Project EAST (Environmental and Spatial Technology): High School to High Tech

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Abstract

Environmental and Spatial Technology (EAST) is a high school elective class that uses sophisticated technology in service projects designed to improve student's critical thinking and problem solving skills. EAST is a national initiative that now includes over 150 schools in Arkansas, Alabama, Illinois, Louisiana and Hawaii. It is a project-based, service-learning class that integrates technology into the traditional high school curriculum. EAST students work in teams to solve real-world problems in their schools and communities. Among the technologies that EAST students interact with on a daily basis are: networking and network system administration, presentation applications, computer aided design (CAD), visualization software, global positioning systems (GPS), geographical information systems (GIS), web page design, computer generated animation, solid modeling and assembly, database management, computer programming, and design concepts and applications. There are over 10,000 students nationwide participating in EAST.

EAST develops partnerships with business, industry, and government agencies to provide access to technology for the students to use in their projects. The benefit of this model for females and minorities is the requirement that students recruited and selected for the EAST program represent the diversity of the school's student population in terms of gender, academic performance, age, race, and socio-economic status. There are on-site visits to ensure that there is equitable access to participation for all students and that the student enrollment is representative of the student body. Equity is achieved because it is required.

Introduction

Launched in Fall 1999, the Women in Technology (WIT) Project facilitates girls/women and underrepresented groups into the science, technology, engineering and math (STEM) pipeline. Begun as a Maui County pilot, the program model has expanded statewide and has served over 6000 participants.

Among programs in the United States addressing the under representation of women in STEM, WIT is unique in several ways:

- While most such programs in the United States are administered by government or educational institutions, WIT is administered by the Maui Economic Development Board,

a private, non-profit organization, led by an industry-based Board of Directors.

- While most federal funding for such programs comes from either the National Science Foundation or the U.S. Department of Education, WIT is the first program of this kind to be funded by the U.S. Department of Labor as a workforce development project.

During its initial assessment phase, a review of the existing literature on the under representation of girls and women in STEM and an analysis of best practices and model programs was conducted. This review convinced the WIT team to focus on systemic change by addressing equity issues directly through equity training for educators and employers and through gender-equitable programs to encourage girls in STEM. This focus on gender equity is based on studies which reveal that treating women and girls differently through "special" gender-specific programs may not solve the problem of gender inequity in STEM, nor does it prepare girls for the reality of the male-dominated STEM workplace.

A gender equity approach is feasible since many of the strategies advocated by national mathematics and science standards, such as hands-on activities and cooperative learning, have been found to stimulate interest in STEM for ALL students, especially girls (Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development [CAWMSET], 2000). According to the National Council for Research on Women, "strategies that increase girls' success in the sciences are also effective with boys, especially those from underrepresented groups." (p. 31). One strategy that the Council identified as effective in encouraging girls in STEM is the incorporation of a cooperative, hands-on approach in math and science programs. (p.31). Programs combining hands-on activities such as student designed projects, and the provision of role models through mentoring, internships, and career-oriented field trips have been found to lead to interest in STEM, increased self confidence, and better skill and concept development by girls (Campbell, 2000).

When looking for program models to duplicate, WIT focused on programs that incorporated the hands-on approach indicated by the research to be effective in stimulating girls' interest in STEM. Since the data shows that girls are less likely than boys to be involved in informal science and mathematics activities outside of school, these program initiatives provided girls with equal opportunity and access (CAWMSET, 2000). Because the research also identified that it was important to help female students see mathematics and science as interesting and fun (CAWMSET, 2000), this goal was also incorporated into WIT's program initiatives.

This paper focuses on a specific gender equity-based program launched in Hawaii by WIT leadership in 2000 and its successful evolvement over the next six years. The Environmental And Spatial Technology (EAST) Project was selected based upon its cost effectiveness, ease of duplication, the collaboration of community, industry and educators, efficacy as a program model and the potential for institutionalization. The purpose of this paper is to share WIT's experiences with this initiative as a possible best practices model for other program developers.

Project EAST

The EAST Project originated in Arkansas as collaboration between industry, school districts, community organizations, and institutions of higher education. EAST leverages its industry connections to secure donations of technology hardware, software, and technical assistance to provide schools, mostly in underserved rural areas, with cutting-edge technology laboratories.

Through its partnerships with school districts and higher education, it has developed the academic methodology to offer the staff development and program infrastructure for students in K-16. Utilizing students and sophisticated technology, EAST projects work with community organizations to develop service-based learning projects to solve community problems. To date, the Hawaii implementation has focused on a high school delivery, with one middle school program.

EAST started in 1995 with one Arkansas school. It has since expanded exponentially. In 2004-2005, EAST projects were in place in more than 150 schools in Alabama, California, Hawaii, Illinois and Louisiana. EAST has since been named a model program by the International Center for Leadership in Education.

The mission of EAST is to promote critical thinking and problem solving skills of all students, regardless of their socio-economic background or previous level of achievement. By engaging students in an educational environment steeped in emerging technologies and focused on self-direction and community service, students can become life-long learners and problem solvers. This program model was selected by WIT because it offers the kind of STEM learning environment that has demonstrated effectiveness for girls and boys, as well as the real-world relevance girls need to remain interested in STEM education.

The EAST Project was also chosen because it offers a great value-added for the school. Under the program, each participating school is provided with the technology infrastructure, hardware, software and staff development necessary at a cost of $0.11 per dollar of value received. The technology infrastructure includes the development of a special computer lab with very sophisticated hardware and software.

Even with the inclusion of considerable donations of hardware and software by the EAST Project's national program administration, the cost per school is substantial -- close to $100,000 coming from a partnership of community and school funding. The technologies made available to students include network system administration, computer-aided design, visualization software, GIS/GPS, programming and design applications.

In return for the technology and program infrastructure, EAST schools must comply with a number of program requirements. Of these, WIT was most impressed with the requirement that student participants reflect the demographics of their school's student body by age, gender, race/ethnicity, socioeconomic status, and academic status. This stipulation ensures that all

students at the school receive equal access to what EAST has to offer, and that Project EAST resources are allocated equitably to all students. It not only makes school administrators and teachers aware of the need for equality of access and opportunity, it obligates their responsiveness to diversity, and provides the incentive to do so.

Real-World Application

EAST is unlike any other class in today's high school curriculum. It is a project-based, service-oriented course that provides students with the most current, high-end software available in the most progressive fields in the world. The learning environment is unique because each class is led by a facilitator who guides the students in their own self-driven learning process. Each student team works with at least one technical advisor/mentor from the community who acts as a role model while providing the students with insights into the application of the technology to community needs and to the local workplace.

Using their hardware and software skills, EAST students interact in:

- ESRI Geographical Information Systems (GIS)
- Global Positioning Systems (GPS)
- Computer Aided Design
- Visualization
- Computer Generated Animation
- Database Design
- Webpage Design
- Programming
- Office Automation

In the process of solving vexing community problems, the students learn to become creative, intuitive, adaptive learners who can solve unpredictable, real-world problems.

Program Results

During the 2000-2001 school year, the Mayor of Maui County recognized the value of the EAST program to Maui's technologically-challenged high schools and provided funding to implement EAST at two high schools. At that time, one school -- Lahainaluna High -- had been ranked as one of the least technologically proficient schools in the state. Within a year of the implementation of EAST, Lahainaluna High's program was awarded the Best EAST Project nationwide at the EAST National Conference. EAST in Maui was so successful in its pilot year that it was implemented at an additional three high schools and one intermediate school in 2002.

EAST's community-based model continued to prove effective with the Maui projects showcased at the 2003 EAST Partnership Conference: "Project Typhus," "Dome School," Hawaiian Commercial & Sugar Virtual Tour," and "The Anti-Drought Project." For the third year in a row, Maui's EAST schools took top honors in the national competition measuring them against

more than 200 schools.

In 2004, students at King Kekaulike High School received one of only four Founders Awards given at the Conference to a Project EAST school that best embodies community interaction, collaboration with schools and business, integration of technology and student growth. Student projects have evolved over the years into sophisticated service based learning projects -- "GIS/GPS mapping of Ko'ie'ie Fishpond", "Maui Police Department 911", "Mayor's Anti Litter Task Force", and "Akimeka's Digital Bus".

In 2005, once again students from King Kekaulike placed as one of the top EAST programs in the country. Formerly a competitive-based conference, now, the focus during the annual EAST Conference centers around celebrating the achievements of the individual EAST programs and student accomplishments. One such achievement includes two students from Maui High and King Kekaulike High School being chosen as finalist in the second annual ESRI GIS Competition, which was held at the 2006 National EAST Conference.

Since Maui EAST students began participating in statewide as well as mainland and international competitions, they have not only received broader recognition, but also the opportunity to network with other schools in diverse communities, compete at a national level, access high-end training workshops and gain exposure to college recruitment and scholarships.

In 2006, the model continued to set the standard in workplace skill development for students. By leveraging county funding with WIT's federal investment and private sector support, training opportunities for students have increased, enabling them to gain skills to compete in the global marketplace.

Although more quantifiable results would be useful at this point, longitudinal tracking of our EAST students has proven difficult due to Hawaii Department of Education privacy rules and regulations. Recently, however, the Women In Technology Project secured permission from both King Kekaulike High School and participating students' parents to implement a pilot tracking system. This tracking system will allow us to follow the impact of the EAST program on student members and the career paths they choose in the future.

Conclusion

WIT has chosen to focus its K-12 program initiatives on gender-equitable rather than gender specific programs to encourage more girls in STEM. This program reflects a growing body of literature that suggests that academic models and standards that are effective for encouraging girls in STEM, such as hands-on, community-oriented and team-based programs that utilize mentors, are equally effective for all student groups. By utilizing an equity-based approach, it is hoped that these programs can more directly address the inequities that have led to the under-representation of women in STEM.

The EAST Project program successfully met the required equities based on age, gender, race/ethnicity, socioeconomic status and academic status, but at a cost of approximately $100,000 per school. EAST was implemented as part of the regular school curriculum, offering a technology lab including hardware, software, technical assistance and appropriate teacher development valued at several hundred thousand dollars. While the cost to the school and community was substantial, the value of technology and expertise made available to the school was exponentially greater.

Acknowledgements

The Women in Technology Project, funded by the U.S. Department's of Labor, Education, and Agriculture.
County of Maui
Tech Ready Campaign, private business leaders, industry and citizens' generous donations
Maui Chamber of Commerce Foundation

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