

## Evidence-Based Practices for Increasing the Number of Female Students in STEM

### Background

The Institute for Women in Trades, Technology & Science (IWITTS) offers products and services that help technology and science educators increase the number of women and girls enrolled in their classes and encourage those students to stay enrolled. In 2006, IWITTS was awarded a five-year National Science Foundation (NSF) grant from the Research on Gender in Science and Engineering program to fund the CalWomenTech (CWT) project. Between 2006 and 2011, seven California community colleges received training and technical assistance to help recruit and retain women into STEM programs through the CWT project.

IWITTS' Proven Practices Collection—an online clearinghouse of over 100 downloadable papers, journal articles, podcasts, webinars, videos, and case studies—was developed during the CWT project and expanded during the CalWomenTech Scale Up (CWT SU) project to provide educators with current evidence-based resources for increasing the number of women and girls in the STEM classroom.

### Documented Results

The CWT project was highlighted by the NSF in December 2009 for demonstrating significant achievement and program effectiveness to the Committee for Government Performance and Results Act Performance Assessment and was chosen as one of three model projects in an American Association of University Women's (AAUW) research report, *Women in Community Colleges: Access to Success*, released in May 2013. CWT provided intensive assistance (over a three-year period) to seven community colleges with the goal of increasing the number of women enrolled and retained in STEM programs in which they were underrepresented. Highlights include the following: six of seven community colleges had increases in female enrollment in introductory STEM courses targeted by CWT; five of the colleges achieved substantive increases in female enrollment ranging from 22% to 47% in introductory courses; four colleges increased both female and male completion rates substantially in targeted STEM courses; and six of seven colleges increased the retention rate of male students. Female completion rates increased between 9% and 25%, and increases in male retention ranged from 4% to 21%. CWT also utilized a collaborative Leadership Team model of key stakeholders that has been employed successfully in three of IWITTS' multi-site national community college projects. IWITTS provided Leadership Team members with evidence-based training on recruiting and retaining female students in STEM and facilitated their Strategic Plan development and implementation.

The improved retention of both women and men across seven community college sites is a major accomplishment of the CWT project. IWITTS attributes this achievement to evidence-based classroom strategies employed by instructors that positively impacted female and male students alike. In 2009 and 2010, CWT conducted anonymous surveys of female students (n=60) in targeted technology classes across seven colleges on what recruitment and retention strategies had proven most effective. The results from a survey of female technology course students

allowed the colleges to see which classroom strategies the women were currently experiencing, found most helpful, and would most like to experience going forward. The results were as follows: 9 of the 21 strategies had >50% of respondents reporting exposure; 20 of 21 strategies were rated helpful by 100% of those exposed; and >50% of those who had not experienced a strategy were interested in experiencing them.

The main focus of the CWT SU project is to begin bringing the evidence-based strategies from CWT to more educators. A key objective of the CWT SU project is delivering professional development in multiple formats—including in-person training, online training, and webinars—to STEM educators. The WomenTech Educators Online Training was developed during CWT SU.

The initial WomenTech Educators Online Training was held in 2012 and the second online training in 2013. Both received an average evaluation of 4.1 on a scale where 5=Excellent and 4=Very Good. On average, 89% of the participants from both trainings reported that they planned to share what they learned with their colleagues (n=38). Participants' knowledge of effective practices for recruiting women to STEM increased by 105% and their knowledge of effective practices for retaining women in STEM increased by 107% during the two online trainings (n=38). Participants' confidence in their ability to recruit more women increased by 51% and their confidence in their ability to retain more women increased by 50% during the second online training.

A participant from the CWT SU project's initial training—a computer programming instructor from a Texas community college—has already increased female enrollment in her required introductory programming courses by 62% and retention of all students by 45%, in less than six months. Her retention of female students went from a baseline of 0% to 86% the semester following the training.

### **Potential Applications**

The proven strategies from the CWT project that have been widely disseminated in the CWT SU project will work for STEM educators across career pathways and school levels. These evidence-based practices are available to everyone through the WomenTech Educators Training and Proven Practices Collection.

### **For More Information**

Institute for Women in Trades, Technology & Science (IWITTS) Website: <http://www.iwitts.org>

Proven Practices Collection: <http://www.iwitts.org/proven-practices>

American Association of University Women's (AAUW's) research report, *Women in Community Colleges: Access to Success*: <http://www.aauw.org/research/women-in-community-colleges>, and related webcast: <http://www.aauw.org/event/2013/05/women-in-cc-webcast>

"How to Recruit Women & Girls to the STEM Classroom" published by International Technology and Engineering Educators Association (ITEEA) in *Technology and Engineering Teacher* magazine: <http://www.iwitts.org/images/media/How-To-Recruit.pdf>