



Engineering Inclusive Teaching

Faculty Professional Development

POWERED BY **WEPAN**

The Power of Personal Vision:

Linking Undergraduate Engineering Education and
Professional Persistence

February 19, 2015

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EIT Project Team



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EIT Project Goal & Strategies

To create engineering learning environments that support the persistence and success of all students, especially diverse women and minority men

- Distill key research findings
- Share practical teaching advice
- Delivering convenient live/recorded webinars
- Providing easy-adoption checklists/resources



Kathleen Buse, PhD



Kathleen Buse, Ph.D. is faculty director of the [Leadership Lab for Women in STEM](#) (Science, Technology, Engineering and Mathematics) and adjunct professor in both the Weatherhead School of Management and the Case School of Engineering. As an engineer for more than 25 years prior to her academic career, Dr. Buse's research focuses on understanding the complex factors involved with retaining and advancing STEM women.

Diana Bilimoria, PhD



Diana Bilimoria, Ph.D. is KeyBank Professor, and Chair and Professor of Organizational Behavior at the Weatherhead School of Management. She is co-author of numerous books on women in STEM careers, women in corporate leadership, and gender equity in STEM. She has published extensively in leading journals and serves on several editorial boards. In 2012 she received the Excellence in Higher Education Leadership Award from the ACE Ohio Women's Network, and in 2014 received the Weatherhead School of Management Teaching Excellence Award.



Raise Hands #1

Are you an educator or do you have influence on students in an engineering school?

(If “yes,” please raise your hand!)



Today's Discussion

- Our research
- Importance of personal vision
- Undergraduate education and engineering persistence
- Incorporating personal vision into learning context





Example Quick Poll #1

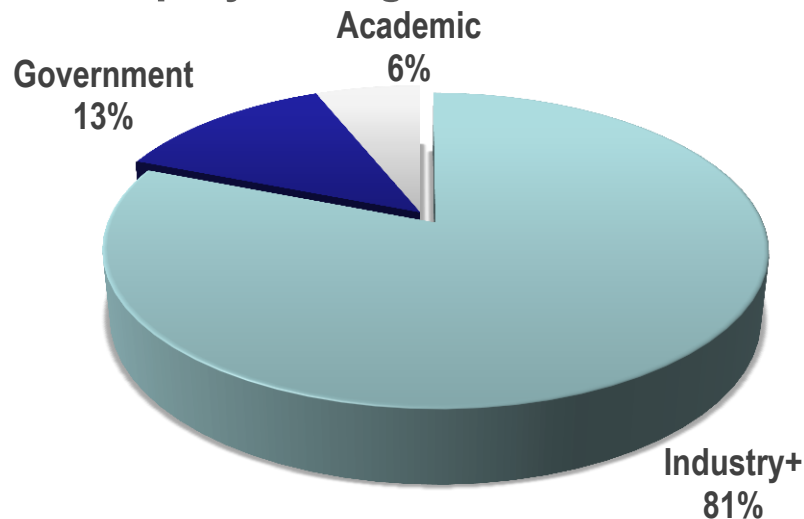
Would you say you have a personal vision related to your work?

- No, I live in the moment
- Kind of – I know what I will be doing in the next year or two
- Yes I know what I will be doing in my work in the next 2-5 years
- Yes absolutely – I have a vision that includes my expectations related to my work for the next 5 to 10 years.



The Engineering Profession

Employed Engineers in the US



<http://www.nsf.gov/statistics/2015/nsf15311/tables/pdf/tab9-19.pdf>

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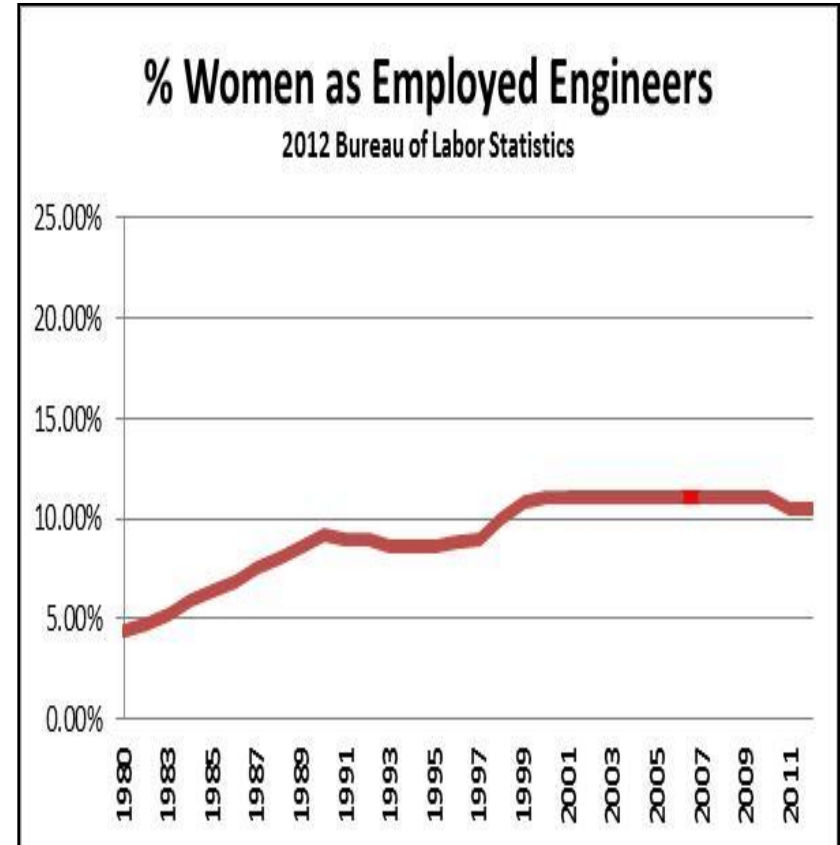
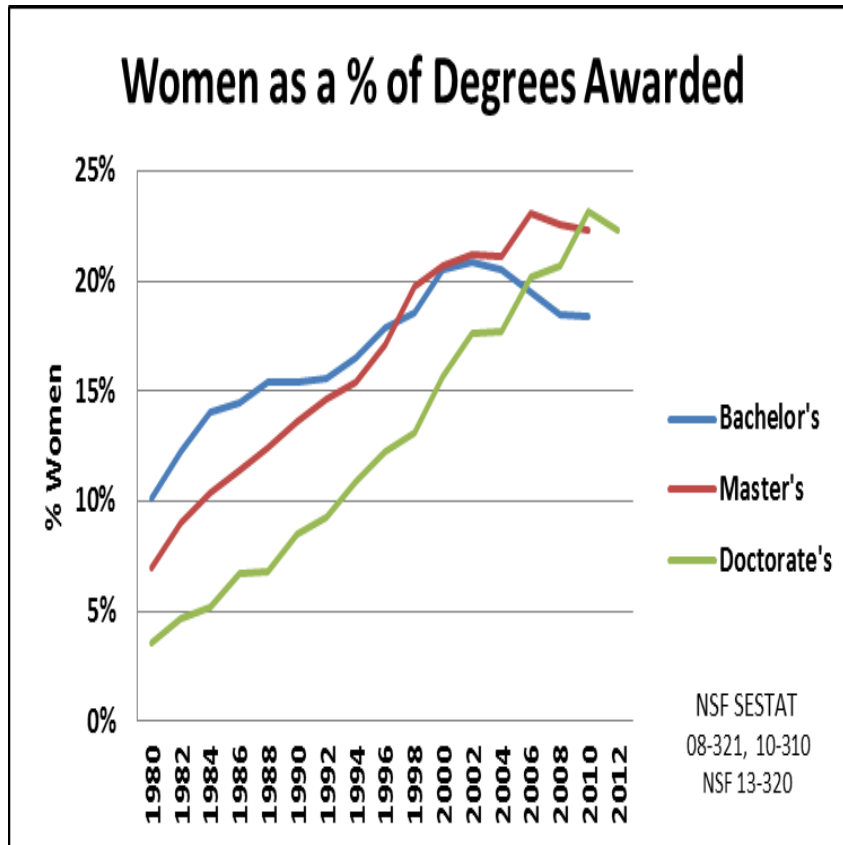
One of the largest professions with more than 2.5 million engineers employed in the US

<http://www.bls.gov/cps/cpsaat11.pdf>

US Engineers

National Science Foundation 13-320

US Bureau of Labor Statistics 2012



Why Women Leave STEM Professions



Recent Research Studies

- [SWE Study 2008](#)
- [The Athena Factor 2008](#)
- [STEMming the Tide 2010](#)

Complex Factors Impacting Retention



Engineering Career Commitment Factors

	Women (n=520)
Work Engagement	***
Supporting Relationship	***
Personal Vision	***
<u>Self Efficacy</u>	***

*** $p < .001$, ** $p < .05$, * $p < .01$

Buse, K. (2012). *Women Persisting in the Engineering Profession: A Paradoxical Explanation Adapting Intentional Change Theory*. (Electronic Thesis or Dissertation). Retrieved from <https://etd.ohiolink.edu/>

Buse, K. R., & Bilimoria, D. (2014). Personal vision: enhancing work engagement and the retention of women in the engineering profession. *Frontiers in Psychology*, 5, 1400. doi:10.3389/fpsyg.2014.01400

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Engineering Career Commitment Factors

	Women (n=520)	Men (n=138)
Work Engagement	***	***
Supporting Relationship	***	*
Personal Vision	***	
<u>Self Efficacy</u>	***	

*** $p < .001$, ** $p < .05$, * $p < .01$

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A Personal Vision is a Life's Plan...

*“Plan your work for today
and everyday
and then work your plan”*



Margaret Thatcher
Prime Minister
United Kingdom
1979-1990



A Personal Vision Includes Purpose...

*“I was placed here to work with young people
and have a positive impact on their lives.
It's my purpose.
And it's always been clear to me
that this is what I would do.”*

-from “A Calling on Campus” in the Pittsburgh Quarterly Summer 2014
<http://www.pittsburghquarterly.com/index.php/Education/a-calling-on-campus.html>



Dr. Kathy Humphrey
Senior Vice Chancellor
University of Pittsburgh

Personal Vision

Ideal self (Boyatzis, 2008)

Core mechanism for self-regulation and intrinsic motivation



Maria Klawe's Vision



Harvey Mudd College awarded
56% of engineering degrees
to women in 2014

Development of a Personal Vision

- Iterative
- Influenced by self-efficacy, hope & identity
- Includes images of a desired future
- Supporting relationships

Personal Vision & Career Choices

- **Personal vision impacts career choices**
- **Self efficacy**
 - Role models or vicarious experiences
 - Belief in ability to achieve
- **Hope**
 - Motivating emotion

Linking Undergraduate Education to Professional Persistence

- Engineering professors (First Impressions)
- Student's view of an engineering career impacted by
 - Stories and discussions from classes
 - Examples of who are engineers and what they do
 - What is “seen”
- **These experiences**
 - Impact Professional Role Confidence (Cech et al., 2011)
 - “Individuals’ confidence in their ability to successfully fulfill the roles, competencies, and identity features of a profession”
 - Women engineering students = lower confidence compared to men
 - Predicts behavioral and intentional persistence
 - Impact personal vision as related to engineering work

Small Changes Make an Impact

- Create positive images of the engineering profession
- Present images of diverse engineers
- Provide support related to careers
 - Network
 - Internships
- Acknowledge the need for an inclusive engineering culture

Power of Personal Vision Action Check-list (www.WSKC.org/EIT)

February 19, 2015 K. Buse

Influence	Reflections
Creating Positive Images of Engineering as a Profession	<ul style="list-style-type: none"> Do I portray engineering as a dynamic field with diverse and challenging opportunities that impact the world? Do I discuss outcomes of engineering work? Do I frame engineering problems as solutions to difficult problems? Can I incorporate the NAE's Engineering Grand Challenges into the discussion? Do I discuss the social relevance of engineering concepts used in class? Do I link specific topics in the classroom to its impact on society?
Presenting Images of Diverse Engineers	<ul style="list-style-type: none"> Can I invite a diverse set of guest engineers to discuss how my class content addresses a real world engineering problem? Do I provide examples of engineers at work? Do these examples include women and under-represented minorities? When I discuss engineering, do I showcase diverse engineers as a regular part of what I do in class? For special events and awards – do I include a diverse group of engineers (i.e. engineer week presentations or alumni award ceremonies)
Providing Supportive Relationships	<ul style="list-style-type: none"> Do I provide support to all of the students, not just the ones that look like me? Do I acknowledge the contributions and engagement of all the students? Do I model support for and understanding of different perspectives? Do I help students develop career plans? In academia? In industry or government? Do I demonstrate inclusive leadership within the classroom and in advising students?
Acknowledging Need for an Inclusive in Engineering Culture	<ul style="list-style-type: none"> Do I understand and discuss how diversity and inclusion can improve engineering education? Do I understand and recognize the impact of my own implicit biases and take action to mitigate the impact of these biases on my students? Do I seek input from students regarding their experiences within the classroom? Within the school of engineering?

Personal Vision within Engineering Curriculum

- **Masters of Engineering Management at Case Western Reserve University**
 - Development of a personal vision is required in 1st of 3 semester program
 - Includes
 - 360 degree assessment
 - Identification of values
 - Coaching
 - Modeled after successes in management programs

Leadership Lab for Women in STEM

- Professional and Leadership Development
- Research-based
- Practical solutions
- For women in academia, industry and government
- Enrolling now for April 2015 start



Learning Objectives

1. Review data related to the under-representation of women in the engineering profession
2. Understand key factors related to career commitment in the engineering profession for men and women
3. Recognize the importance of a person vision
4. Understand how a personal vision is developed throughout one's life
5. Understand how a personal vision impacts career choices
6. Learn how professors impact student's view of an engineering career
7. Identify small changes in the classroom that can influence longer term retention in the profession

Resources

- **Programs & Courses**
 - [Leadership Lab for Women in STEM](#)
 - [Crafting a Leadership Vision](#)
 - [Inspiring Leadership Through Emotional Intelligence](#)
- **Books & Articles**
 - [Becoming a Resonant Leader](#)
 - [Women in STEM Careers](#)
 - [Personal Vision: Enhancing Work Engagement and the Retention of Women in the Engineering Profession](#)

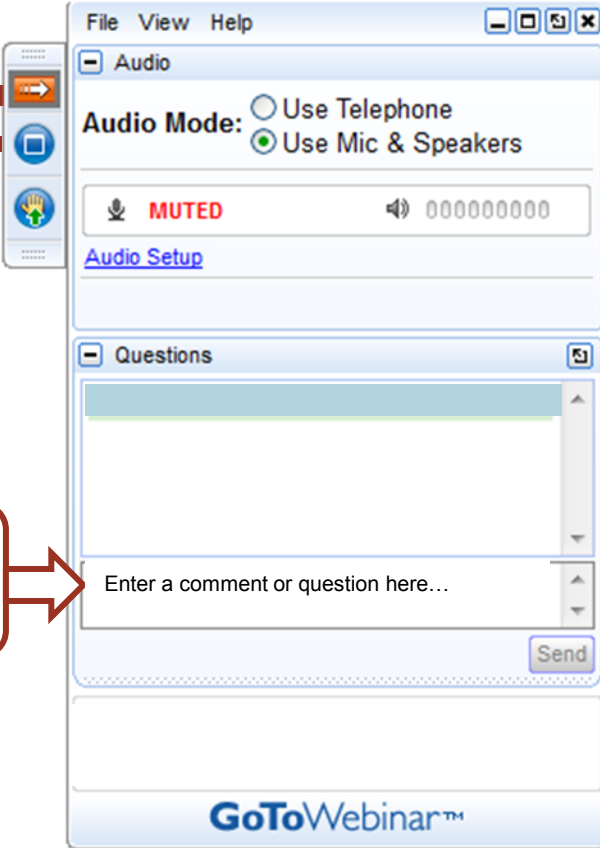


Resources – Positive Images of Women Engineers

- Sources
 - [Makers](#)
 - [Women in STEM videos](#)
 - [International Women's Air & Space Museum](#)
- Organizations
 - [Society of Women Engineers](#)
 - [IEEE Women in Engineering](#)
 - [National Center for Women & Information Technology](#)
 - [Lean In Stories](#)
 - [Phi Sigma Rho](#)
 - [Anita Borg Institute](#)

Asking Questions and Discussion

- Type questions in to “Questions Pane”



The screenshot shows the GoToWebinar interface with two panes visible: 'Audio' and 'Questions'. The 'Audio' pane includes options for 'Audio Mode' (Use Telephone or Use Mic & Speakers), a 'MUTED' indicator, and a volume level. The 'Questions' pane has a text input field with the placeholder 'Enter a comment or question here...' and a 'Send' button. To the left of the interface is a control panel with three buttons: 'Hide/show control panel' (with a right-pointing arrow), 'Full screen' (with a square icon), and 'Raise hand' (with a hand icon). A red-bordered box on the left contains the text 'Question or Comment pane' with a red arrow pointing to the text input field in the Questions pane.



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Personalized “To Do”

Now that you have heard this information, what are some things that you might want to do?



Next Steps

- Provide us Feedback:
<https://www.surveymonkey.com/s/EITPPVEvaluation>
- Go to our website: www.WSKC.org/EIT
 - Participate in other live or recorded webinars
 - [*Thriving vs. Surviving: A Four-Frame Model*](#)
 - [*Engineering Self Efficacy*](#)
 - [*How Learning Works: 7 Research-Based Principles for Smart Teaching*](#)
 - Use the *Action Checklists* & recommended reading
- Share this information with colleagues!



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POWERED BY **WEPAN**

**Together we can engage all minds
in engineering the future!**



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