STEM, Equity, & Access: Why, Who, and How

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Agenda

1. Introductions

2. What are we talking about?

3. Why do we focus on STEM?

4. Who is missing from STEM classrooms and industry?

5. How to we begin to move the needle?
Introductions

**Elizabeth Wallner**

Elizabeth has been working with the CA Perkins JSPAC for 17 years. She has a passion for ensuring the access and opportunities for each student in the community college CTE programs and beyond.

Elizabeth is a graduate of Cosumnes River College and CSU, Sacramento. She has a BA in Liberal Studies, a minor in women’s studies, and a MA (ABT) in Public Policy. She is a proud single mother of one CCC student.

**Tonette Salter**

Tonette, is a seasoned grant manager with emphasis on developing educational programs. She has lead faculty from K-14 in developing a region wide education plan to address students in ESL, Short Term CTE, and Adult with Disabilities. Tonette is pretty clever at finding ways to achieve what may seem impossible. Her ingenuity comes from a creative spirit and her credence to Listen – Learn – Connect - Implement – Achieve. She is an advocate for teachers and knows first-hand that teachers have the ability to see the effectiveness or inefficiencies of education and are vital players in educational reform.
Audience Introductions

- A = K-12
- B = Adult Ed.
- C = Community College
- D = Other
Audience Introductions

A. = Teacher
B. = Counselor
C. = Administration
D. = Student Services
E. = Program Coordinator/Other
STEM → STEAM → STEMM → STREAM

- **A** = Art and Design
- **M** = Music
- **R** = Reading
  - Apple
  - Media
  - Web design
  - Software design and applications
Definition
• STEM = Science, Technology, Engineering, and Math
• Skills & knowledge in each discipline are essential for student success
• STEM is an interdisciplinary and applied approach
• Coupled with hands-on, problem-based learning.

STEM Literacy
• Innovator and critical thinker
• Meaningful connections between school, community, work, & global issues.
Other STEM Initiatives

- CA Dept. of Ed.’s STEM Taskforce -- [http://www.cde.ca.gov/eo/in/stemtf.asp](http://www.cde.ca.gov/eo/in/stemtf.asp)
- STEM to STEAM -- [http://stemtosteam.org/](http://stemtosteam.org/)
Economic Need

- Do we need more STEM students or employees?
- What occupations are growing? Which STEM Fields?

- Many lists and resources
  - CA LMI
    - All but a few occupations earning at least $25,000 and having the greatest numerical growth in 2012 – 2020 are in STEM/CTE


<table>
<thead>
<tr>
<th>Data</th>
<th>Computer</th>
<th>Finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific</td>
<td>Engineering</td>
<td>Management</td>
</tr>
<tr>
<td>Research</td>
<td>Veterinarians</td>
<td>Entrepreneurship</td>
</tr>
<tr>
<td>Counseling</td>
<td>Environmental and Conservation Science</td>
<td></td>
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</tbody>
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Shortage or NO shortage?

- Domestic v. Guest Workers
- Women
- Other under-represented students

Previous STEM studies have neglected the many blue collar and technical jobs that require considerable STEM knowledge. But this study finds that

50% of STEM jobs do not require a bachelor’s degree. As a result, STEM knowledge plays a much larger role in our economy than previously thought:

There are 26 million STEM jobs in the U.S.

STEM jobs comprise 20% of all U.S. jobs.

The share of jobs requiring STEM knowledge has doubled since the Industrial Revolution.

http://www.fastcoexist.com/1682246/this-is-what-stem-jobs-really-look-like#1
<table>
<thead>
<tr>
<th>Occupation</th>
<th># of jobs</th>
<th>avg. wages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineers</td>
<td>16,590</td>
<td>$88,360</td>
</tr>
<tr>
<td>Chemical Engineers</td>
<td>27,860</td>
<td>$99,440</td>
</tr>
<tr>
<td>Biochemists and Biophysicists</td>
<td>25,160</td>
<td>$87,640</td>
</tr>
<tr>
<td>Engineers, All Other</td>
<td>125,590</td>
<td>$92,260</td>
</tr>
<tr>
<td>Nuclear Engineers</td>
<td>18,430</td>
<td>$105,160</td>
</tr>
<tr>
<td>Agricultural Engineers</td>
<td>2,650</td>
<td>$78,400</td>
</tr>
<tr>
<td>Materials Scientists</td>
<td>7,900</td>
<td>$86,600</td>
</tr>
<tr>
<td>Engineering Teachers</td>
<td>33,660</td>
<td>$97,260</td>
</tr>
<tr>
<td>Hydrologists</td>
<td>6,960</td>
<td>$79,070</td>
</tr>
<tr>
<td>Materials Engineers</td>
<td>22,160</td>
<td>$86,790</td>
</tr>
</tbody>
</table>

Most common STEM occupations requiring less than an Associate’s Degree

<table>
<thead>
<tr>
<th>Occupation</th>
<th># of jobs</th>
<th>avg. wages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered Nurses</td>
<td>2,724,570</td>
<td>$69,110</td>
</tr>
<tr>
<td>Auto Techs and Mechanics</td>
<td>589,570</td>
<td>$38,560</td>
</tr>
<tr>
<td>Carpenters</td>
<td>578,910</td>
<td>$44,330</td>
</tr>
<tr>
<td>Supervisors of Prod. &amp; Ops. Workers</td>
<td>559,350</td>
<td>$56,890</td>
</tr>
<tr>
<td>Electricians</td>
<td>512,290</td>
<td>$52,910</td>
</tr>
<tr>
<td>Computer Systems Analysts</td>
<td>487,740</td>
<td>$82,320</td>
</tr>
<tr>
<td>Supervisors of Mechanics, etc.</td>
<td>418,530</td>
<td>$62,190</td>
</tr>
<tr>
<td>Machinists</td>
<td>368,510</td>
<td>$40,520</td>
</tr>
<tr>
<td>Plumbers, Pipefitters, Steamfitters</td>
<td>349,320</td>
<td>$51,830</td>
</tr>
<tr>
<td>Welders, Cutters, Solderers, Brazers</td>
<td>316,290</td>
<td>$37,920</td>
</tr>
</tbody>
</table>
Share of workers in STEM Occupations, 100 largest metro areas

- Seattle -- 25.9%
- San Jose -- 33.2%
- Detroit -- 22.9%
- D.C. -- 27.1%
- Palm Bay -- 26.7%
- Houston -- 22.8%
Metro areas with higher STEM knowledge have stronger economies

Workers not only do better economically when they work in STEM fields, but the overall economy appears to benefit as well.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Top</th>
<th>Second</th>
<th>Third</th>
<th>Bottom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patents per million residents, 2011</td>
<td>1.27</td>
<td>0.72</td>
<td>0.48</td>
<td>0.37</td>
</tr>
<tr>
<td>Unemployment rate, 2011</td>
<td>8.3%</td>
<td>9.0</td>
<td>9.9</td>
<td>10.3</td>
</tr>
<tr>
<td>Median household income, 2011</td>
<td>$58,482</td>
<td>54,005</td>
<td>46,575</td>
<td>44,184</td>
</tr>
<tr>
<td>Exports as share of GDP, 2011</td>
<td>10.8%</td>
<td>8.9</td>
<td>8.5</td>
<td>7.4</td>
</tr>
<tr>
<td>Employment growth rate, 2008-2012</td>
<td>-2.8%</td>
<td>-3.7</td>
<td>-5.4</td>
<td>-5.2</td>
</tr>
<tr>
<td>Tech. sector employment share, 2011</td>
<td>6.2%</td>
<td>4.4</td>
<td>3.0</td>
<td>2.3</td>
</tr>
</tbody>
</table>
Who is missing from STEM?

- Women
- Blacks/African Americans
- Hispanics/ESL
- (dis)Abled
- Low SES
Q: African Americans, American Indians, and Latinos comprise 34% of the US population and only ____ of undergrad degrees in engineering.¹

A: 

Q: Women account for one-half of the US workforce but only ____ of US engineers?¹

A: 

Number of persons by gender 25-24 with BA+, 2011

Number of persons by race, 25-24 with BA+, 2011

How do we begin to Improve?

• No Silver Bullet!

• Most effective schools = equity is integrated seamlessly into the community, curriculum, and programs.

• Environmental Scan

• Micromessages

• Root Causes & Strategies
Environmental Scan

• Why?

• When?

• How?
  • National Alliance for Partnerships in Equity (www.napequity.org)

We can't solve problems by using the same kind of thinking we used when we created them.

Albert Einstein
German Theoretical-Physicist (1879-1955)
Micromessages

“...apparently small events which are often ephemeral and hard to prove, events which are covert, often unintentional, frequently unrecognized by the perpetrator...”  
Mary Rowe, MIT

- Micro-inequities v. Micro-affirmations
- Micro-disadvantages and micro-advantages
- Intent v. Impact

Mircomessaging To Reach and Teach Every Student
- [http://www.napequity.org/professional-development/teacher-training/](http://www.napequity.org/professional-development/teacher-training/)

Mary Rowe, MIT

Stephen Young -- [MicroMessaging: Why Great Leadership is Beyond Words](http://www.napequity.org/professional-development/teacher-training/)
Career/Occupational Information

- **Materials, practices**
  - Professional Development for Counselors
    - Project Implicit
      - [https://implicit.harvard.edu/implicit/takeatest.html](https://implicit.harvard.edu/implicit/takeatest.html)
    - JSPAC e-Seminar: *Improving STEM and NT Career Advising*
      - [http://jspac.org/training-e-seminars#Advising](http://jspac.org/training-e-seminars#Advising)
  - Comprehensive characteristics & benefits of **STEM** and/or **NT**
  - STEM focused materials
- Early Counseling Intervention
Family Characteristics

• I cannot be what I cannot see

• Love or hate parents career?

• Other influences on student decisions

• Perceived barriers and rewards from a career choice


Internal/Individual

Self-Efficacy
• The ability to see oneself as being successful in a career

Attribution Theory
• The way in which a student attributes success and failure
• Bernard Weiner
  • Internal v External
  • Stable v. Unstable

What does this look like in your classroom?
Are the students “correct” in their attributions?
How does this relate to STEM education?

http://www.education.com/reference/article/attribution-theory/
Stereotype Threat

“Refers to being at risk of confirming, as self-characteristic, a negative stereotype about one's group”
Claude Steele, Whistling Vivaldi

- Leads to self-handicapping strategies
- Leads students to choose different careers
- To Reduce:
  - Reframe Role Models Critical Mass
  - Deemphasize Incremental intelligence “You’re from Stanford!”
  - Encourage self Affirmation External Attributes for difficulty “Passing”
  - Emphasize high standards & the belief that one can meet them!

http://reducingstereotypethreat.org/reduce.html
http://www.npr.org/player/v2/mediaPlayer.html?action=1&t=1&islist=false&id=125859207&m=125859195
**Mindset**

By: Carole Dweke, Stanford

**Fixed mindset** people believe their basic qualities, like their intelligence or talent, are simply fixed traits.

**Growth mindset** people believe that their most basic abilities can be developed through dedication and hard work—brains and talent are just the starting point.
Resources

• CA Perkins Joint Special Populations Advisory Committee
  • [www.jspac.org](http://www.jspac.org)

• National Alliance for Partnerships in Equity
  • [www.napequity.org](http://www.napequity.org)
  • [www.stemequitypipeline.org](http://www.stemequitypipeline.org)

• CA Stem Learning Network

• NSF.GOV

• Map of Regional STEAM effort

• IWITTS -- [www.iwitts.org](http://www.iwitts.org)
Research Studies Mentioned

• Male biology students consistently underestimate female peers, study finds – Feb 11, 2016

• Reducing Stereotype Threat
  • www.reducingstereotypethreat.org
JSPAC Conference 2016

Save the date!

• December 1-2, 2016
  • November 30 – preconference

• Additional details to be posted to www.JSPAC.org ASAP
• Questions

• Reflections

• Evaluations
Thank you!