

Exciting Girls (and All Students) about STEM: Messaging, Imagery, & Attitude

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Texas Girls Collaborative Project

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TEXAS

WEP

WEP connects students, educators and professionals to the **world of engineering to promote the success and advancement of women in engineering.**

- * **Recruitment Initiatives**
- * **Supportive Structures**
- * **Educational Services**



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Texas *Girls*
Collaborative Project



Mission: To connect & support organizations and individuals across Texas committed to informing and motivating girls to pursue careers in science, technology, engineering and mathematics (STEM)

www.txgcp.org



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- * Role Models Matter
- * SciGirls
- * WaterBotics
- * Effective STEM Messaging
- * Strategies to Engage Girls (and All Kids) in STEM
- * Mother/Daughter TEA (*Technology & Engineering Aptitude*)

Curriculum Dissemination



www.txgcp.org



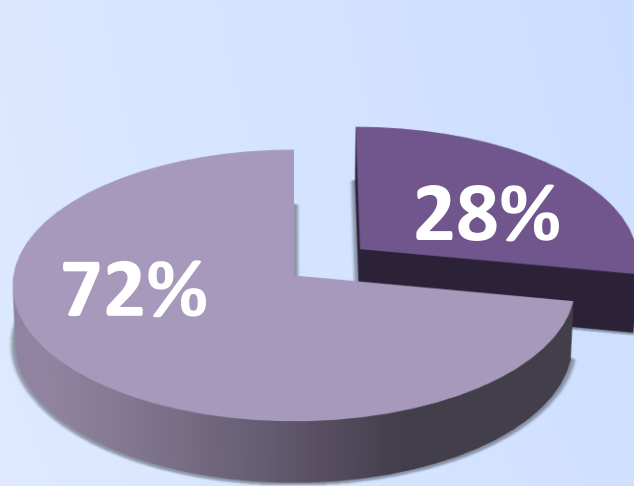
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What is our current state?



Diversity in STEM



■ Women ■ Men

■ Black

■ Hispanic

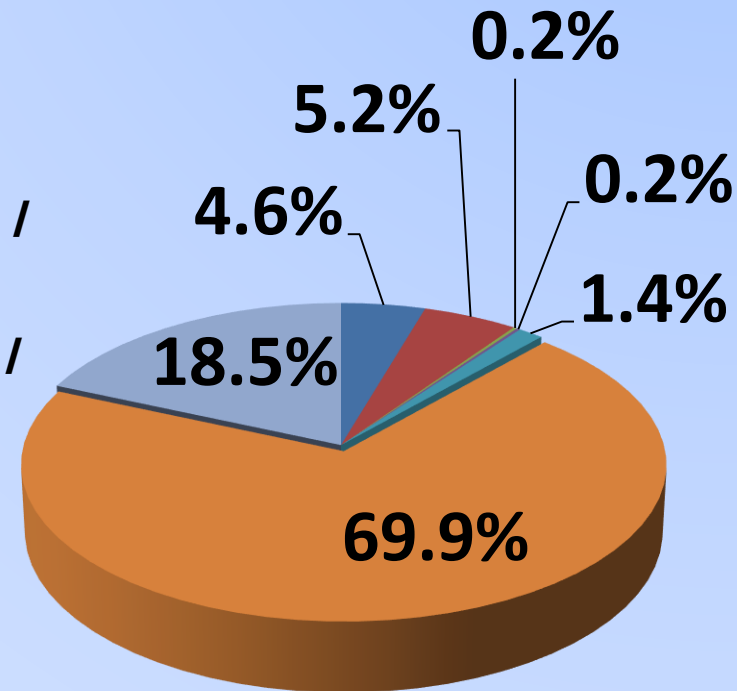
■ American Indian /
Alaska Native

■ Native Hawaiian /
Pacific Islander

■ Multiple Race

■ White

■ Asian



Science & Engineering
Indicators 2014

Girls do STEM...sort of

56% of AP Test-Takers

47% of AP
Calculus Test-Takers

...but only

20% of AP Computer Science Test-Takers



Women Earn...

57% of undergrad degrees

42% of undergrad math & stats degrees

40% of undergrad physical sciences degrees

...but only

19% of undergrad CS and engineering degrees



What does an engineer or scientist look like?



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Before Fieldtrip to a Lab

I think of a scientist as very dedicated to his work. He is kind of crazy, talking always quickly. He constantly is getting new ideas. He is always asking questions and can be annoying. He listens to others' ideas and questions them.

-Amy, 7th grader



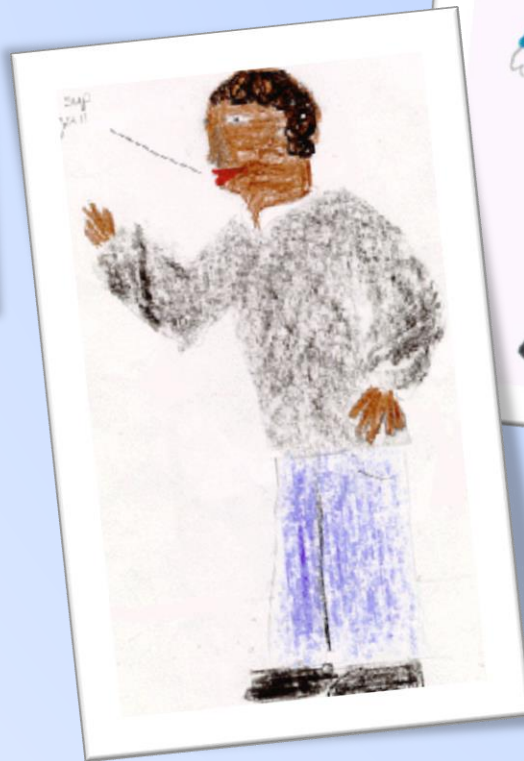
After Fieldtrip to a Lab

I know scientists are just normal people with a not so normal job. . . Scientists lead a normal life outside of being a scientist. They are interested in dancing, pottery, jogging and even racquetball. Being a scientist is just another job which can be much more exciting.

-Amy, 7th grader



<http://ed.fnal.gov/projects/scientists/index.html>



Boys



- African American boys think salary extremely important to job choices
- Hispanic boys are more likely to believe engineering has a positive effect on people's everyday lives
- Boys like space exploration and designing video games

From Changing the Conversation

Girls



- African American girls want a job that makes a difference
- Hispanic girls think engineers are nerdy and boring
- Girls gravitate to using DNA evidence to solve crimes

From Changing the Conversation



Boys & Girls



***Both believe engineering is
a very good career choice***



From Changing the Conversation



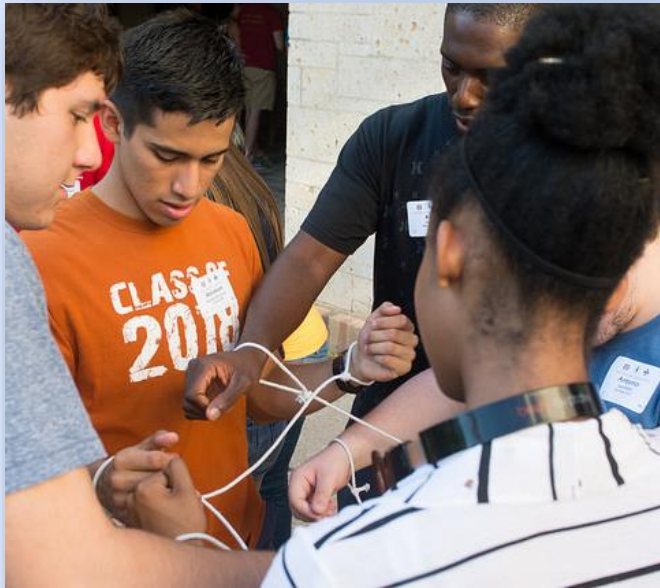
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Why do we care?



STEM education builds basic skills for all students, skills that make it easier to find a job in almost any field.



The U.S. Department of Labor estimates that by 2020 there will be more than **1.4 million computing-related job openings**. At current rates, we can only fill about 30% of those jobs with U.S. computing bachelor's grads.

www.ncwit.org



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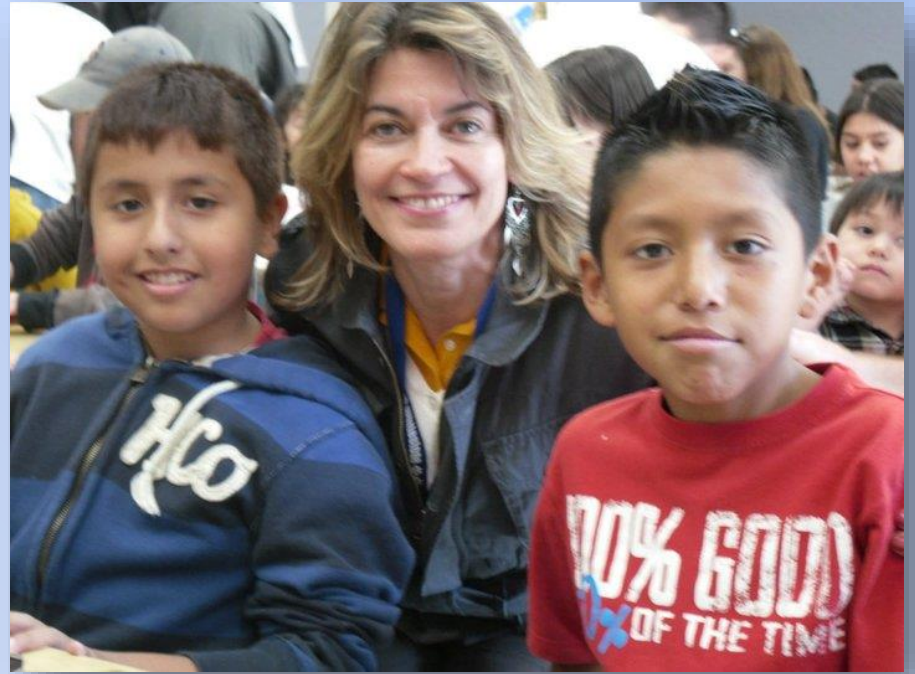
Diversity drives innovation, increases financial gains, & makes us smarter!



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What can we do?



CHANGING THE CONVERSATION:

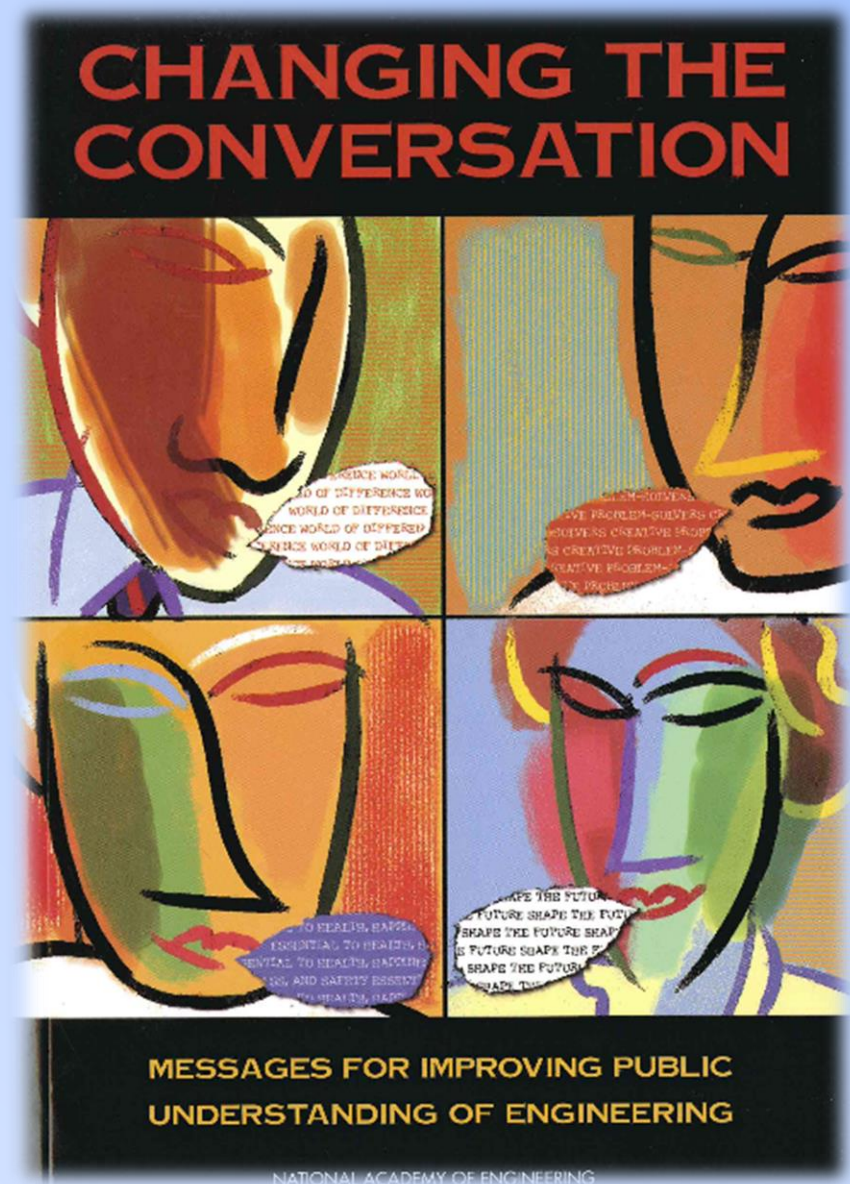
Messages for Improving Public Understanding of Engineering

National Academy Of Engineering (NAE)

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



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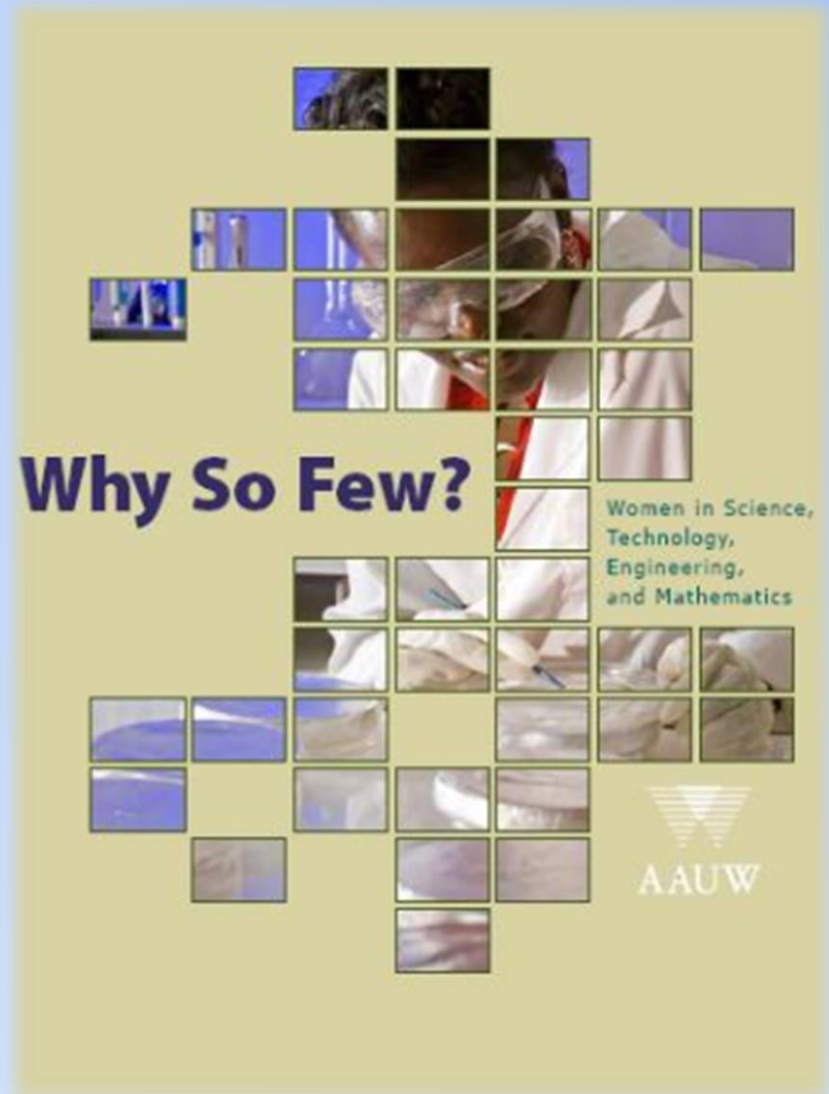


Why So Few?

Women in Science, Technology, Engineering and Mathematics

American Association of University Women

<http://www.aauw.org/learn/research/whysofew.cfm>



What can we (and parents) do?

1. Adjust the STEM image
2. Embrace the growth mindset
3. Encourage spatial skills development
4. Ask “what do you think” and encourage problem solving
5. Be a STEM Role Model

Adjust the STEM Image

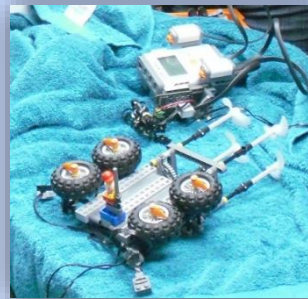
- ~~‘Nerdy, geeky and boring’~~
- Provide STEM **role models** that look and sound like them
- Use words to describe STEM like **discovery, design, imagination, innovation, contribution**
- Use the word **create**, not build



Adjust the STEM Image

Use **images of people:**

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



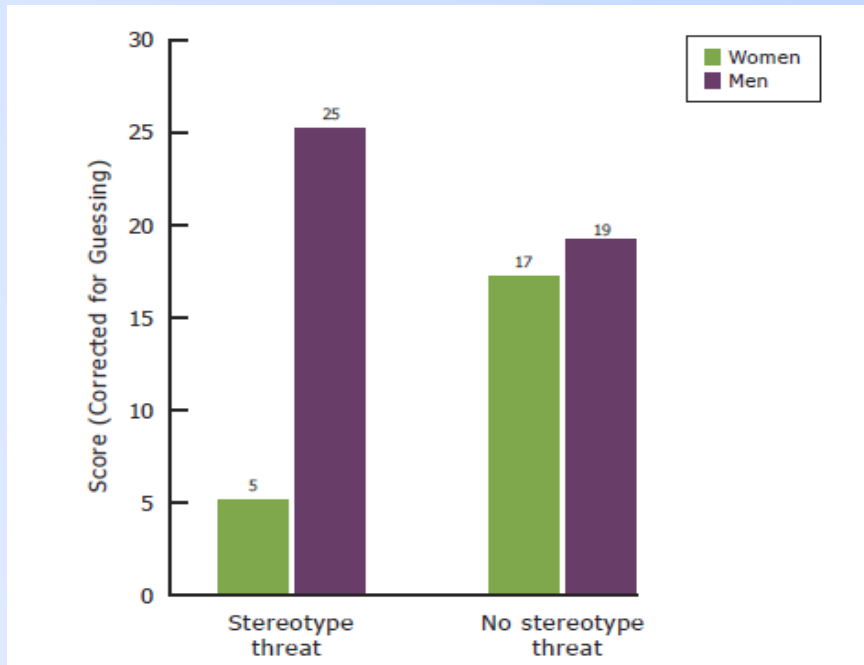
Stop Focusing on STEM Inputs

- 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**



Negative stereotypes about girls' and women's abilities in math and science adversely affect their performance in these fields.

Performance on a Challenging Math Test,
by Stereotype Threat Condition and Gender

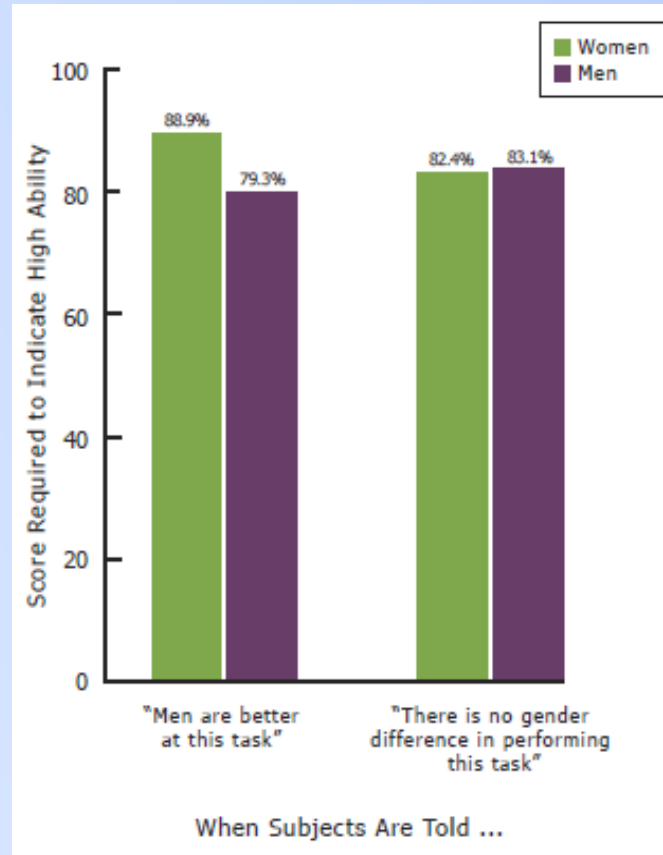


- Expose girls to successful female role models in math and science.
- Teach students about stereotype threat.

Source: Spencer, S. J., Steele, C. M., & Quinn, D. M., 1999, "Stereotype threat and women's math performance," *Journal of Experimental Social Psychology*, 35(1), p. 13.

Women hold themselves to a higher standard compared with men in “masculine” fields.

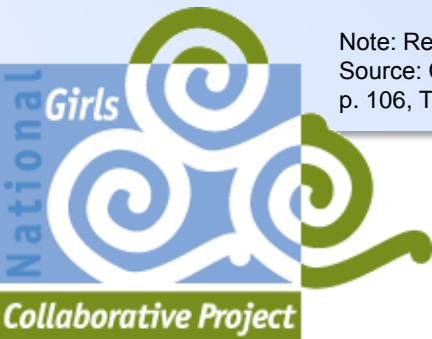
Students’ Standards for Their Own Performance, by Gender



Set clear performance standards.

Help girls recognize their career-relevant skills.

AAUW



Note: Respondents were asked, “How high would you have to score to be convinced that you have high ability at this task?”

Source: Correll, S.J., 2004, “Constraints into preferences: Gender, status, and emerging career aspirations,” American Sociological Review, 69, p. 106, Table 2.



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Embrace the Growth Mindset

Believing in the
potential for
intellectual growth,
in and of itself,
improves outcomes.

*Growth Mindset Improves
STEM Persistence*



Fixed Mindset	Growth Mindset
Intelligence is static.	Intelligence can be developed.
Leads to a desire to <i>look smart</i> and therefore a tendency to	Leads to a desire to <i>learn</i> 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

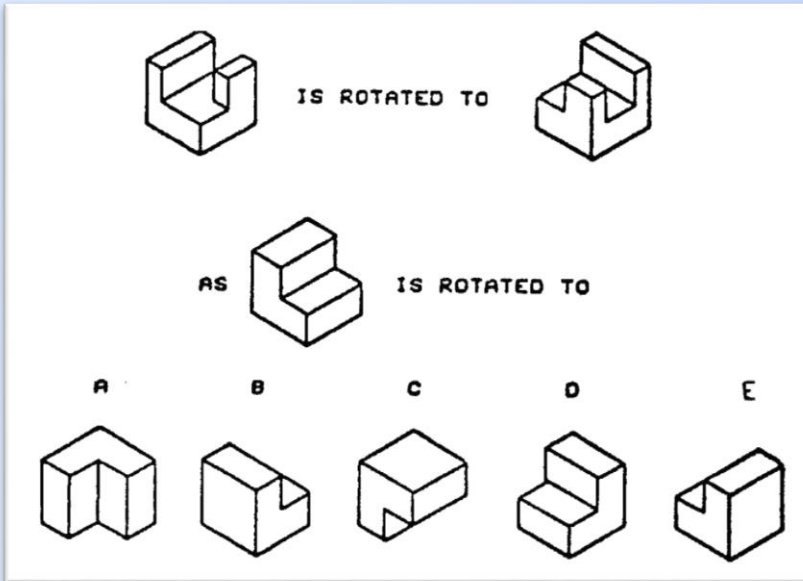
- Teach children that intellectual skills can be acquired.
- Praise children for effort.
- Highlight the struggle.
- Gifted and talented programs should send the message that they value growth and learning.

AAUW

Encourage Spatial Skills Development

Spatial skills are not innate and can be improved with training.

One of the largest and most persistent gender gaps in cognitive skills is found in the area of mental rotation, where boys consistently outperform girls.



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Encourage Spatial Skills Development

- Playing with building toys
- 3D Video Games (Minecraft)
- Puzzle Apps
- Drawing



Encourage Problem Solving

- How might this be more efficient?
- It broke? How might it be better designed?
- What would happen if....?
- I don't know. What do you think?



Be a STEM Role Model

- Don't minimize your STEM skills
- Embrace the growth mindset
- Explicitly point out when you are using STEM skills
 - Shopping, budget, discounts
 - Cooking, conversions, temperatures, estimating



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

- Sports
- Cooking
- Driving
- Games & Apps
- Music
- Health & Medicine
- PBS
- MythBusters
- ESPN Sports Science
- STEM & Puzzle Apps
- STEM Camps
- Museums & Centers & Colleges & more

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