Seven Strategies to Engage Girls (and All Kids) in STEM

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SciGirls

TEXAS WEP

What does a girl *(or any student)* imagine when she thinks of a scientist?

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BIG IDEA:

To change how millions of girls (ages 8-13) think about STEM

- Features *real* girls doing investigations they're passionate about
- Highlights the *process* of science

SciGirls is produced for PBS by ***tpt* National Productions** and is made possible by the National Science Foundation. Additional funding is provided by L'Oreal USA's For Girls in Science program and PPG Industries Foundation.

SciGirls

scigirlsconnect.org

1. **Girls benefit from collaboration, especially when they can participate and communicate fairly.** (Parker & Rennie, 2002; Fancsali, 2002)

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2. Girls are motivated by projects they find personally relevant and meaningful. (Eisenhart & Finkel, 1998; Thompson & Windschitl, 2005; Liston, Peterson, & Ragan, 2008)

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3. **Girls enjoy hands-on, open-ended projects and investigations.**
(Chatman, Nielsen, Strauss, & Tanner, 2008; Burkam, Lee, & Smerdon,1997; Fanscali, 2002)

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4. Girls are motivated when they can approach projects in their own way, applying their creativity, unique talents and preferred learning styles. (Eisenhart & Finkel,1998; Calabrese Barton, Tan, & Rivet, 2008)

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5. **Girls' confidence and performance improves in response to specific, positive feedback on things they can control – such as effort, strategies and behaviors.**

(Halpern, et al., 2007; Zeldin & Pajares, 2000; Blackwell, Trzesniewski, & Sorich Dweck, 2007; Mueller & Dweck, 1998)

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6. Girls gain confidence and trust in their own reasoning when encouraged to think critically.
(Chatman, et al., 2008; Eisenhart & Finkel,1998)

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7. Girls benefit from relationships with role models and mentors.

(Liston, et al., 2008; Evans, Whigham, & Wang, 1995)

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Role Models Matter:

Engaging Girls (and All Kids) in STEM

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Why Train Role Models?

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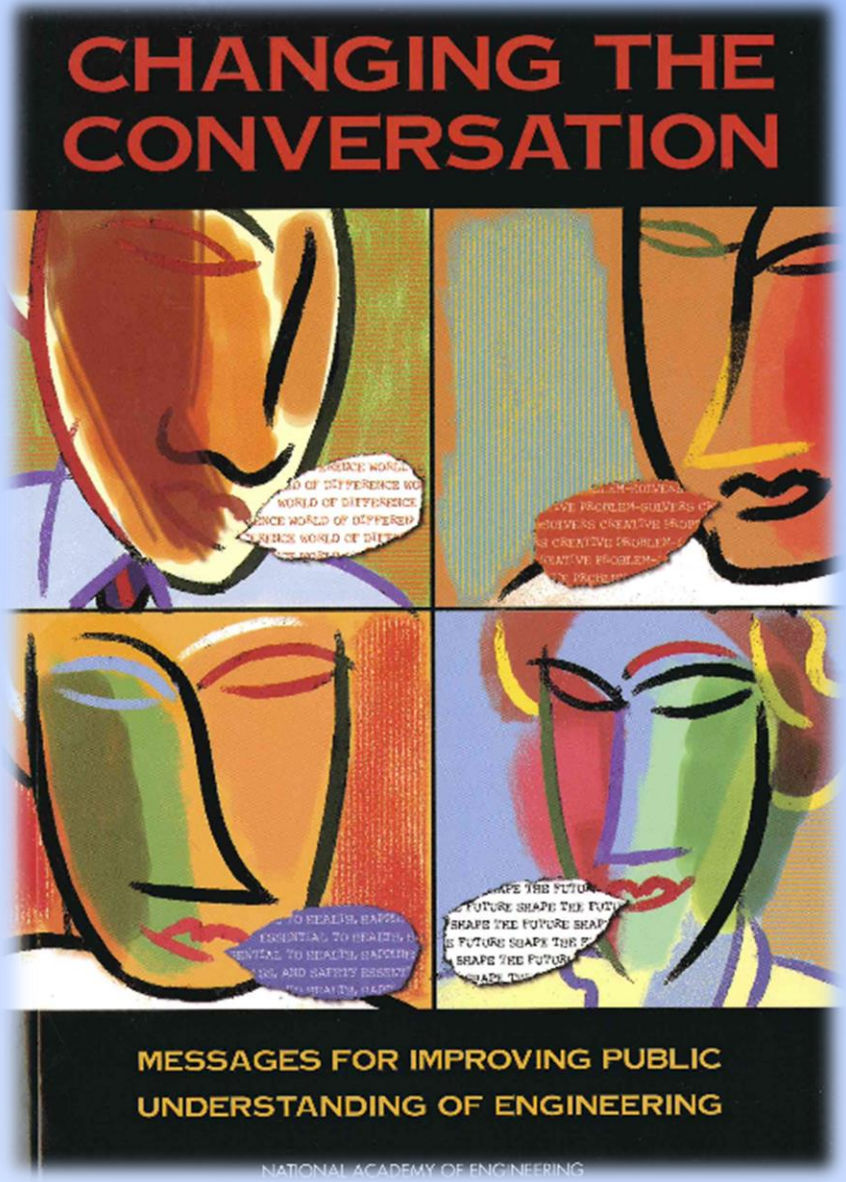
CHANGING THE CONVERSATION:

Messages for Improving Public Understanding of Engineering



National Academy Of Engineering (NAE)

http://www.nap.edu/catalog.php?record_id=12187

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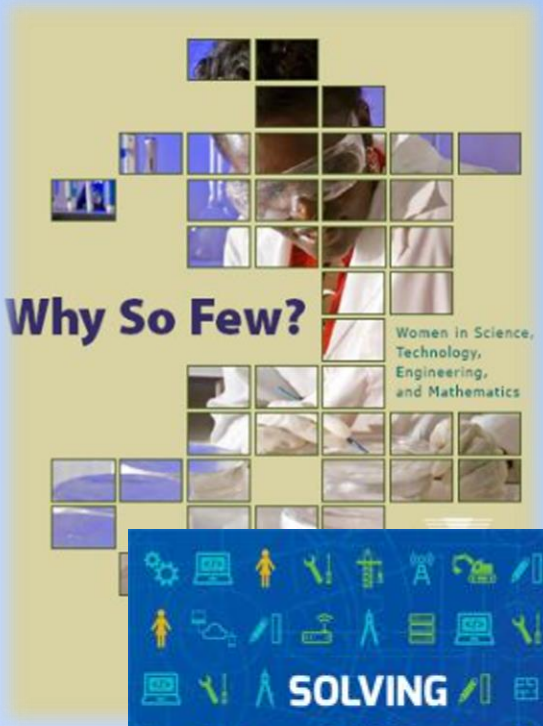
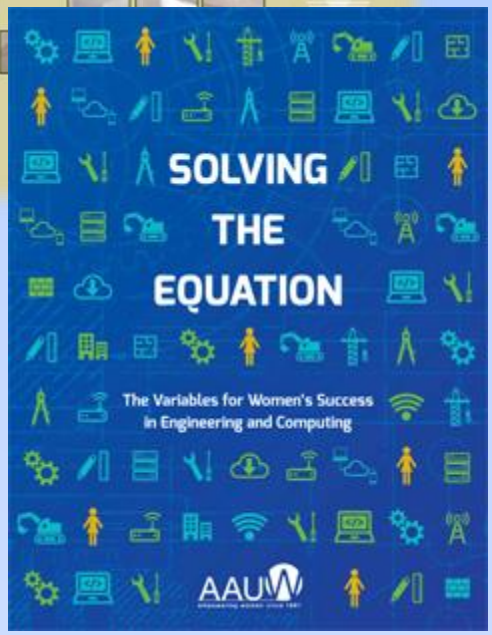
WHY SO FEW?

Women in Science, Technology, Engineering and Mathematics



SOLVING THE EQUATION

The Variables for Women's Success in Engineering & Computing



American Association of University Women

http://www.aauw.org

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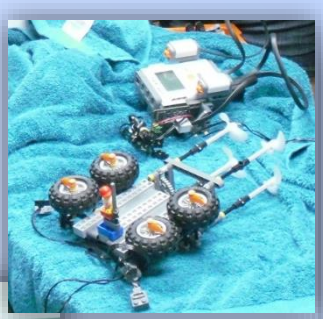
Adjust the STEM Image

- ‘~~Nerdy, geeky and boring~~’
- Provide STEM role models that look and sound like them
- Use words to describe STEM like discovery, design, imagination, innovation, contribution
- Use the word create, not build

Adjust the STEM Image

Use images of people:

Younger girls pick images involving female engineers; boys more likely to pick images that features “things”



Stop Focusing on STEM Inputs

Stop focusing on math and science as the needed inputs for a STEM career and instead focus on:

- **Outputs**
- **Career opportunities**
- **Making a difference in the world**

“Secret Sauce” for Success

1 part passionate

1 part personal

1 part informal

1 part interactive

Mix ingredients and give time to develop

Techbridge Role Model Event

- Icebreaker (10 minutes)
- Role model introductions (10 minutes)
- Hands-on STEM activity
- Reflection and connections to the world (10+ minutes)

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Icebreakers can...

- Make students and role models more comfortable
- Introduce new scientific topics, vocabulary or careers
- Check for background knowledge

Key Elements of a Role Model Introduction (and Interaction)

These elements should be threaded throughout a role model interaction!

- Make it personal
- Use kid-friendly language
- Share academic and/or career path
- Share challenges and triumphs
- Show how engineers can change the world

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Hands-on Activity

Hands-on Activity Facilitation

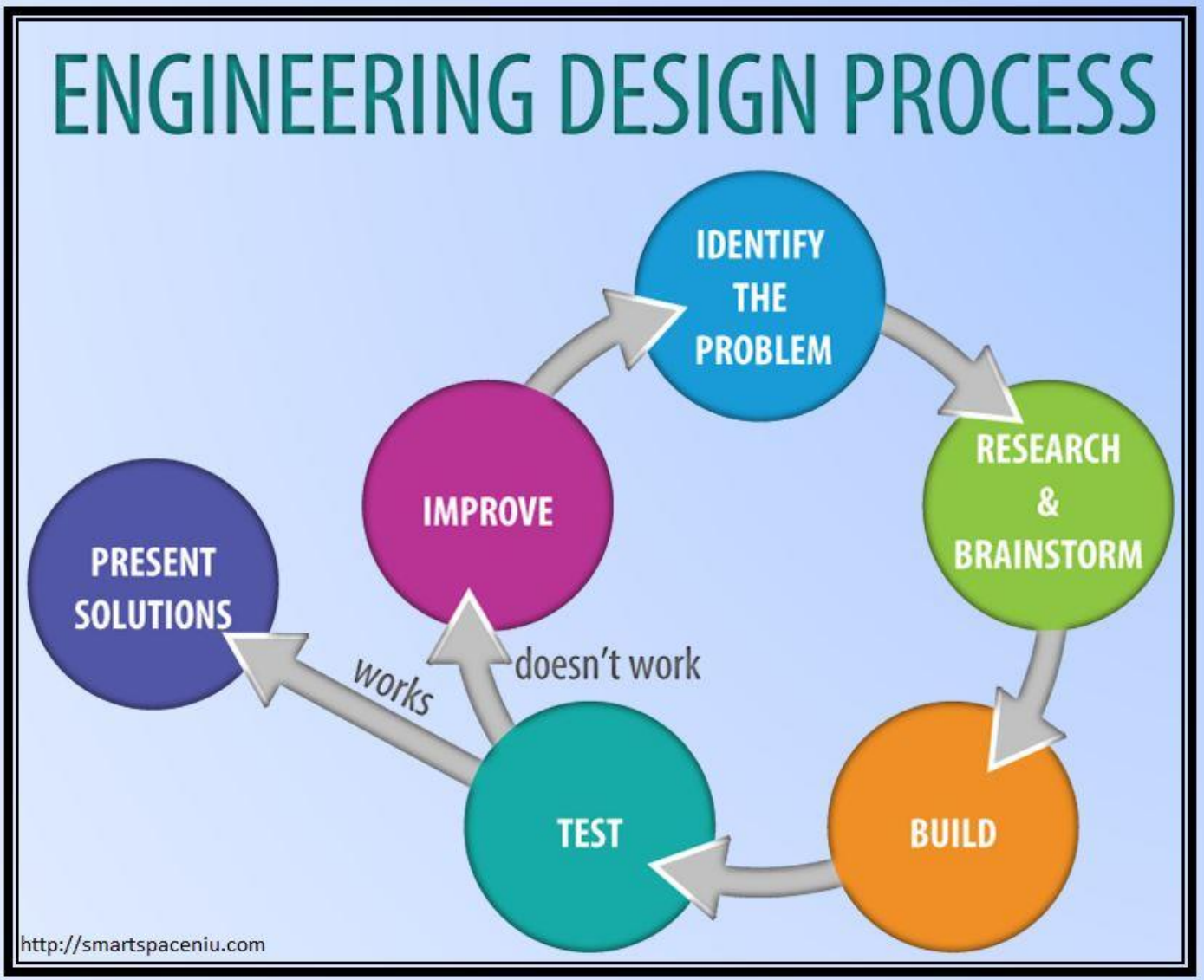
- Give useful and specific feedback
- Use questions
- Promote inquiry
- Highlight the challenge
- Praise the effort
- Foster collaboration

Reinforce the Growth Mindset

- Teach children that intellectual skills can be acquired.
- Praise the effort.
- Highlight the struggle.
- Gifted programs should send the message that they value growth and learning.

Fixed Mindset	Growth Mindset
Intelligence is static.	**Intelligence can be developed.**
Leads to a desire to *look smart* and therefore a tendency to	Leads to a desire to *learn* and therefore a tendency to
• **avoid challenges**	• **embrace challenges**
• **give up easily due to obstacles**	• **persist despite obstacles**
• **see effort as fruitless**	• **see effort as path to mastery**
• **ignore useful feedback**	• **learn from criticism**
• **be threatened by others' success**	• **be inspired by others' success**

AAUW Why So Few



Reflection - Make it Meaningful

Connect the activity to...

- Kids' lives
- Careers
- STEM
- Other activities or disciplines

Make connections throughout the hands-on activity.

Find STEM in your everyday life ... & use resources to help you!

- Sports
- Cooking
- Driving
- Games & Apps
- Music
- Health & Medicine
- PBS
- MythBusters
- STEM & Puzzle Apps
- STEM Camps
- Museums & Centers
- Local STEM Events

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Resources

Collaborative Effort including Lawrence Hall of Science, Exploratorium,
New York Hall of Science, Science Museum of Minnesota, Children's Museum of Houston

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Searched:

- Civil Engineering
- Free - $1.00
- 10 – 30 minutes

Results Showing 1-10 of 91 records: Sort by: Relevance

Forces on the Human Molecule

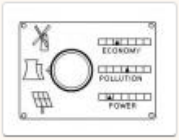
In this physical activity, two lines of learners link hands and arms to model a beam subject to various loading schemes. They discover how inter-atomic forces react to the five ...

ADD TO LIST

WPI

free
Ages 11 - 14
10 to 30 minutes

DETAILS



Power Up!

In this online game, learners must purchase power plants for their city. They must balance the need for adequate power against the environmental impact of different power plants ...

ADD TO LIST

AAAS
ADVANCING SCIENCE, SERVING SOCIETY

free
Ages 8 - 11
10 to 30 minutes

DETAILS

The Best Dam Simulation Ever

This online simulation game explores the different consequences of water levels on the Columbia River in the Pacific Northwest. Learners play the role of dam operator, controlling ...

ADD TO LIST

OMSI

free
Ages 8 - 18
10 to 30 minutes

DETAILS

Turning the Air Upside Down: Spinning Snakes

Learners color and cut out a spiral-shaped snake. When they hang their snake over a radiator, the snake spins. This is because the heated air is less dense and rises, pushing ...

free
Ages 8 - 14

Your Filters: clear all

- Search Term: civil engineering
- Materials Cost: free x
- Materials Cost: 1 cent - $1 x
- Learning Time: 10 to 30 minutes x

Narrow Results By:

Age Range

- 4-6 years old (PreK-K) (8)
- 6-8 years old (grades 1-2) (32)
- 8-11 years old (grades 3-5) (83)
- 11-14 years old (grades 6-8) (66)
- 14-18 years old (grades 9-12) (31)
- 18 years and older (adult) (16)

Subject

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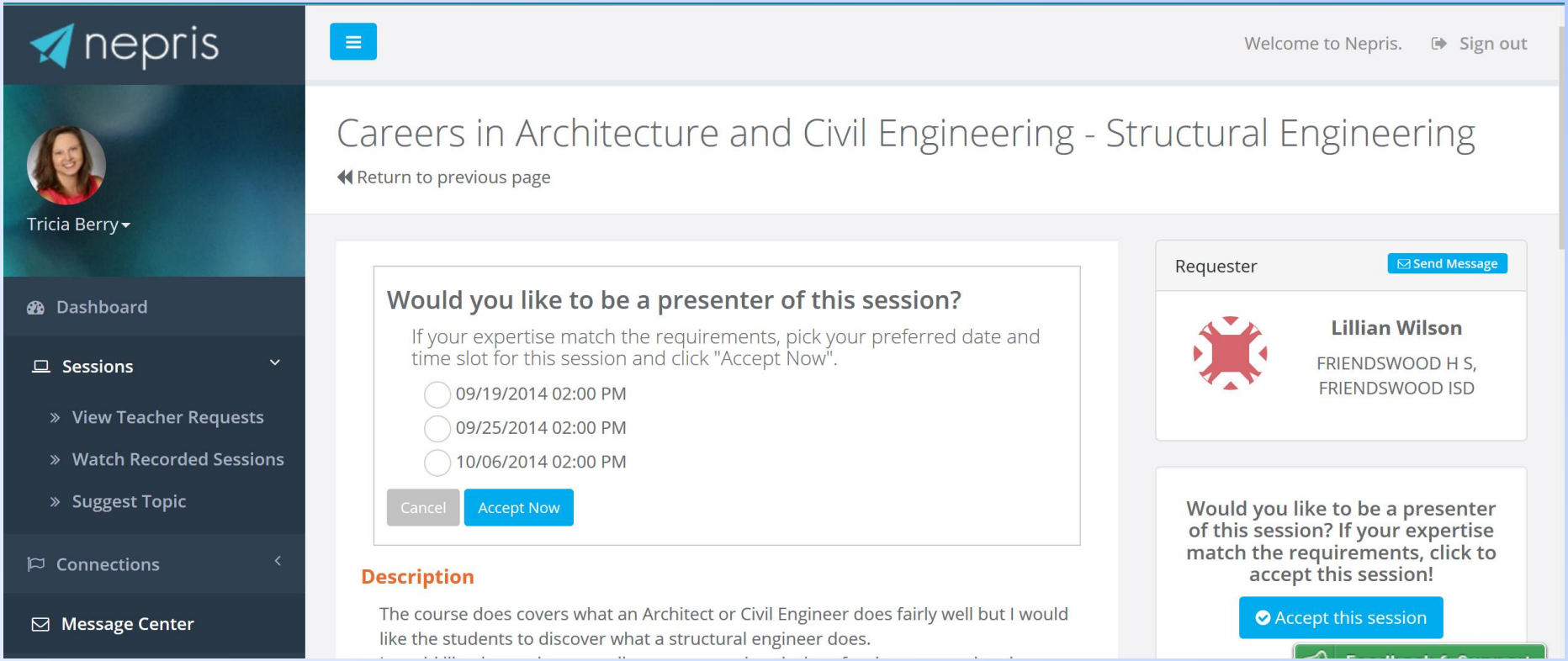
Finding & Being Role Models



http://www.nepris.com/

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Finding & Being Role Models

THE CONNECTORY

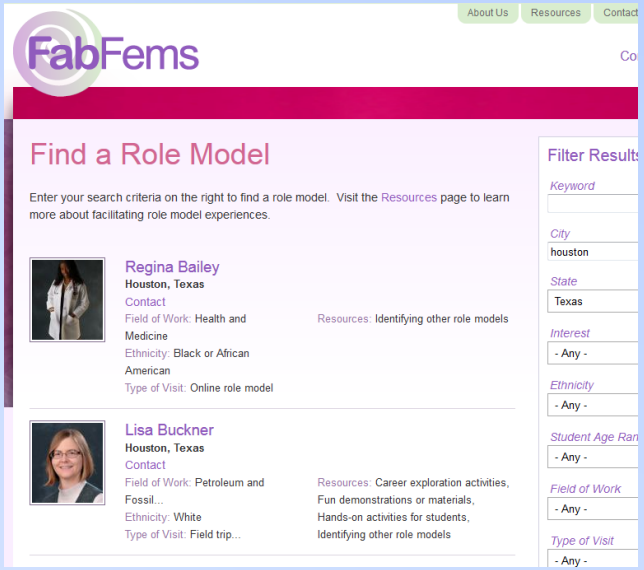
http://www.theconnectory.org

MWM Million Women Mentors
Advancing Women and Girls in STEM Careers Through Mentoring

www.millionwomenmentors.org

FabFems

http://www.fabfems.org/



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Techbridge Resources

- Role Model Guide
- Techbridge Tips
- Online Training

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