourage more mentor leadership and support in their groups.** While each mentor was provided project resources and training prior to the workshops, this focused on the technical or logistical aspects of the projects. It was observed that mentors used their free time during the event to socialize with the other mentors rather than assuming responsibilities for their groups, resulting in a lack of mentor support needed for group bonding and direction. Also, some students required more attention and persuasion from mentors to participate. This also caused some concern over student safety, whereabouts, and appropriate behavior in public.
Recommendation:

- Strictly advise mentors that they are accountable and responsible for all students in their respective groups and that socializing can be done prior to or after event.
- Also, training/discussion should be provided on how to: appropriately and tactfully intervene during inappropriate behaviors; get students to interact with one another using fun methods; assess when intervention is needed; and know what to do when accidents occur.

3. Work with parents to prepare for the unexpected. There were several students who became ill during and after the trip to the Maui Space Surveillance Complex. Accidents or unexpected emergencies may occur at any time during the Camp.

Recommendation:

- Advise parents to pack extra clothing for their daughter to take on all three days of Camp.

References


Biographical Information

LESLIE WILKINS: Ms. Wilkins is Vice President of the Maui Economic Development Board and is Program Director of its Women Technology Project. An experienced advocate for workplace equity, served as National President of the Business & Professional Women’s organization in 2001. Appointed by the Hawaii governor to two terms on the Hawaii State Commission on the Status of Women, she was Commission Chair from 1996 - 2003.

JENILYNNE GASKIN: Ms. Gaskin joined the MEDB Women in Technology Project in November 2003 as a program manager for student outreach. She served as the manager and logistical coordinator for Excite Camp 2004 profiled in this paper. She holds a baccalaureate degree in Business and Information Systems from the University of
Phoenix. She has served over 8 years with the Hawaii Air National Guard as the sole female in the Satellite and Wideband Communications Section of the 292nd Combat Communications Squadron in Maui, Hawaii.