

Preparing All Learners for the Future of Work

1:00 – 2:00pm

June 13, 2019



PRESENTERS



Carrie Parker
Education Development
Center
Chair



Ritu Raman
Massachusetts Institute
of Technology
Presenter



Emily Reid
AI4ALL
Presenter



Sheryl Sorby
University of
Cincinnati
Presenter

Preparing all learners for the future of work:

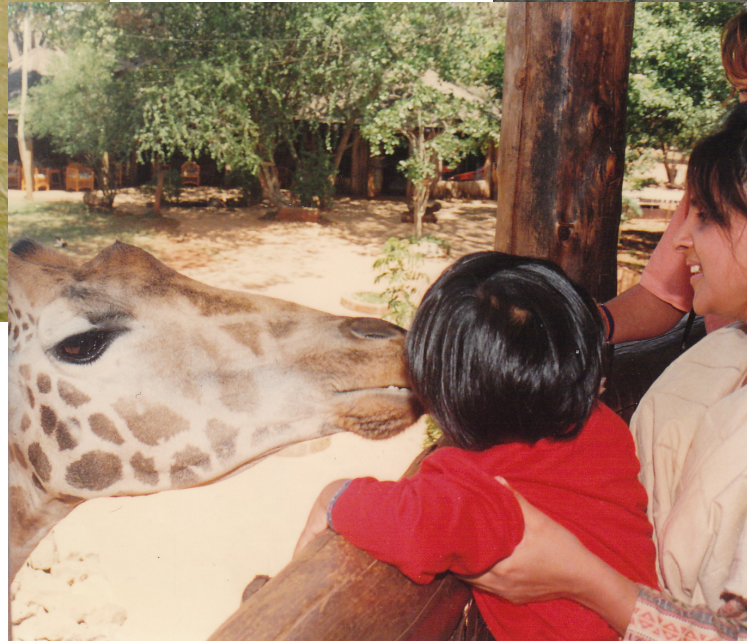
How I learned to build with biology

Ritu Raman

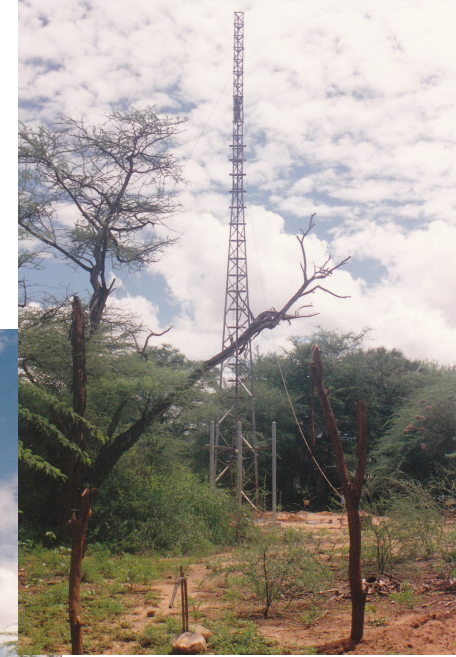
Postdoctoral Fellow, MIT

RituRaman.com | ritur@mit.edu | [@DrRituRaman](https://twitter.com/DrRituRaman)

A little personal history

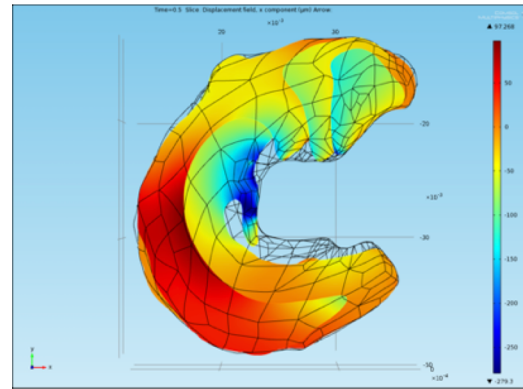
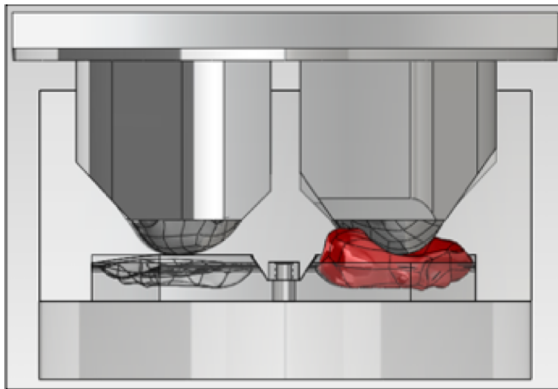
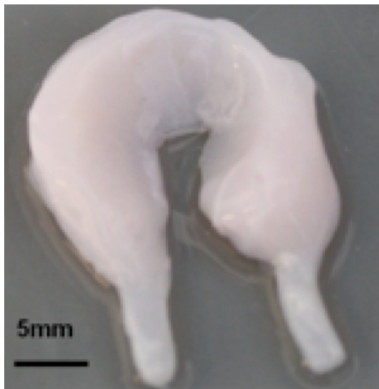


Innovation is a force for social change



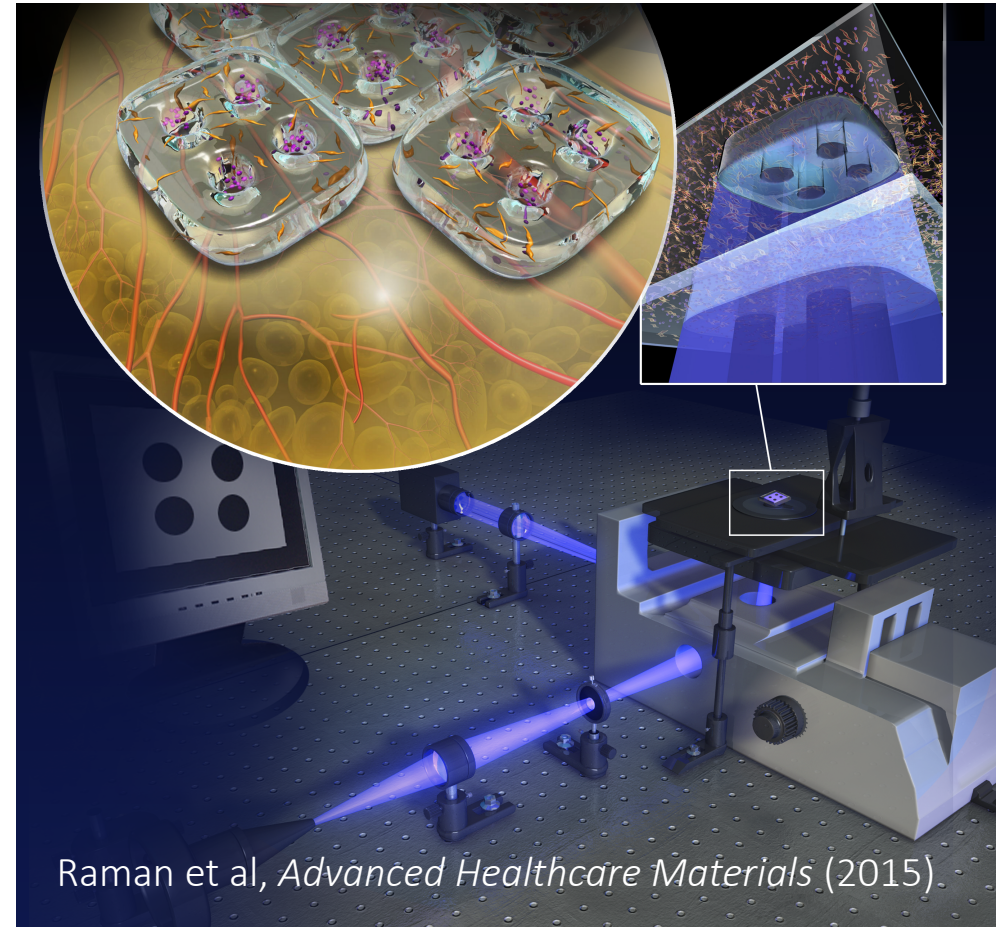
STEM journey

1991 – 2007	3 continents, 5 languages, 10 schools, no particular STEM focus
2007	How do you apply to college?
2008	Cornell, Aerospace to BME
2009	Bird watching, rat walking, and water cleaning (oh my)
2010	Entrepreneurial fellowship at a biotech startup
2011	Research + preparation for graduate school



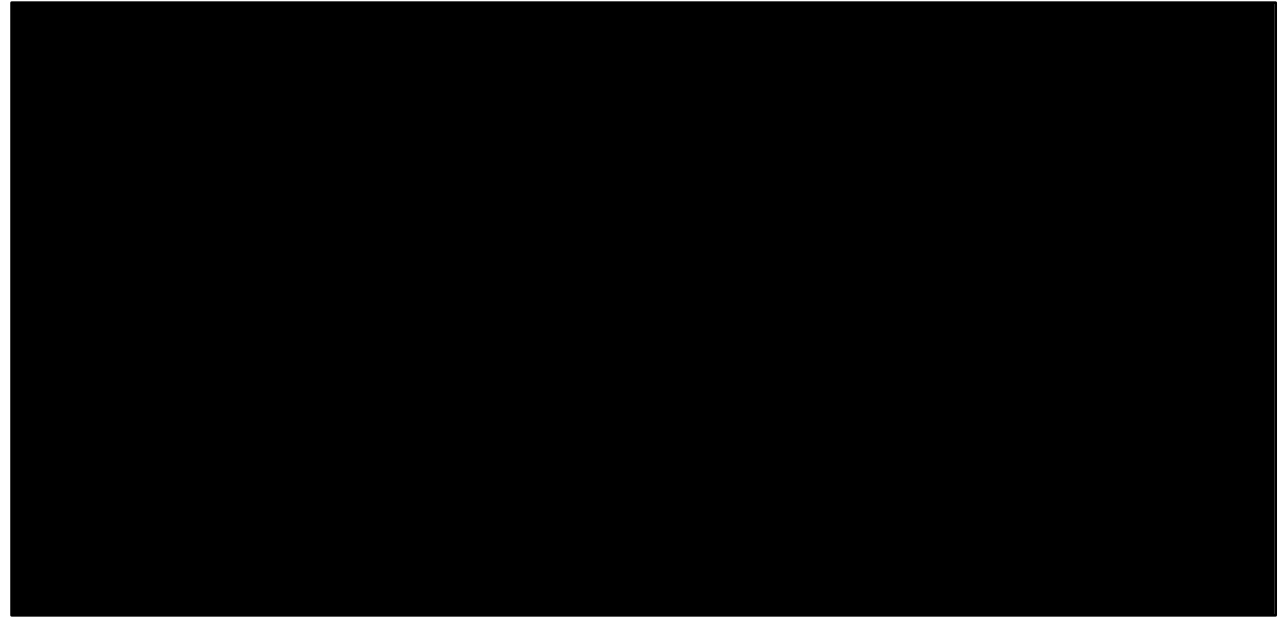
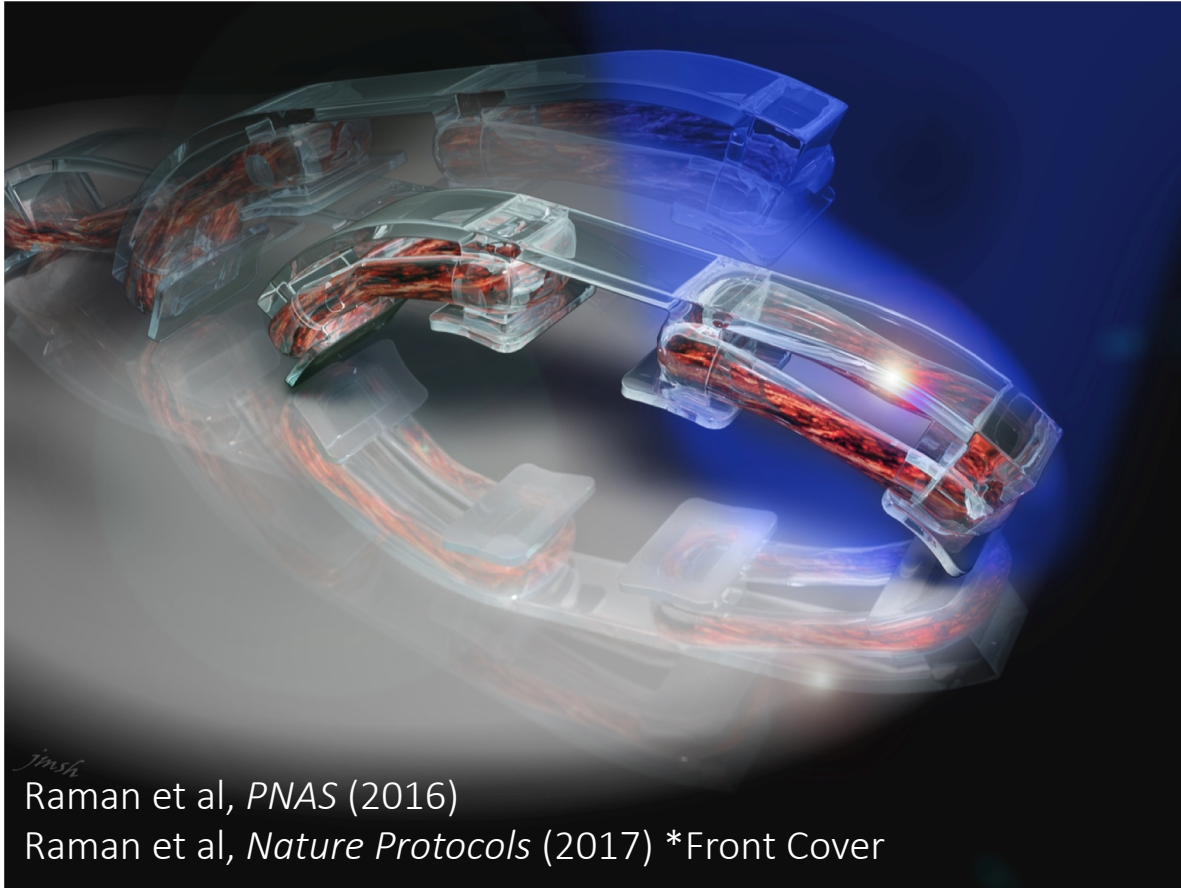
Learning how to build with biology

http://img.sparknotes.com/content/sparklife/sparktalk/androids_welove_2_LargeWide.JPG



Raman et al, *Advanced Healthcare Materials* (2015)

Can I build *beyond* biology?



Can I teach others to build beyond biology?



Raman et al, *Journal of Biological Engineering* (2016)



Should you build beyond biology?

Biohybrid Design:

A new era in bioethics

Ritu Raman

Postdoctoral Fellow, MIT

RituRaman.com | ritur@mit.edu | [@DrRituRaman](https://twitter.com/DrRituRaman)

Encouraging young people interested in STEM

Focus on goals external to yourself

Find good friends and mentors

Learn to work with others

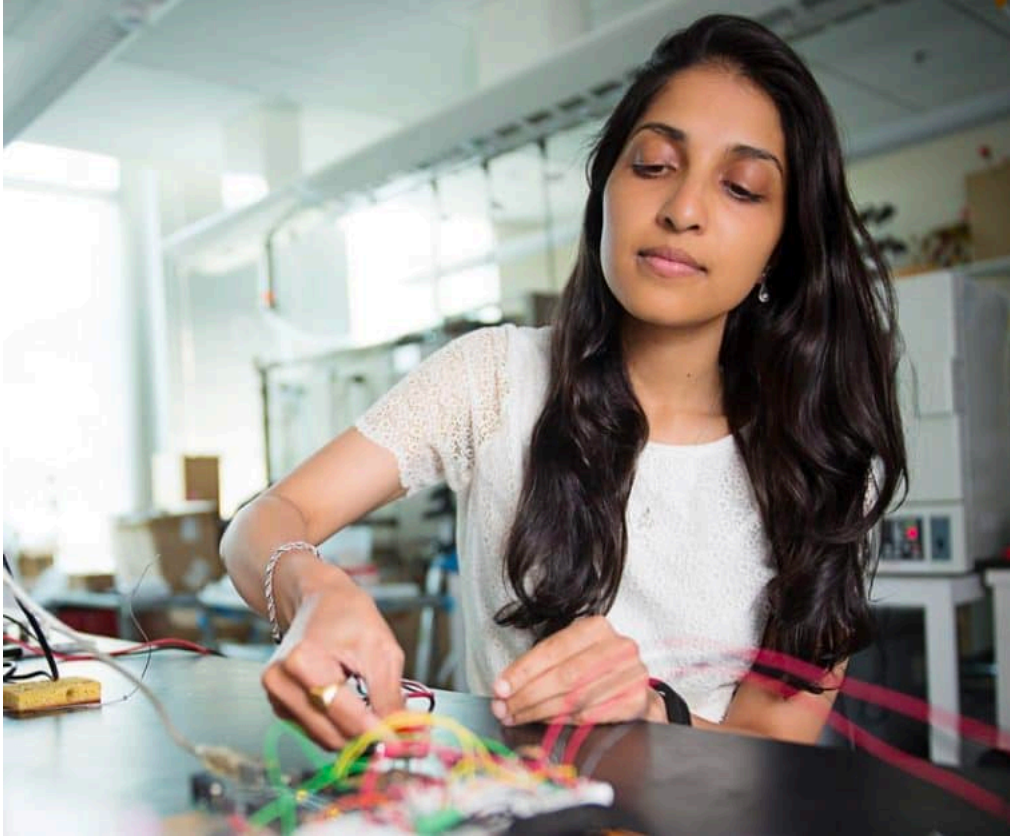
Live by your conscience and trust your instincts

Don't be afraid to change and adapt!

Encouraging young people: real world example



Empowering young women: real world example



WiSDM

Women in STEM Database at MIT

- [Mission](#)
- [Search For Speakers](#)
- [Join The Database](#)
- [Newsletter Sign-Up](#)
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[Login using Touchstone](#)

The Women in STEM Database at MIT (WiSDM) is an initiative designed to promote the visibility of women in our academic community. The goal of WiSDM is to provide a curated searchable online database of MIT women, making it easier to find talented and diverse speakers for conference talks, panels, news stories, and outreach events.


WiSDM includes MIT faculty, postdocs, research staff, and graduate students from all STEM fields. In addition to including each listed speaker's areas of technical expertise, the database also includes information about non-technical expertise, ranging from science policy to entrepreneurship to outreach. WiSDM's searchable database makes it easy to find qualified and talented speakers for your event.

Stay up to date by [signing up for our newsletter](#) and searching our regularly updated database.

Why use WiSDM? We believe that the best conversations are sparked by diverse voices, and we want to make those voices easy to find. [Search WiSDM](#) to find speakers for your next event!

Why be listed in WiSDM? Speaking opportunities are an incredibly effective way to engage with your academic community, and contribute to your professional advancement. Make your voice, your story, and your perspective a part of the conversation by [joining WiSDM](#) today.

Don't see someone who should be listed? [Contact us](#) and we will invite them to join the database.



MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Takeaways for training the next (diverse) generation

Identify the real-world impact of every basic scientific or mathematic concept

Especially important to find a range of relevant examples that connect with diverse audiences

Provide examples of role models and invite them into the classroom

Virtual or in person lunch with a scientist (WiSDM, 500 Women in Science, etc.)

Fight the stereotype of the “lone scientist” and incorporate ways to acknowledge the unique contributions of each group member

Include discussions of ethics, regulatory, and funding frameworks – innovation is a team sport!

Read science news articles and talk about the importance of not overstating the conclusions of a research study

Split the classroom into a “news article” group and a “research article” group and compare conclusions

Acknowledgements

Mom, Dad, Granddad

Large bubble of incredibly supportive friends in and out of STEM

Fantastic mentors and role models

Great teachers throughout the years: Mr. Harrison, Prof. Bonassar, Prof. Bashir, Prof. Langer

Academic, professional, financial support for women in STEM

Preparing all learners for the future of work:

How I learned to build with biology

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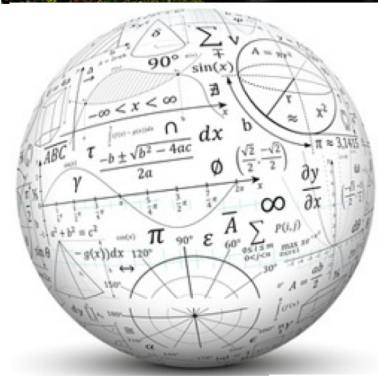
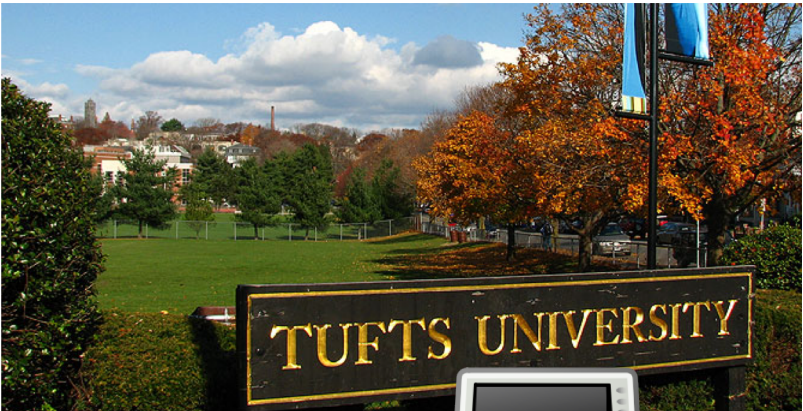
Creation over Preparation in CS Education

Emily Reid

@emilyerinreid
@ai-4-all
ai-4-all.org

Images via Wikimedia
Commons & Emily Reid
unless otherwise noted

Where I'm Coming From



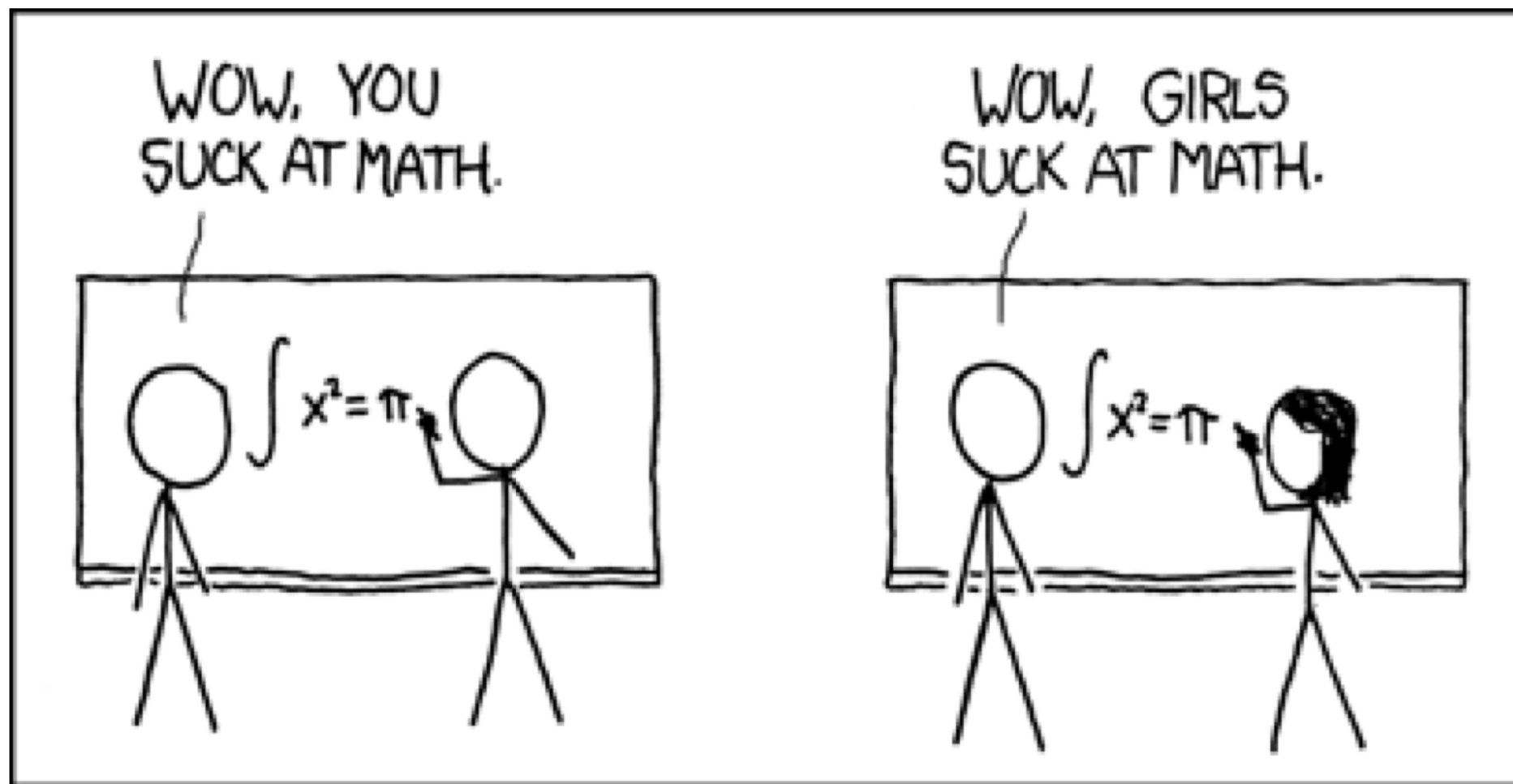
- Science
- Technology
- Engineering
- Mathematics



EdLab

MITRE

Gerald



The Students Who Changed My Life




```
6 </script type="text/javascript" src="http://tfcrc.cs.fiu.edu/api/v5.0/default.aspx"></script>
7 </body>
8 <h1>Lesson 1 - Hello World</h1>
9 <div id="mapContainer0" style="width: 640px; height: 400px;"></div>
10 <script language="javascript" type="text/javascript">
11 | var map0 = new TMap(mapContainer0, 25.75869, -80.37388, 15, "", 1, true, "", "hybrid");
12 </script>
13 </body>
14 </html>
15 <html xmlns="http://www.w3.org/1999/xhtml">
16 <head>
17 <title>Lesson17:To create a map at a specific street address using geocoding service</title>
18 <script type="text/javascript" src="http://tfcrc.cs.fiu.edu/api/v5.0/default.aspx"></script>
19 </head>
20 <body>
21 <h1> Type to search for address </h1>
22 Address:
23 <input id="Text_Street" type="text" value="11200 S.W. 8th Street Miami FL 33199" />
24 <input id="Button_Goto" type="button" value=" Go " onclick="return Button_Goto_onclick()" />
25 <br><br>
26 <div id="mapContainer0" style="width: 550px; height: 420px; margin-right:100px; float:left"></div>
27 <script type="text/javascript">
28 | var map0 = new TMap(mapContainer0, 25.760807274063, -80.376427038444, 17, MapLoaded, 1,true, "", "hybrid");
29 | function MapLoaded() {
30 | | map0.SetPanelVisibility("FLY", "SHOW");
31 | | map0.SetPanelVisibility("ZOOM", "SHOW");
32 | | map0.SetPanelVisibility("OVERVIEW", "SHOW");
33 | }
34 |
35 | function Button_Goto_onclick(){
36 | | var address = Text_Street.value;
37 | | TGetLatLonByAddress(address, geoCode);
38 | }
39 |
40 | function geoCode(Lat, Lon){
41 | | if ( Lat == 0.0 || Lon == 0.0 ){
42 | | | alert("Could not find the location!");
43 | | }
44 | | else {
45 | | | map0.PanTo(Lat, Lon);
46 | | }
47 | }
48 </script>
49 </body>
50 </html>
51 <html xmlns="http://www.w3.org/1999/xhtml">
52 <head>
53 <title>Lesson 11 - Add layers and markers to the map</title>
54 <script type="text/javascript" src="http://tfcrc.cs.fiu.edu/api/v5.0/default.aspx"></script>
55 </head>
56 <body>
57 <h1></h1>
58 <div id="mapContainer" style="width: 640px; height: 400px;"></div>
59 <script type="text/javascript">
60 | var map0 = new TMap(mapContainer, 25.7599256665386, -80.3738769902151, 15, mapLoaded, 1, true, "", "hybrid");
61 | function mapLoaded() {
```

♥ 14 likes



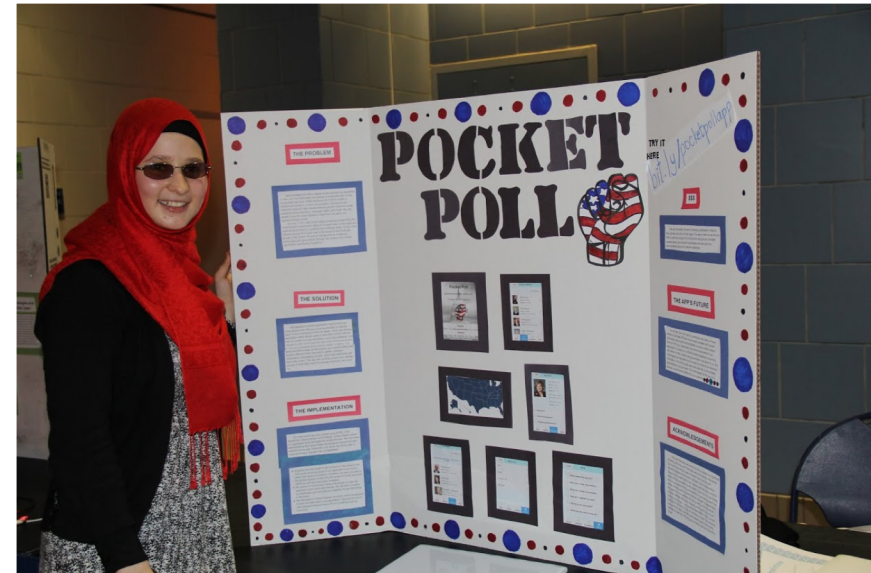
This is how I spent my summer vacation and it's awesome!

Computer Science Education/D&I Work




What Has Worked in my Experience

1. Belief in every student's capability to learn, **create**, and **influence**
2. Connecting to what students already care about
3. Building community
4. Understanding the value of role models & mentors
5. Growth mindset approach (vs. a “weed-out”-style course)
6. Emphasis on “**future-proof**” skills:
 - Computational thinking
 - Communication
 - Creativity
 - Leadership
7. **Project-based learning**




We Could Be Doing Better

Two Petty Theft Arrests



VERNON PRATER

LOW RISK 3



BRISHA BORDEN

HIGH RISK 8

Borden was rated high risk for future crime after she and a friend took a kid's bike and scooter that were sitting outside. She did not reoffend.

Two Petty Theft Arrests

VERNON PRATER

Prior Offenses
2 armed robberies, 1 attempted armed robbery

Subsequent Offenses
1 grand theft

LOW RISK 3

BRISHA BORDEN


Prior Offenses
4 juvenile misdemeanors

Subsequent Offenses
None

HIGH RISK 8

Borden was rated high risk for future crime after she and a friend took a kid's bike and scooter that were sitting outside. She did not reoffend.

<https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing>



[My Network](#) [Jobs](#) [Interests](#)

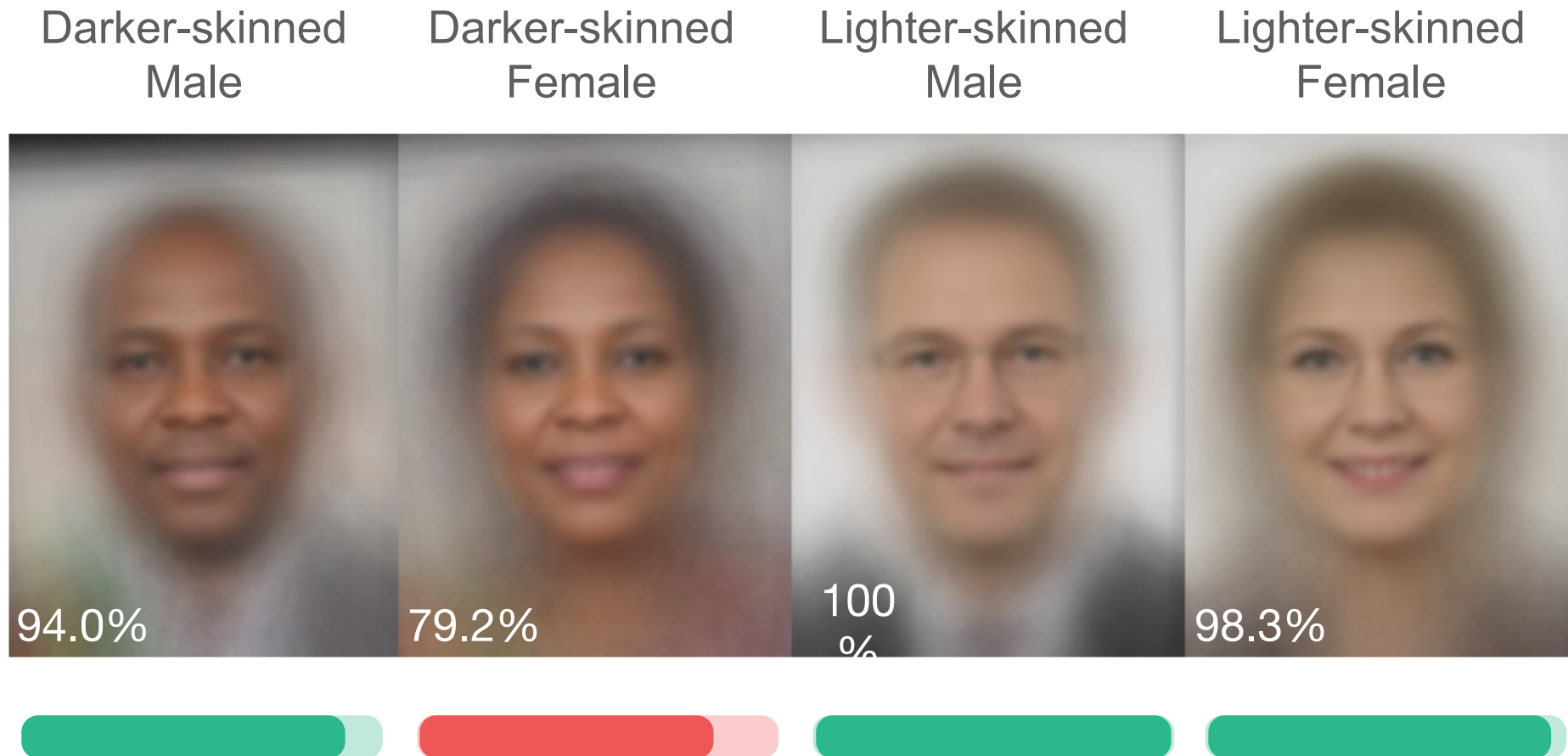
2,513 results for stephanie williams

Did you mean [stephen williams](#)?

Some search results have been filtered to improve relevance.
[Show all results](#)

<https://www.seattletimes.com/business/microsoft/how-linkedin-search-engine-may-reflect-a-bias/>

One Example: Bias in Facial Recognition



Social Impact Opportunity



Water

AI can help model global water supply to better respond to clean water shortages.



Agriculture

AI can help monitor the health of farms, in turn helping farmers to better address looming food shortages.



Climate Change

AI can help accurately model climate change to help communities respond.



Biodiversity

AI can help detect and monitor biodiversity and predict the spread of disease.

Economic Opportunity

2.3 Million Jobs

Projected AI Job Growth, compared
to 1.8 Million Jobs Replaced by AI by
2020

Gartner, 2017

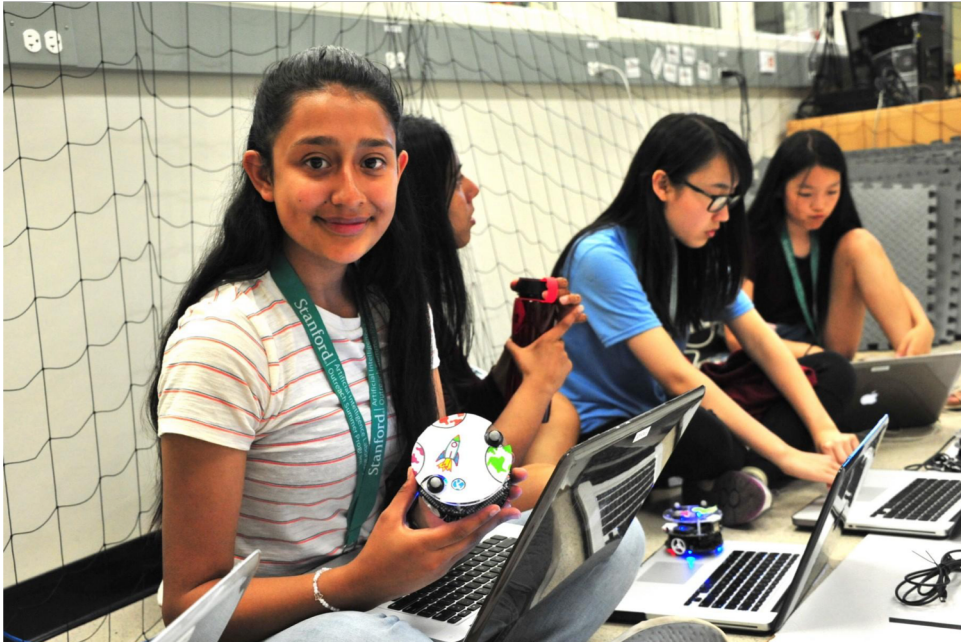
~\$500B

Projected new value for tech industry
that will result from improving diversity

*Intel, Decoding Diversity,
2016*

Student Examples: Akka Creativity Team

Student Examples: Stephanie



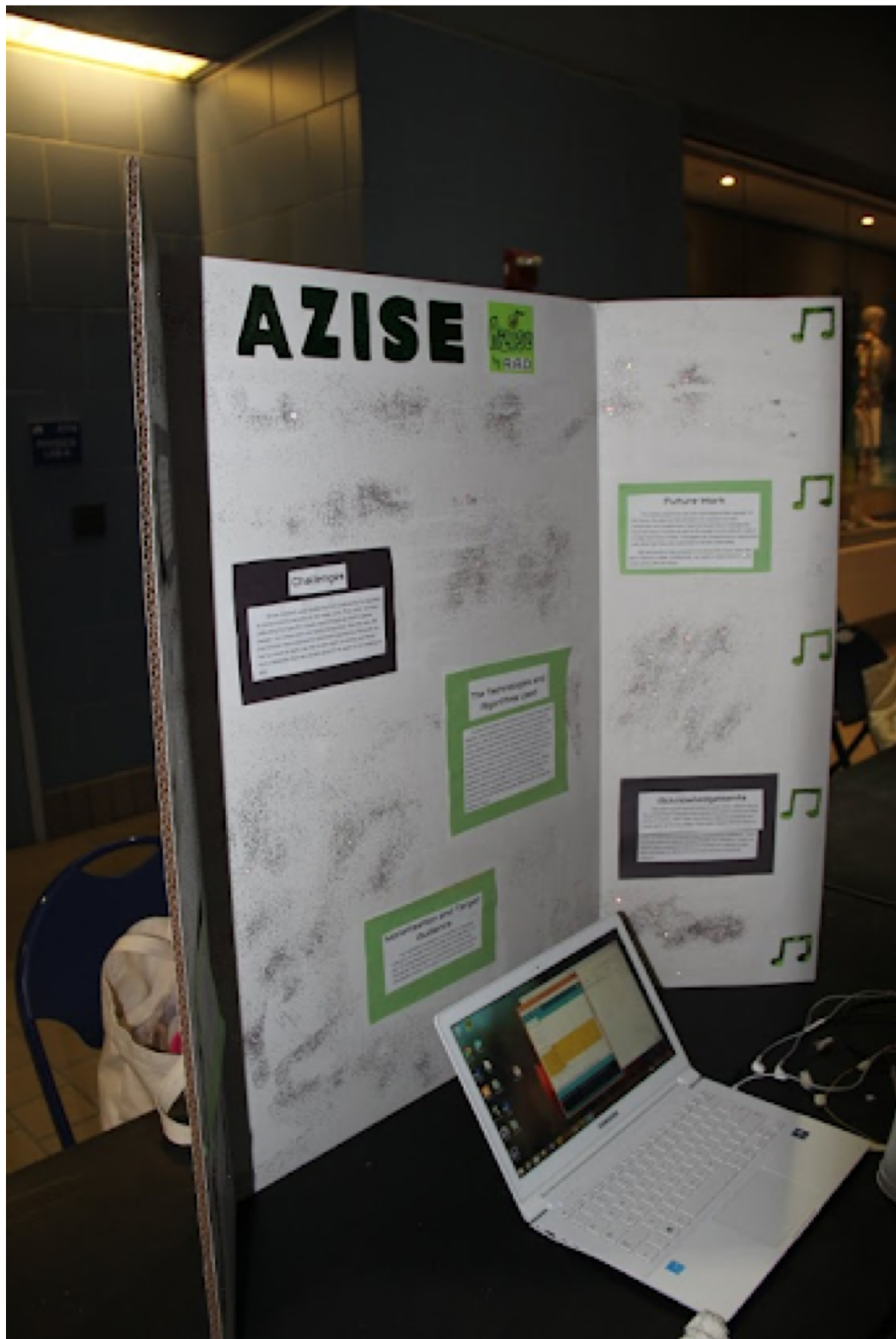
Stephanie is researching AI solutions for predicting the flow of contaminated water and created an AI club at her high school.

For every student that goes through our programs, they educate 14 more.

Sparking interest is not enough.

**We need to let students know they can create our future using
technology.**

They are active participants.



Message to students: Computer science is a **tool** to **solve problems** you care about.

WE CAN CODE IT!

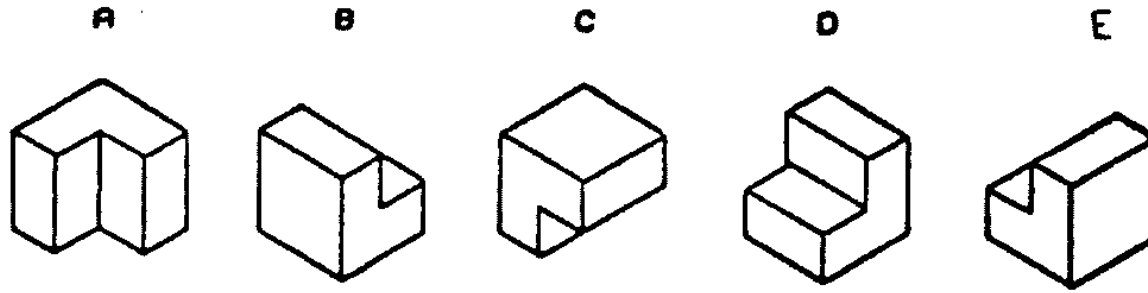
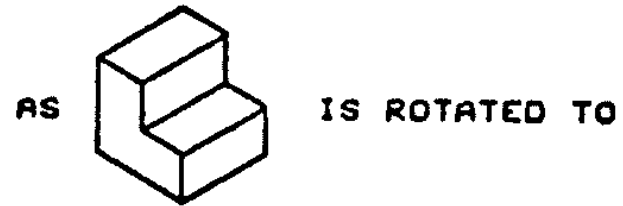
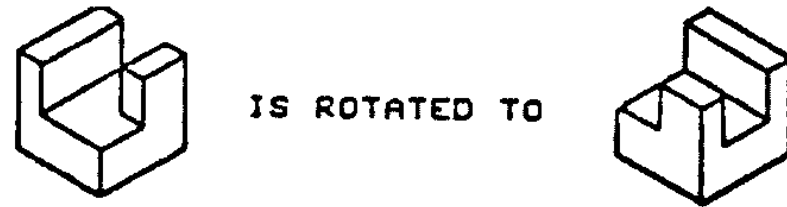


@emilyerinreid
@ai-4-all
ai-4-all.org



Gateway to STEM: Improving 3-D Spatial Skills

What are spatial skills?



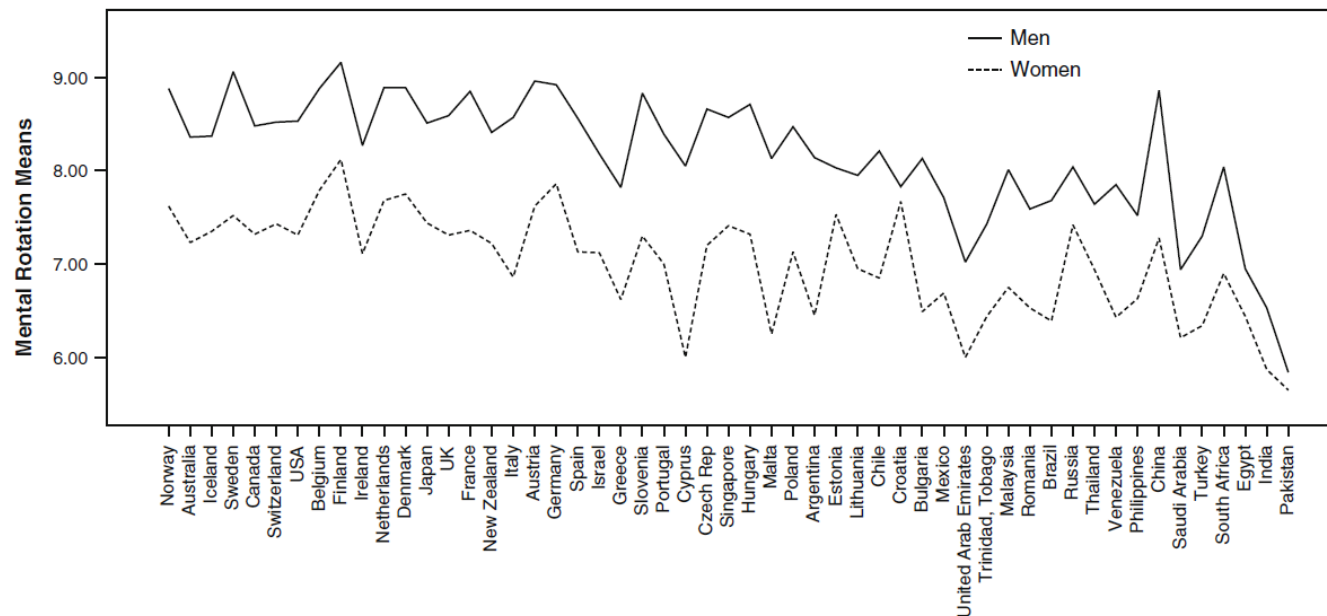
Longitudinal Study

- Followed 400,000 students over a 30 year period
- A child's spatial skills level is a better predictor of STEM attainment than is their math skill level

Wai, Lubinski, & Benbow, 2009

Who is at risk of poor spatial skills development?

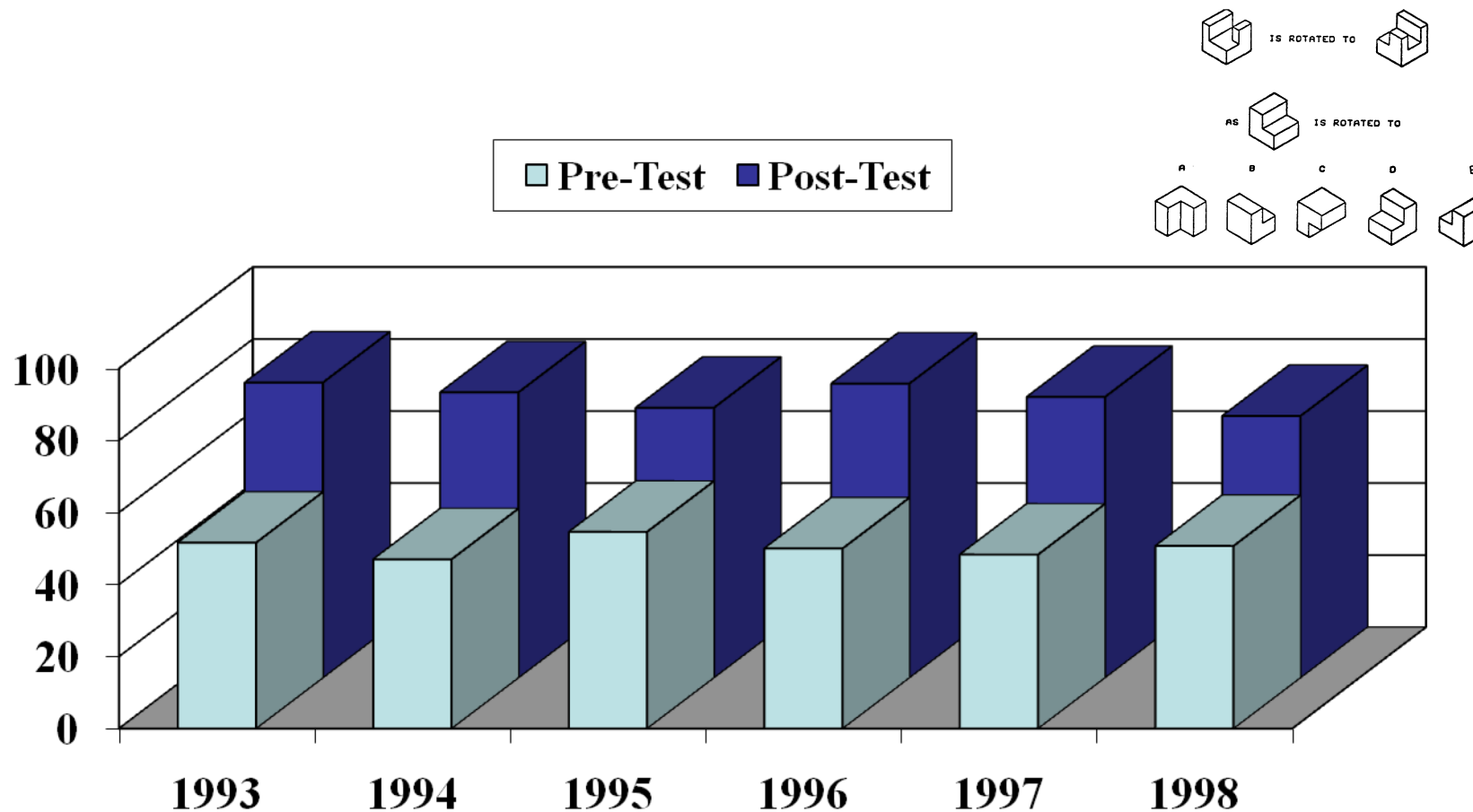
- Girls/women
- Students from low SES backgrounds



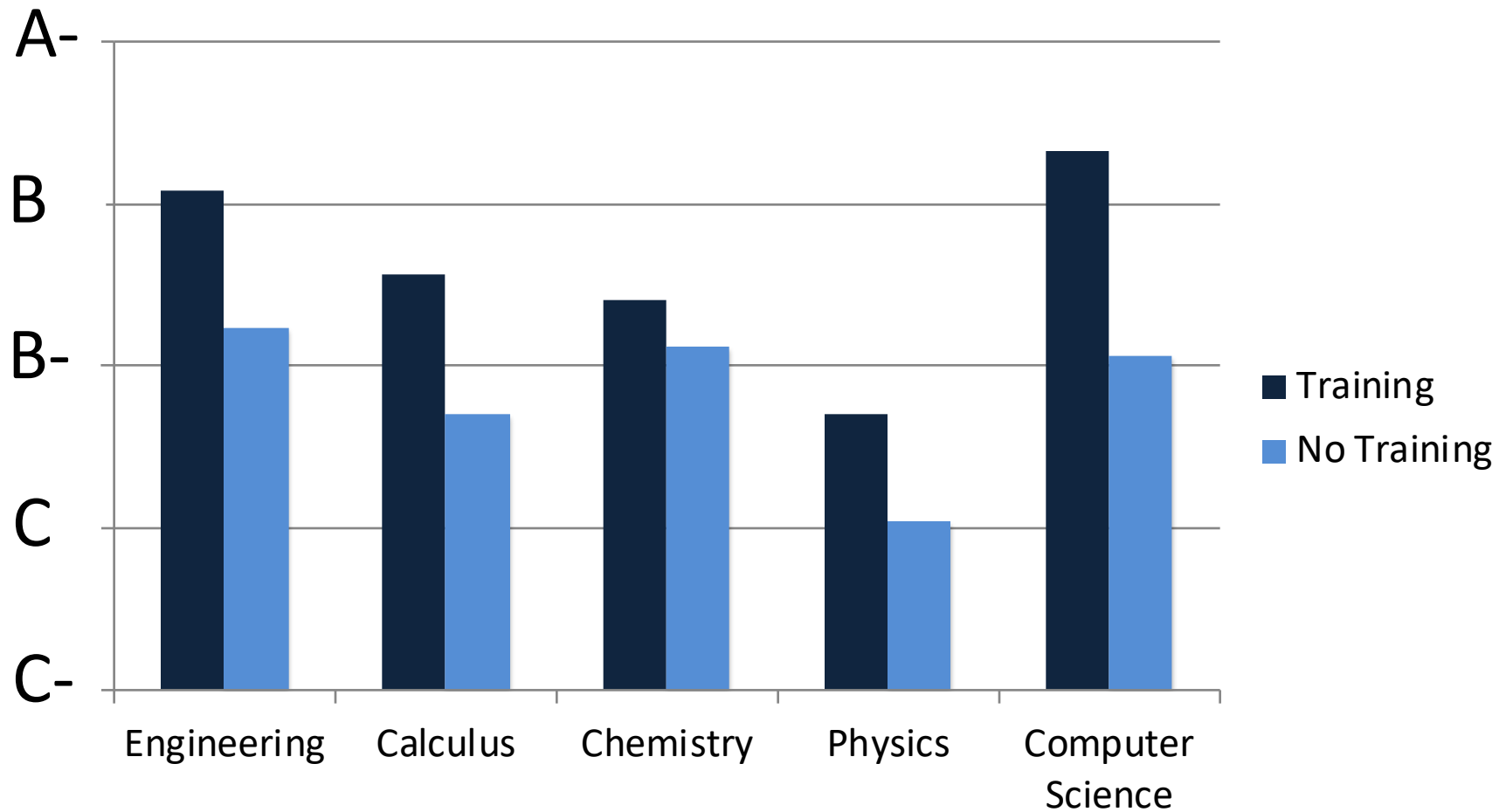
Lippa,
Collaer, &
Peters
(2009)

Spatial Skills can be learned!

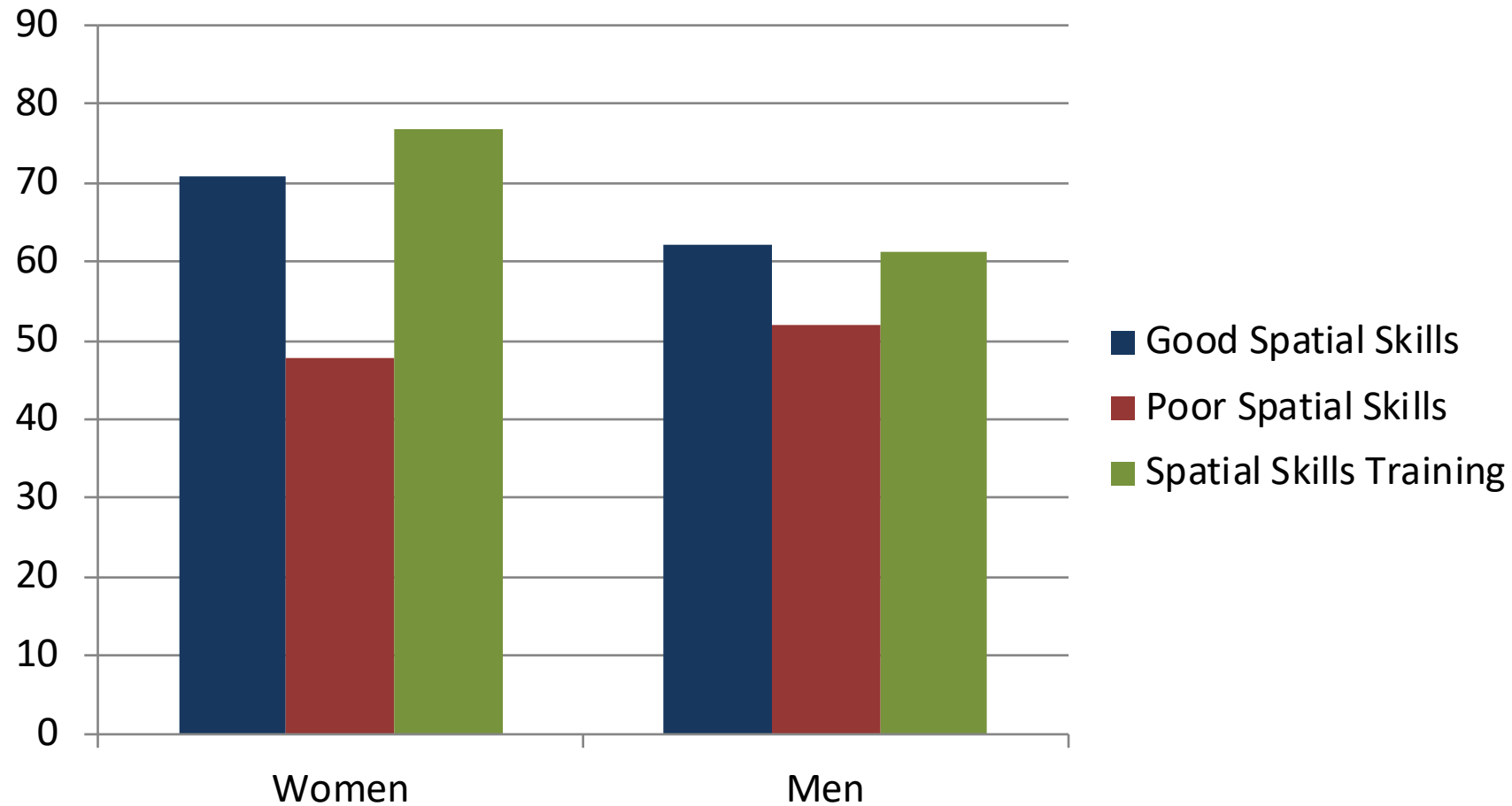
Spatial skills improved



Grades in STEM Courses Improved



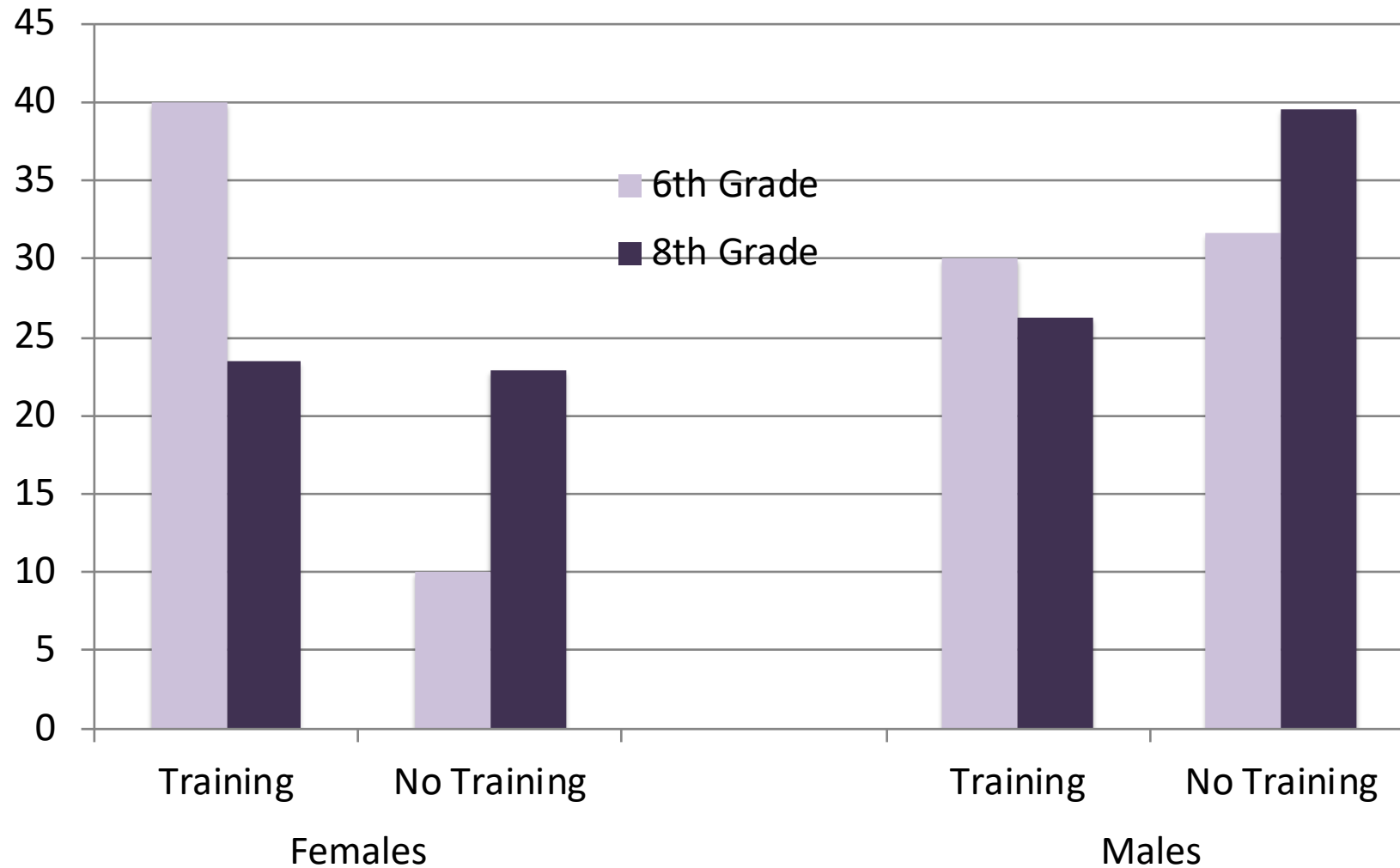
More Students Graduated from Engineering



Current Projects

- Impact of spatial skills training on performance in:
 - Computer Science
 - Mathematics
 - Others.....

Fewer students scored “Unsatisfactory” on state math assessment



Computer Science

- Summer Camp for rising senior girls
 - Intervention helped girls from low SES groups learn to code
- First-year CS at the university level
 - Intervention helped students learn to code
 - Improved attitude about CS

Teacher Quote:

Students love the blend of using software to watch visualizations of different types of transformations, modeling with snap cubes, and the change of pace of conversation with their peers about mathematics.

Teaching spatial skills has allowed some of my students, who struggle with traditional numeric operation and algebraic mathematics, to really shine and lead their peers. Several of my "struggling students" have taken leadership roles during these lessons; teaching their classmates, walking their peers through problems, and explaining what they are able to visualize.

Conclusions

- Well-developed spatial skills are a key to success in STEM fields
- Spatial skills training has a positive impact on STEM performance
 - Especially for women and girls

Acknowledgement

- The research reported here has been supported through various grants over the years:
 - Current:
 - USED IES Award #R305A17640-17A
 - NSF DUE-1818758
 - Prior Awards from NSF
 - DUE-9254207
 - DUE-9752660
 - HRD-0429020
 - HRD-1159252
 - DUE-1407123