


# How Well Are We Serving our Female Students in STEM?

May 16, 2012


## Evaluate

EVALUATION RESOURCE CENTER *for*  
advanced technological education







This material is based upon work supported by the National Science Foundation under grant number 0802245. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the presenters and do not necessarily reflect the views of NSF.

# Introductions




Jason

Jason Burkhardt      Lori Wingate      Donna Milgram



**Evaluate**  
WESTERN MICHIGAN UNIVERSITY

Laura Sanchez  MARICOPA COMMUNITY COLLEGES

National Institute for Women in Trades, Technology and Science

# Objectives



Jason

By the end of this webinar, you will learn...

- 1) Why gathering gender data is critical
- 2) The nuts and bolts of collecting enrollment/retention data
- 3) How to assess the effectiveness of strategies to improve the recruitment and retention of women in STEM programs
- 4) How to use data to leverage change

**How Well Are We Serving our Female Students in STEM?**  
by Jason Burkhardt, Donna Milgram, and Lori Wingate

This material is based upon work supported by the National Science Foundation under Grant No. 0802243. The content reflects the views of the authors and not necessarily those of NSF.

Webinar slides and recording are available at [evalu-ate.org/events/webinar\\_May\\_2012/](http://evalu-ate.org/events/webinar_May_2012/)



Jason

# Handout

Available from [www.evalu-ate.org/resources](http://www.evalu-ate.org/resources)

Keyword search: **female**

**Women in ATE**  
According to the most recent survey of ATE grantees, 23 percent of students in ATE-supported programs are women. **Annual ATE Survey Fact Sheets** report on key characteristics of the ATE programs, including the representation of women and other underrepresented groups in advanced technology education programs. **Data snapshots on Women in ATE** provide more detail for which women are represented in various ATE disciplines. A **two-year trend report on women in ATE** from 2000-2009 is also available. See [evalu-ate.org/annual\\_surveys/factsheets/](http://evalu-ate.org/annual_surveys/factsheets/).

**National Data on Women in STEM**  
The National Center for Education Statistics' *Digest of Education Statistics* ([nces.ed.gov/ipeds/data/digest/](http://nces.ed.gov/ipeds/data/digest/)) is a compilation of statistical information covering the broad field of American education from prekindergarten through graduate school. See especially Tables 298 and 299 for *associate's degrees conferred by field of study, sex, race/ethnicity*.

**Evaluating Female Recruitment and Retention**  
When assessing a program's efforts to improve the female recruitment and retention, it's important to compare both enrollment and completion rates of men and women, in addition to gauging their key outcome variables, the extent to which strategies are actually implemented should be assessed, along with female students' perceptions of their programs. IWITTS has developed a **worksheet** for tracking male and female enrollment and completion rates for introductory and advanced courses. It's available from [iwitts.org/](http://iwitts.org/).

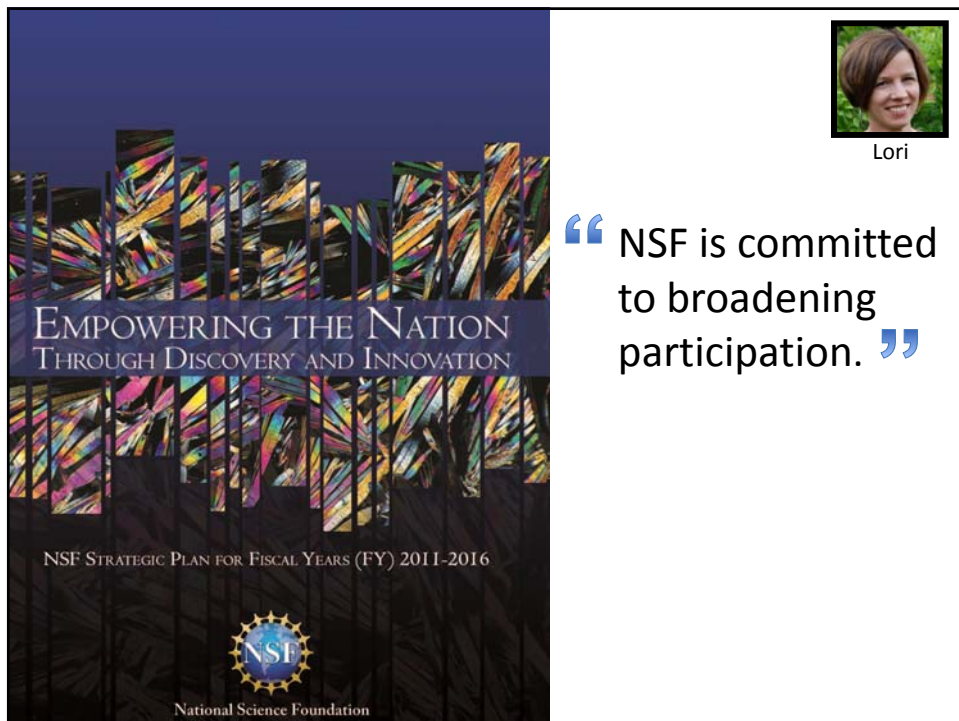
Regular review of findings provides **retention feedback** about the extent to which strategies are working and can reveal aspects of the program that are especially strong or weak in terms of attracting and retaining female students.

The **Assessing Women and Men in Engineering (AWME) project** provides assessment tools for people involved in K-16 formal and informal educational outreach activities. Available tools include 16 downloadable, adaptable surveys (for evaluating activities, retention, classroom environments, and recruiting), literature reviews, and an online tool for tracking activities and participants, among others. Registration is required to access the tools, but it's free. See [www.engr.msu.edu/awme/default.aspx](http://www.engr.msu.edu/awme/default.aspx) for more information.

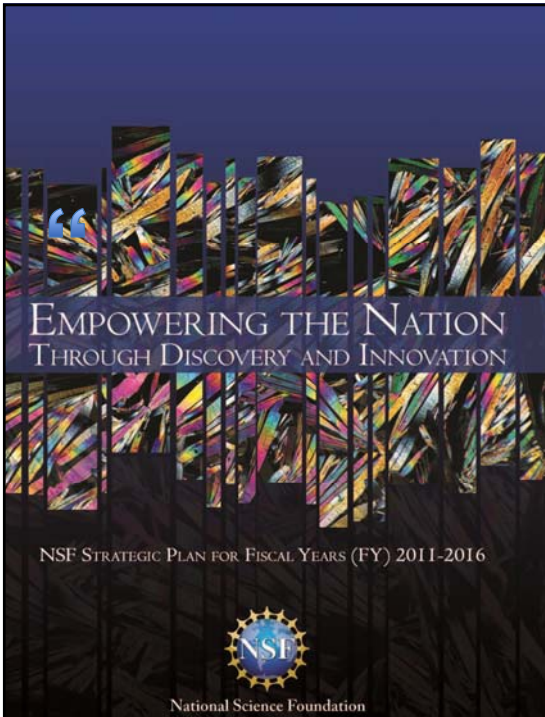
**Evaluations of Female and Recruitment and Retention Projects**  
Here are some examples of evaluation reports on female recruitment and retention projects:  
Attracting and Retaining Women in Computer Science and Engineering: [Analyzing the Results by David Kruttschnitt and Robert J. All, University of North Dakota](http://www.cse.msu.edu/~davidk/awme/), <http://www.cse.msu.edu/~davidk/awme/>  
Recruitment and Retention of Women in STEM: [The Success of Current Outreach Programs at University of Wisconsin-Platteville](http://www.cse.msu.edu/~davidk/awme/), by Lisa Landgraf, Pamela Peters, and Tammy Johnson-Stephens, University of Wisconsin-Platteville  
[www.msu.edu/~awme/awme2008/awme2008.pdf](http://www.msu.edu/~awme/awme2008/awme2008.pdf)

**IWITTS Training Events**  
IWITTS provides online and onsite training on strategies for improving recruitment and retention of female students in STEM programs. To find more events, go to [www.iwitts.org/training](http://www.iwitts.org/training) or email Donna Milgram at [donna\\_milgram@iwitts.org](mailto:donna_milgram@iwitts.org).


**Evalu@te** [www.evalu-ate.org](http://www.evalu-ate.org) | (202) 367-5895 | Western Michigan University








The image shows the cover of the NSF Strategic Plan for Fiscal Years (FY) 2011-2016. The cover features a colorful, abstract design of vertical bars in various colors (red, yellow, green, blue, purple) against a dark blue background. The text on the cover reads: "EMPOWERING THE NATION THROUGH DISCOVERY AND INNOVATION" and "NSF STRATEGIC PLAN FOR FISCAL YEARS (FY) 2011-2016". The NSF logo and "National Science Foundation" are at the bottom.



Lori


**women,  
minorities,  
and  
persons with  
disabilities**

**Broader Impacts Criterion**



Lori

“ How well does the proposed activity broaden the participation of under-represented groups? ”



The image shows the NSF logo, which consists of a blue globe with the letters "NSF" in white, set against a background of yellow gears.

**Results from Prior NSF Support**



Lori

**Describe**  
specific  
outcomes  
and results



**Results from Prior NSF Support**



Lori

**Demonstrate**  
impact



Results from Prior NSF Support



Lori



**Provide  
evidence  
of quality and  
effectiveness**

Results from Prior NSF Support



Lori



Accomplishments  
related to  
**broader  
impacts** and  
results

## 2012 ATE Survey Results



Lori

**230 (92%)** of ATE PIs completed the 2012 survey

↳ **120 (52%)** reported supporting a degree or certificate program with their grants

↳ **109 (91%)** reported gender data



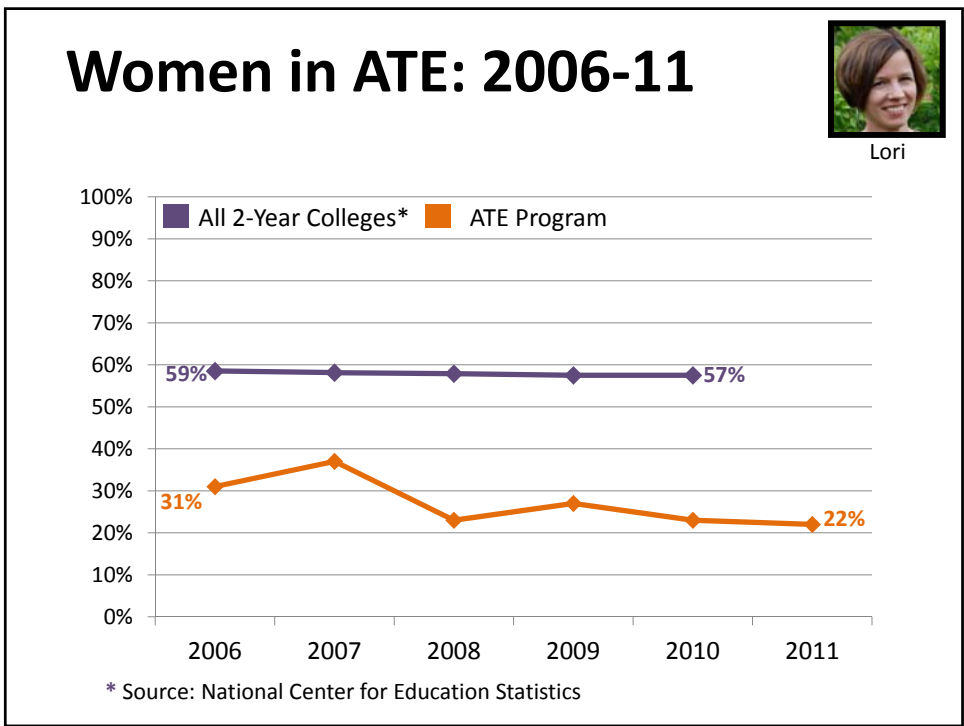
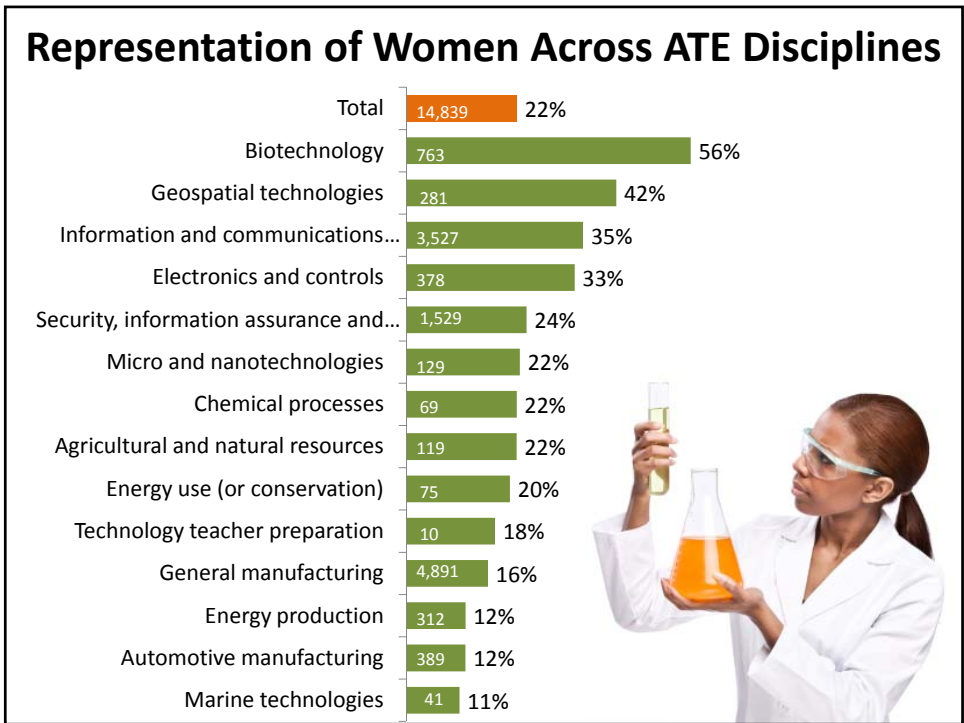
## 2012 ATE Survey Results



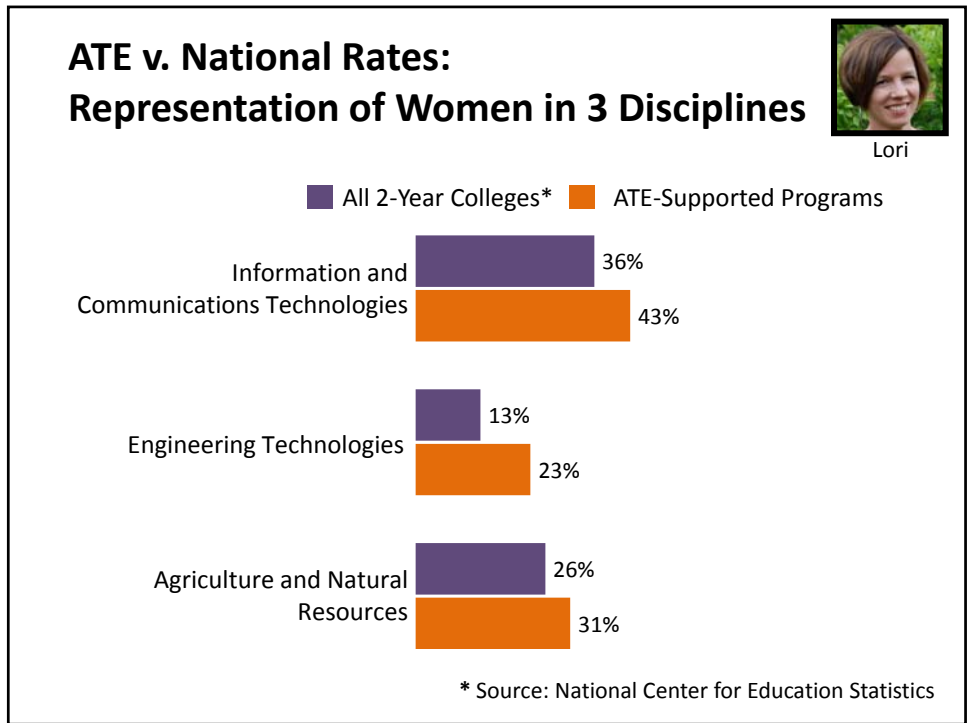
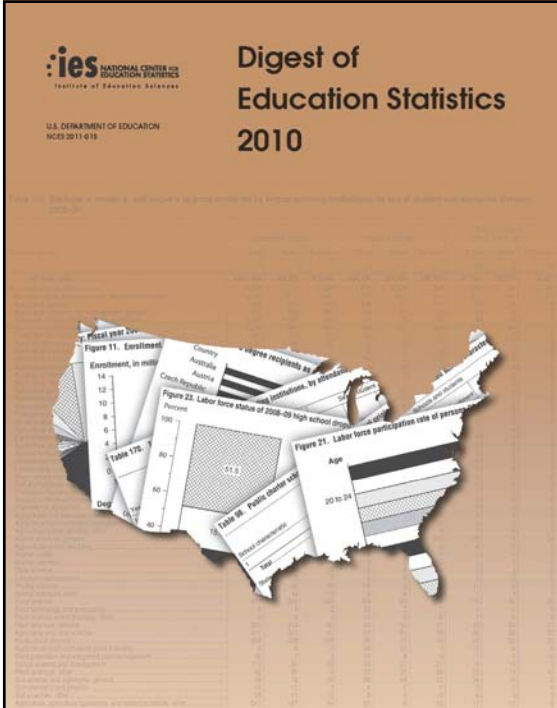
Lori



~ 1 in 5 ATE students is female






**ies** NATIONAL CENTER FOR EDUCATION STATISTICS  
Institute of Education Sciences

U.S. DEPARTMENT OF EDUCATION  
NCES 2011-018

## Digest of Education Statistics 2010




Lori

### Data from K-16 institutions

- Enrollments
- Degrees awarded
- Programs
- Student demographics
- Faculty demographics



Lori



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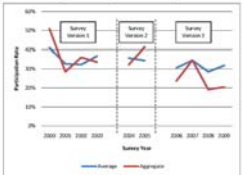
Carl D. Wendt, Arden R. Gullickson & Lori A. Wingate April 2010

It is widely known that women are generally underrepresented in STEM disciplines (science, technology, engineering, and mathematics). The National Science Foundation (NSF) Science, Technology, Education (STE) program has persistently worked to reduce this disparity. For example, in a 2000 solicitation specified "increasing the participation of women" as a broader impact that projects should address (NSF, 2000, p. 10). In the current solicitation's section on "Integrating Diversity into NSF Programs, Projects, and Activities," the importance of including women is raised as part of its attention to the "percentage of students and centers it targets in the programs, projects, and activities it sponsors and supports." (NSF, 10-150, p. 14). This briefing paper, which focuses strictly on the ATE program and is based on self-reported data by ATE grantees, represents a starting point for further research on trends in female representation in technology education.

In each of the past ten years, ATE program grantees engaged in program improvement efforts were asked to estimate the percentage of female students in their ATE-supported programs as part of an annual survey of ATE grantees. Between 2000 and 2009, three versions of the survey instrument have been used (see Appendix A for descriptions of the different versions). Respondents' answers were compiled longitudinally to study the participation of women from 2000-2009. Figure 1 shows both aggregate (percentage of female students programwide) and average (per grantee) percentage of female students' participation trends. As this figure shows, the percentage of women in ATE-funded programs declined over the ten-year period, as reported by grantees engaged in program improvement efforts. This decline is evident in both the aggregate and average trends.

Female participation data have been disaggregated by education level, with the results shown in Figure 2.5. These figures help to show both the general consistency with, and some points of variation from the overall trend. The overall and disaggregated survey findings consistently show women representing less than 40 percent of all

## Female Participation in ATE-Funded Programs: A Ten-Year Trend



**Figure 1. Female Participation Rate in ATE Programs**

The overall aggregate percentage in the result of summing the number of women across all grantee institutions and dividing that number by the total number of all students reported by that same institution is 31.1%. The overall average percentage is the result of dividing the percentage of female students reported by each grantee in a given year and dividing that number by the total number of responding grantees for that year.

Year	Average	Aggregate
2000	31.1%	31.1%
2001	30.8%	30.8%
2002	30.5%	30.5%
2003	30.2%	30.2%
2004	29.9%	29.9%
2005	29.6%	29.6%
2006	29.3%	29.3%
2007	29.0%	29.0%
2008	28.7%	28.7%
2009	28.4%	28.4%



**LOGON** **STEM Assessment Tools**

**What's New?**

- Spanish Versions of Elementary-Aged Surveys Now Available for [Download](#)
- Check out AWE's Revised Monitor-Murton Surveys
- Disseminate your research to others by authoring AWE-CASEE ARP Resource
- Register**  
One-time registration is required to access various services.
- Who Stays? Who Leaves?**  
Compare characteristics of students who persist or leave engineering.
- Why do they choose another school?**  
College Choice Surveys helps you discover why students make the college choices they do
- AWE Surveys Online**  
Access ALL versions of AWE surveys online
- AWE Collaborators**


**ABOUT US** **FAQ** **CONTACT US** **PRIVACY STATEMENT** **PROBLEM REPORTING** **SITE REQUIREMENTS** **HOME**

Lori

## Assessing Women and Men in Engineering (AWE) Project:

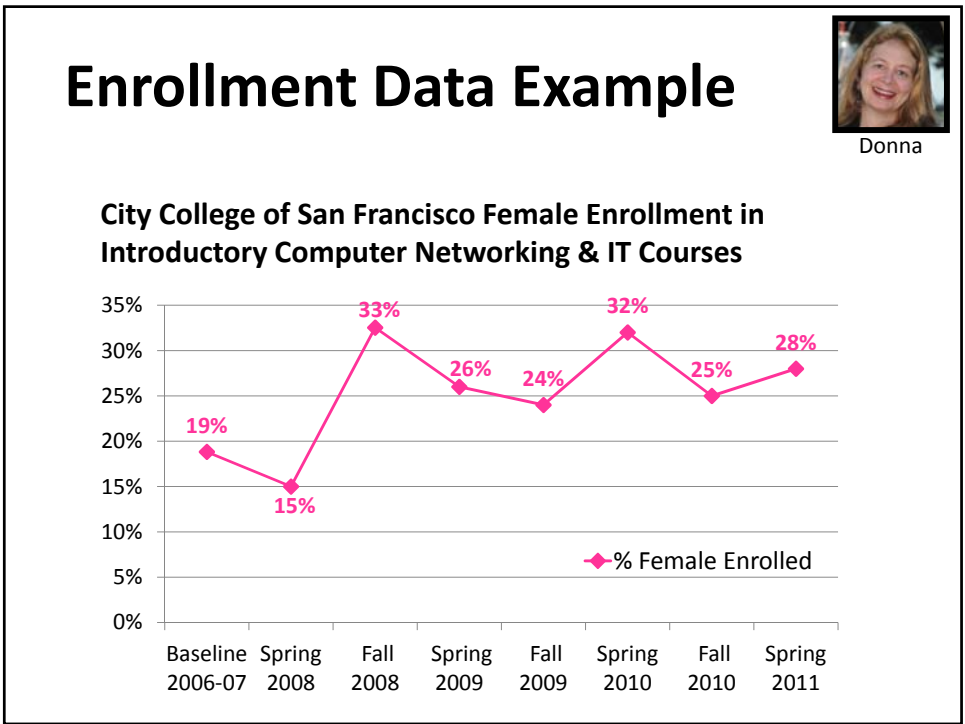
- surveys
- literature reviews
- participant tracking tool
- webinars

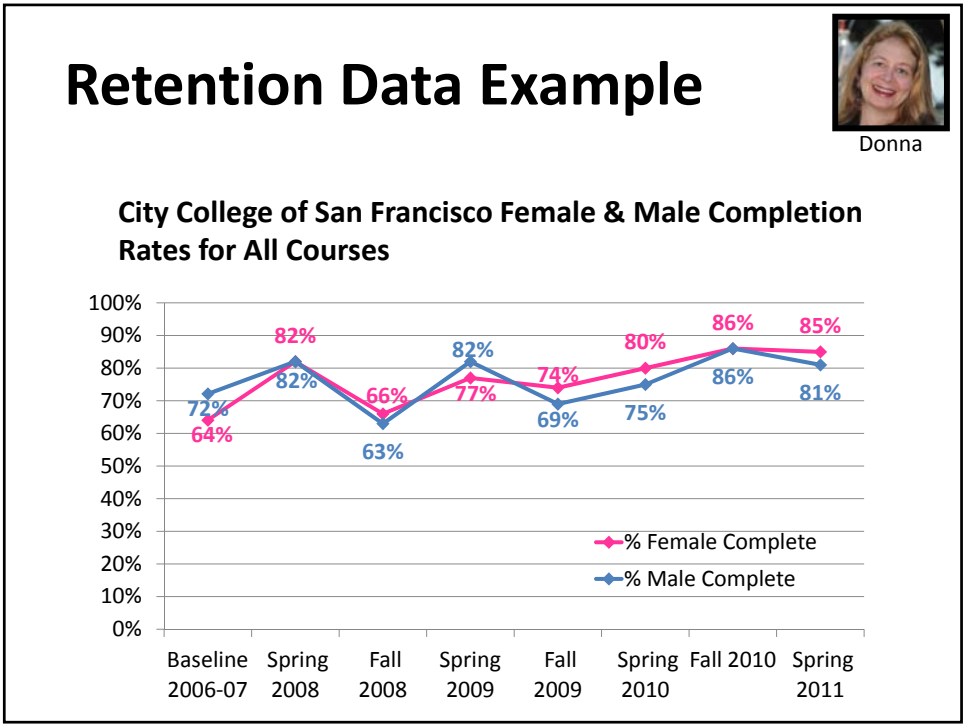
Developed by The Pennsylvania State University and University of Missouri  
Funded by The National Science Foundation (HRD 0123642 and HRD 0607081)  
and With Supplemental Funding from The Henry Luce Foundation  
A product of **AACSB** and **CHEE**




**Donna Milgram**

## Why Gathering Gender-Segregated Data is Critical






## Retention Rates




Donna



### Compare

- female and male retention rates
- *changes* in female and male retention rates



## Hard Data vs. Anecdotal Evidence



Donna

- Impressions often skewed when it comes to groups with minority status
- Impression is there are larger #s from the minority group than are actual
- Stories and “lore” are the norm



Donna

CCSF online training:

Good example of why data should inform rather than impressions



## Feedback Loop

- For administrators and instructors
- Assess effectiveness of intervention; what is/is not working
- Positive validation for those schools



Donna



## The Nuts and Bolts of Data Collection

Donna  
Milgram



Term	Course	Enrollment						Completion				
		# total students	# females	# males	# gender unknown	% female	change from baseline in % female	# females	# males	% female	% male	% difference btwn male & female
Average Baseline Sp06 F06 Sp07 F08	SAMPLE	40.5	7.6	32.6	0.3	18.8%	-	4.8	23.4	62.3	71.6%	-9.4%
Spring 2008	CNIT 103 CNIT 104											
Fall 2008	CNIT 103 CNIT 104											
Spring 2009	CNIT 103 CNIT 104											
Fall 2009	CNIT 103 CNIT 104											
Average Sp 08 to Current	CNIT 103 CNIT 104											
SAMPLE No Introductory Courses offered Summer 2008, Summer 2009												

## Data Collection Spreadsheet



Donna

- Intro vs. advanced courses
- Formulas are averages and percentages
- Limitations:
  - No total "N" of women
  - Low numbers skew percentages

Term	Courses	ENROLLMENT						Incr from Baseline % Fem Enroll (Goal ≥ 10%)
		# Total Students Enrolled	# Females Enrolled	# Males Enrolled	# Gender Status Unknown Enrolled	% Female Enrolled (Goal ≥ 30%)	% Fem Enroll (Goal ≥ 10%)	
SAMPLE	SAMPLE	14.5	1.5	13.0	-	10.3%	-	
Spring 2008	CNIT 105							
Fall 2008	CNIT 150							
Average Spring 2009	CNIT 105 CNIT 150							
Fall 2009	CNIT 105							
Spring 2010	CNIT 105							
Average Sp08 to Current	CNIT 105 CNIT 150							
SAMPLE No Advanced Courses Offered Summer 2008, Summer 2009								

## Obtain the Data

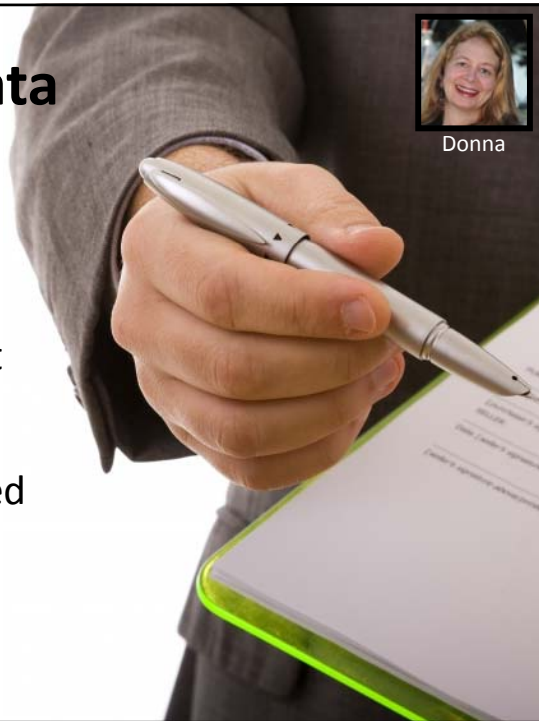
Commitment letters  
from

- College President
- STEM Department  
Chair

Baseline data required  
in proposal



Donna



## Assessing Strategies for Improving Female Recruitment and Retention




Donna  
Milgram



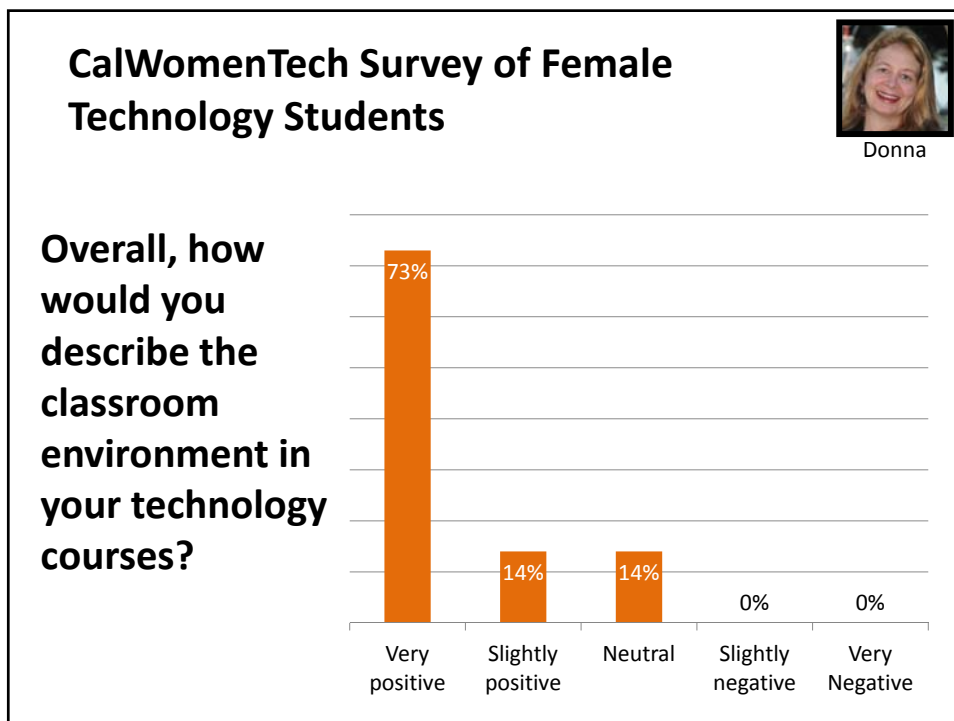


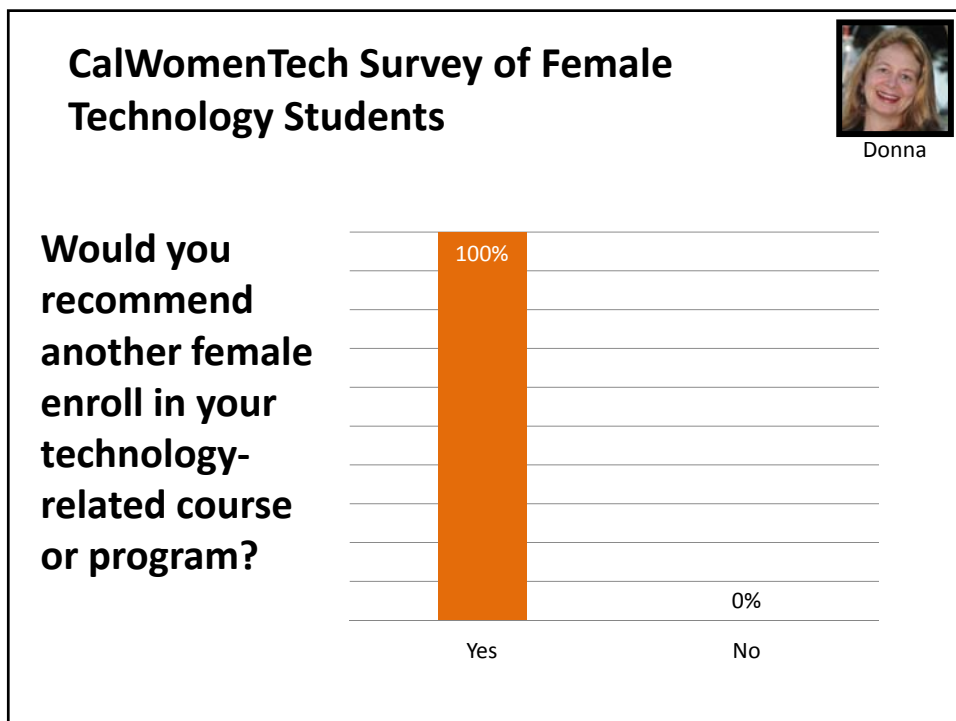
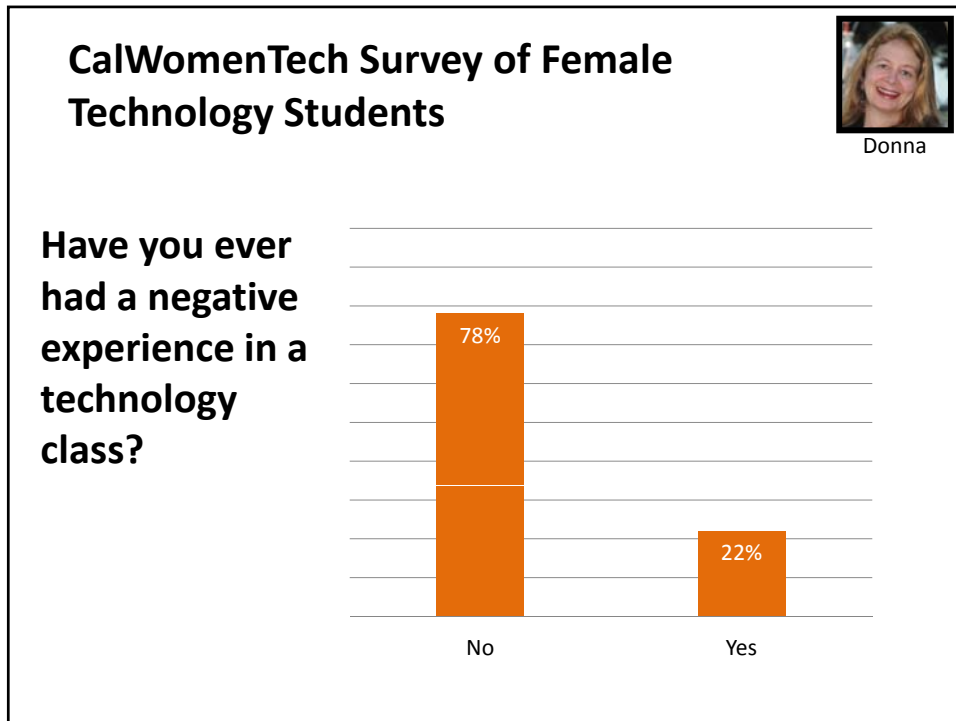
### CalWomenTech Survey of Female Technology Students (N=60)



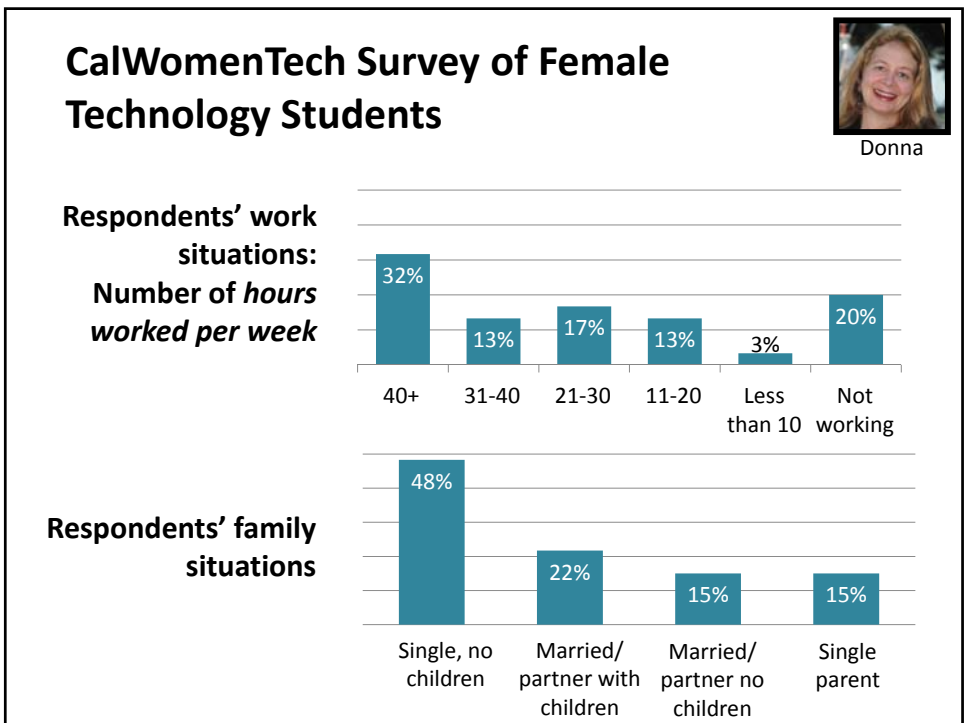
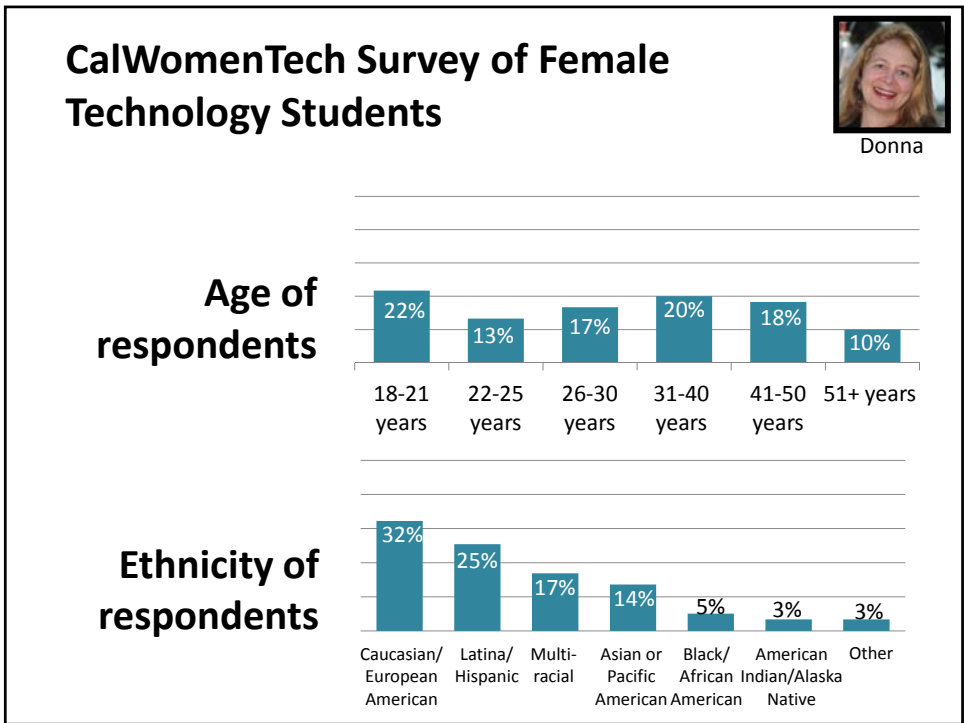
Donna

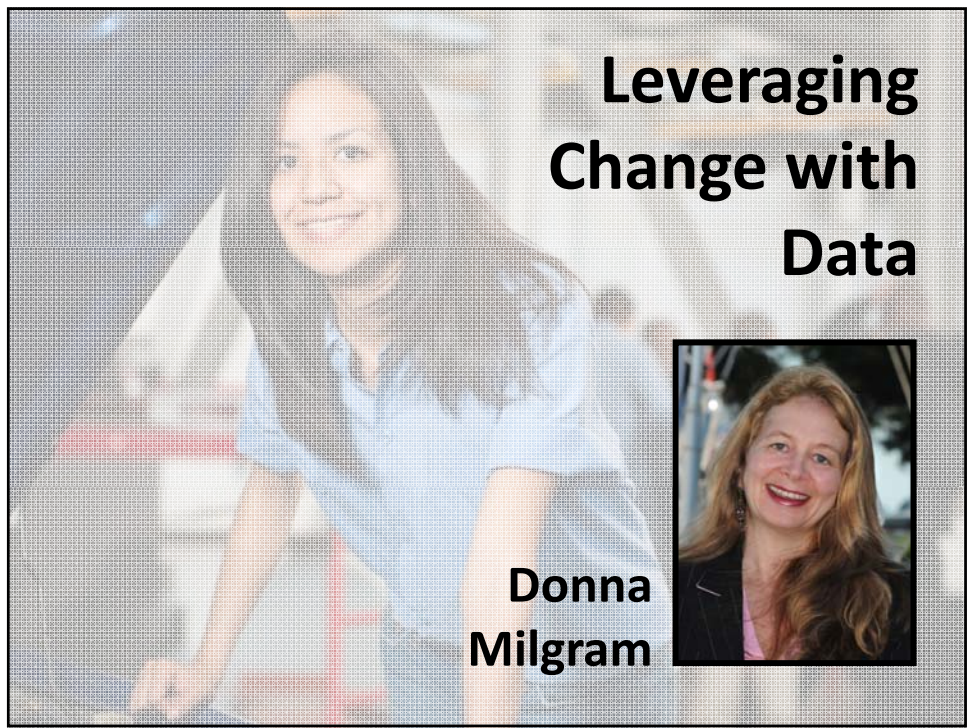
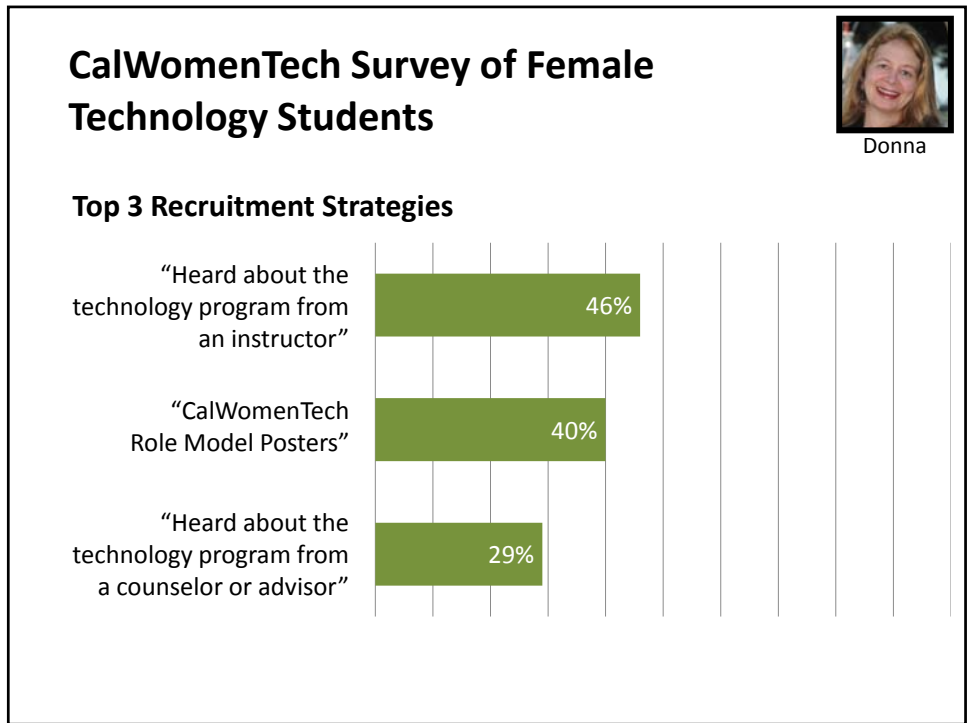
Retention Activity/Strategy	Have Experienced			Have Not Experienced		
	Rated Helpful or Very Helpful	Rated Not helpful	Count	Interested	Not Interested	Count
Learned basic skills needed for the course during the first few weeks of a course	100.0%	0.0%	49	50.0%	50.0%	6
Instructor demonstrated or modeled before we did lab activities	98.1%	1.9%	52	66.7%	33.3%	3
Was taught modules or small sections of instruction focused on one aspect of a course	97.4%	2.6%	39	53.3%	46.7%	15
Used software to help me with problem-solving	97.0%	3.0%	33	54.5%	45.5%	22
Helped with tool identification and use	96.9%	3.1%	32	60.0%	40.0%	20
Participated equally with males during hands-on activities	95.7%	4.3%	47	44.4%	55.6%	9
Taught the process of problem-solving	93.8%	6.3%	32	56.3%	43.8%	16











## Data for Change



Donna

- Baseline data sound alarm bell
- Generate interest in building a team for change
- Progress reports on outcomes, not just process, kept the focus on **outcomes**



## Data for Change



Donna

Patterns in data can reveal strengths and weaknesses in the system



## Data for Change

Outside technical assistance provider can help with the delivery of less-than-favorable results



## Data for Change

- In the case of CCSF data presented to all instructors who helped developed plan to increase retention
- Check-ins with coaching and report on data collection



## Data for Change



Donna

Ultimately, CCSF's data validated their strategies and allowed them to be featured by IWITTS, NSF, CCSF and be celebrated



## WomenTech Educators Training



Donna

### National Training

More Female Students in Just One Year System

June 21-22, 2012

San Francisco Bay Area

### Online Training

September 10-November 16, 2012

Your Office!

Learn more and register at

**[www.iwitte.org/training](http://www.iwitte.org/training)**



## WomenTech Educators Training: NSF-ATE



Donna

*Includes long-term support for implementation*

### **BATEC**

July 9-10, 2012, UMass Boston

Apply by May 24, 2012

[www.surveymonkey.com/s/KLW7NK](http://www.surveymonkey.com/s/KLW7NK)

### **MPICT and CCC-ICT Collaborative**

June 25-29, 2012, Ohlone College in Fremont, CA

*Faculty Development Week for qualified community college instructors in ICT related programs*

[www.mpict.org/](http://www.mpict.org/)

## Webinar Evaluation



Jason

Please complete our 1-minute  
webinar survey to help us improve.



Click **Begin Survey**.

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**August 15 (NEW DATE)**  
Build a Better ATE Proposal  
With Evaluation and Logic Models

**September 19**  
Introduction to ATE Evaluation  
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Register at  
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Jason



## AEA

**Coffee Break Webinar Series**

**May 31**  
Evaluative Thinking

**June 21**  
Making Evaluation Findings  
"Actionable" to Improve Practice

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[www.eval.org](http://www.eval.org)



Jason

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# Thank You!

**Evaluate**  
EVALUATION RESOURCE CENTER *for*  
*advanced technological education*