

WEPAN

Women in
Engineering
ProActive
Network

*Transforming culture
in engineering education*

Identity: Why is it important to think about how women and girls see themselves in science and engineering

**Marie-Claire Shanahan, Ph.D.
University of Alberta**

WEPAN 2011-2012 Webinar Series



- **Host: Diane Matt**, Executive Director, WEPAN (Women in Engineering ProActive Network)



- **Moderator: Jenna Carpenter, Ph.D.**, Associate Dean; College of Engineering & Science, Louisiana Tech University; Director of Professional Development, WEPAN BOD



- **Presenter: Marie-Claire Shanahan, Ph.D.**, Associate Professor, Science Education; University of Alberta

Housekeeping Information

- **The webinar will use Voice Over Internet. If the sound quality is not good, a teleconference line is available:**
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 - Code: 174-555-634

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How to Ask a Question

- **Participant microphones are muted for webinar quality.**
- **Type your question in the “Question” space in the webinar control panel.**
- **A presenter will respond as time allows.**

Who's on the Call Today

- **We have almost 100 registered participants.**
- **Thank you to ASEE WIED, ASEE ERM, NAPE Stem Equity Pipeline, PGEList, ADVANCE, AWM, and others for helping us spread the word!**

What's WEPAN? www.wepan.org

WEPAN is the nation's leading organization for transforming culture in engineering education to promote the success of all women.

- mobilize diverse, inclusive and collaborative stakeholders
- foster diversity in engineering graduates
- inspire a network of advocates to empower and advance the education of women pursuing engineering and related disciplines
- translate research into practice and develop national models to attract and retain women in engineering



WEPAN Knowledge Center

<http://wepanknowledgecenter.org>

Goal: Increase the number, scope and effectiveness of initiatives to advance women in engineering.

- **Catalogued and fully cited resources**

Research, reports, data and statistics, agenda papers, bibliographies, best practices, key programs, and more—1,000+

- **Online Professional Community**

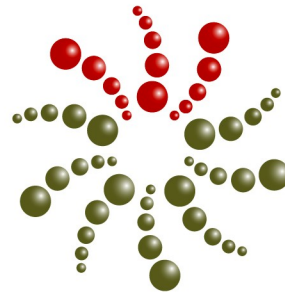
Network, collaborate, identify experts, share information

- **Special online events**

Feature WKC Professional Community and networking opportunities

- **Use** the research, information & data, **Submit** & suggest resources, **Share** the WKC with





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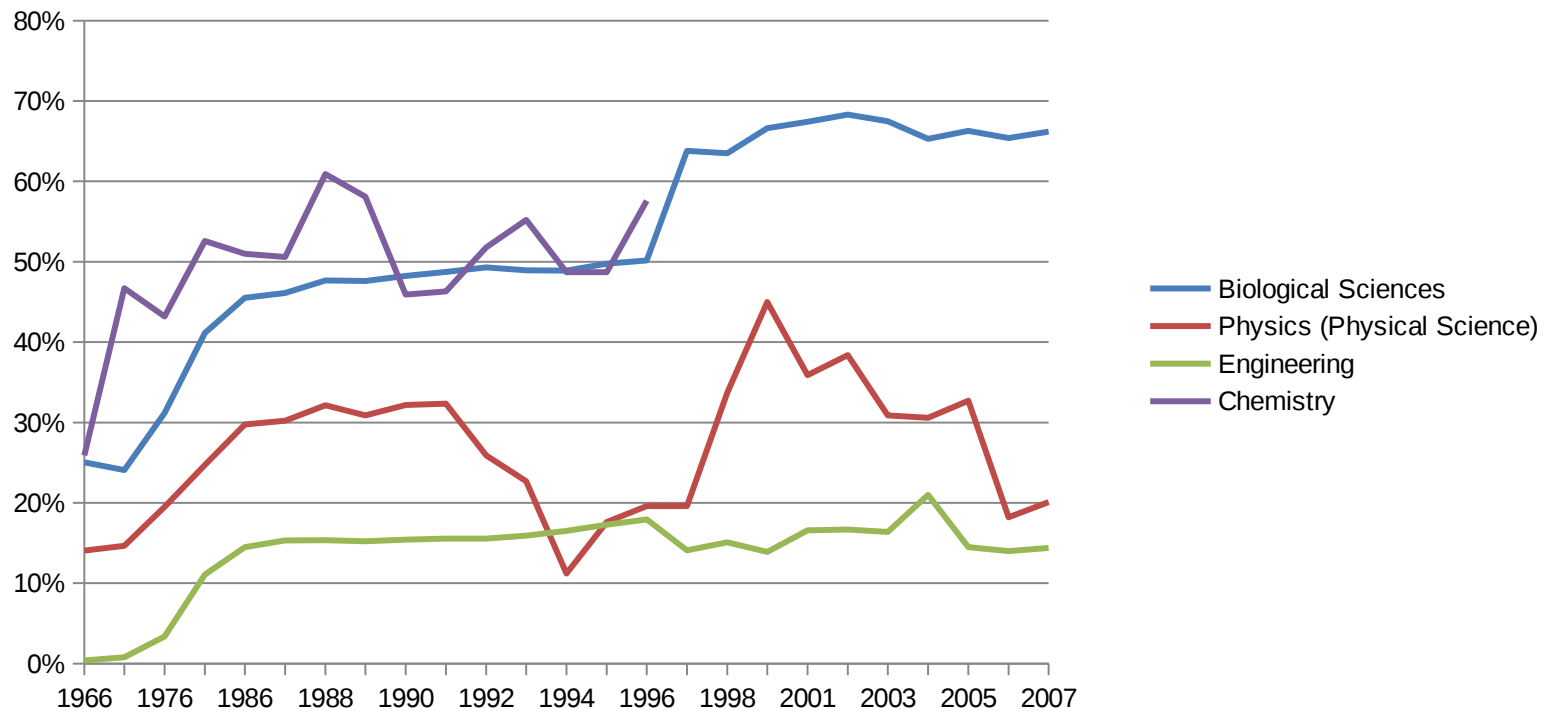
Identity: Why is it important to think about how women and girls see themselves in science and engineering

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Representation of Women in science

- Since 1980s efforts to encourage women in science have met with differing degrees of success.
 - Degrees earned from 1960 to 2007:
 - Biology: 25% → 60%
 - Physics: 14% → 21%
 - Engineering: 0.4% → 14%
 - (Source: NSF, Science and Engineering Indicators 2000 and 2010)

Percentage of all bachelors degrees that were awarded to women



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What predicts participation in science?

- **Intrinsic interest in science** (Tai, Liu, Maltese, & Fan, 2006)
- **Situational/topical interest in science** (Nieswandt & Shanahan, 2009)
- **Self-efficacy for science and math** (Fouad, et al., 2002)
- **Recognition from peers, parents and teachers** (Bleeker and Jacobs, 2004)

Poll Question:

In your experience as a scientist or engineer or in your role supporting those in science and engineering, which of these had the greatest influence on your participation in science?

- A) Intrinsic interest in science
- B) Situational/topical interest in science
- C) Self-efficacy for science and math
- D) Recognition from peers, parents and teachers

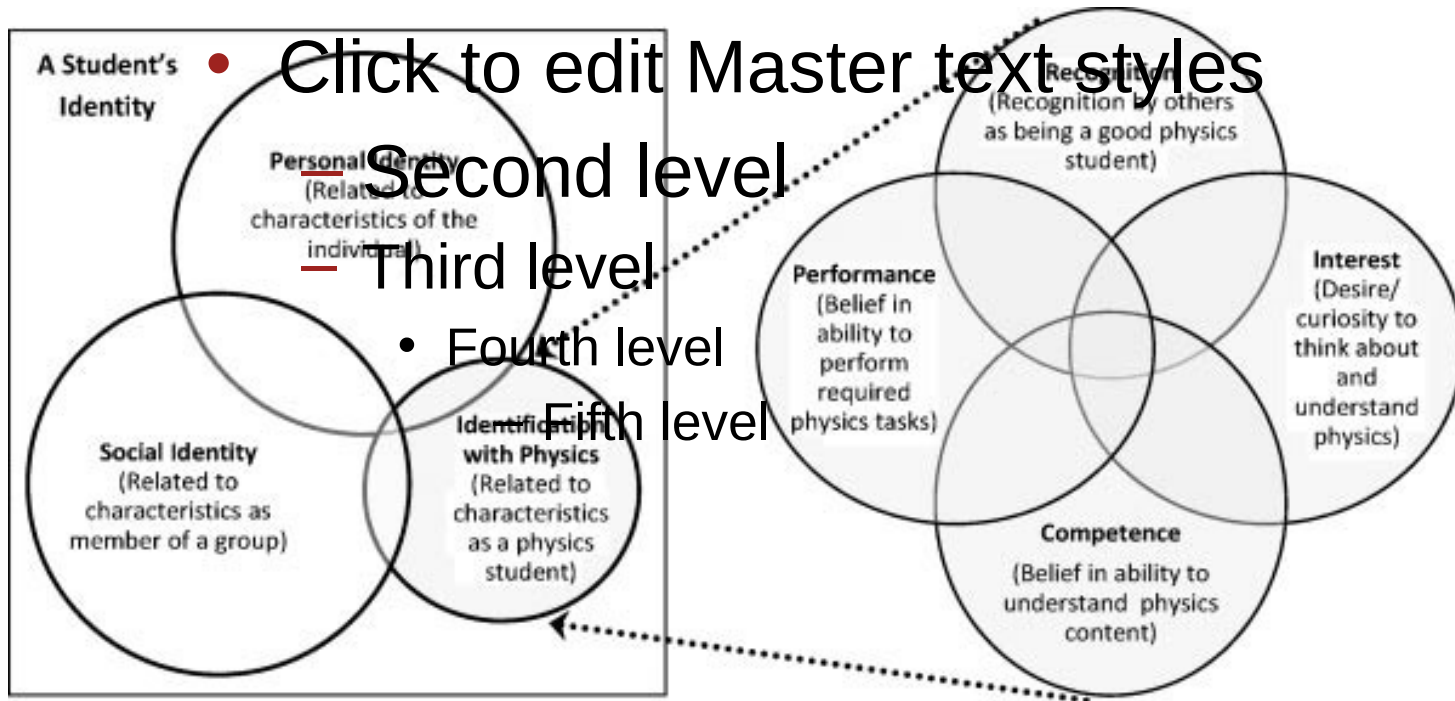
What about gender?

- Stronger impact of encouragement and confidence (Bleeker & Jacobs, 2004)
- Gender appropriateness (Farenga and Joyce, 1999)

What is a science/engineering identity?

- Being a “science person”:
 - Seeing oneself as a science person (interest, self-efficacy)
 - Wanting to be a science person (goals, future orientation, career encouragement)
 - Being seen as a science person (recognition and encouragement from parents, friends, peers)

Identity



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What influences that identity? Expectations

- Exploratory study of 16-year-old students at a variety of schools:
 1. Interviews and open-ended writing (95 students)
 2. Questionnaires comparing science to other subjects (129 students)
 3. Questionnaires asking for self-ratings (335 students)

What influences that identity?

- High School Students identified 4 key expectations:
 - Intelligence (e.g., good grades, right answers)
 - Scientifically-minded (e.g., rational, objective)
 - Skilled in science (e.g., designing experiments, drawing conclusions)
 - Well-behaved student (e.g., follows directions, is safe with materials)

Connections to identity

- Self-perceptions of intelligence and scientific mindedness were significant predictors of identity for both male and female students.
 - But their impact was stronger for female students.
- Male and female students rate themselves about equally for being scientifically-minded.
- Female students rate themselves lower on intelligence.

Who can influence it?

- Persistence Research in Science and Engineering Study
 - Subsample of those with high school physics (3,829 students)
 - What high school experiences impacted on identity?
 - Classroom environment
 - Teaching styles
 - Practical work
 - Assessment style

What contributes to strong identities?

- teachers who introduce cutting edge physics topics
- frequent labs addressing students' beliefs about the world
- opportunities for peer teaching
- encouraging student questions and comments
- receiving encouragement from their teachers to pursue physics
- having discussions in class about the benefits of being a scientist

What about gender?

- What didn't have an impact?
 - providing positive female science role models
 - creating opportunities for collaborative group work
 - discussing the lives of female scientists

What about gender?

- What did have an impact?
 - Only one thing: discussing underrepresentation in physics

More on gender

- But...several of the important factors were experienced less frequently by female students:
 - focus on conceptual understanding
 - labs addressing their beliefs about the world
 - discussing currently relevant science topics
 - discussing the benefits of being a physicist

Why identity?

- Identity lets us bring together several factors including interest, ability, confidence, encouragement and social pressures.
 - Offers suggestions for changes that can be encouraged in science and in female students
 - Change the way students see science
 - Change the way students see themselves

Questions?

- **Remember:**
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Thank You!



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- We will E-mail the link to the recorded webinar to you—share with your colleagues!
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