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

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WEPAN 2011-2012 Webinar Series

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• 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 others
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
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

- A Student’s Identity
  - Personal Identity (Related to characteristics of the individual)
  - Social Identity (Related to characteristics as member of a group)
  - Identification with Physics (Related to characteristics as a physics student)

- Recognition (Recognition by others as being a good physics student)
- Performance (Belief in ability to perform required physics tasks)
- Competence (Belief in ability to understand physics content)
- Interest (Desire/curiosity to think about and understand physics)

- Click to edit Master text styles
- Second level
  - Third level
    - Fourth level
    - Fifth level
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?

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