Who gets to be a “Smart Science Student” in your Classroom?
Our Session Agenda

1. Our experiences: feeling [smart/not smart] in Science ... 

2. U.S. STEM student outcomes: How do we know that these aren’t currently equitable? 

3. Identity: What is identity? How does it help us make sense of and improve outcomes? 

4. Teachers: What can we do to help all students access “Smart Science Student” identities? 

5. Personal Next Steps & Resources
1. Our experiences

When have you (or friends/peers/students) felt *not smart* in science?

What impact did feeling *not smart* have?
2. U.S. STEM student outcomes

Connecting our experiences to U.S. national data

Explaining differences
The U.S. population is changing
U.S. Adult Population by Race

- White women 31.0%
- White men 31.0%
- Hispanic men 8.7%
- Hispanic women 8.3%
- Black men 6.1%
- Black women 6.6%
- Asian men 2.7%
- Asian women 3.0%
- Other men 1.2%
- Other women 1.3%

*Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017*
U.S. Professional STEM Workforce

White men 49%
White women 18%
Asian men 14%
Asian women 7%
Black men 3%
Black women 2%
Hispanic men 4%
Hispanic women 2%
Other men 1%
Other women 1%

Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017
Women in Science Occupations

Percentage of Employed STEM Professionals Who Are Women, Selected Professions, 2008

<table>
<thead>
<tr>
<th>Profession</th>
<th>Percentage of Women</th>
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<tbody>
<tr>
<td>Biological scientists</td>
<td>54%</td>
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<tr>
<td>Chemists and materials scientists</td>
<td>32%</td>
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<tr>
<td>Environmental scientists and geoscientists</td>
<td>27%</td>
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<tr>
<td>Computer scientists and systems analysts</td>
<td>25%</td>
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<tr>
<td>Computer programmers</td>
<td>23%</td>
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<tr>
<td>Computer software engineers</td>
<td>19%</td>
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<tr>
<td>Chemical engineers</td>
<td>13%</td>
</tr>
<tr>
<td>Civil engineers</td>
<td>10%</td>
</tr>
<tr>
<td>Electrical and electronics engineers</td>
<td>7%</td>
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<tr>
<td>Mechanical engineers</td>
<td>6%</td>
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(not) Explaining Differences: AAUW’s Why So Few?

Figure 1. High School Credits Earned in Mathematics and Science, by Gender, 1990–2005

Figure 2. Grade Point Average in High School Mathematics and Science (Combined), by Gender, 1990–2005

So ... Why So Few?

- Historical & structural inequities impact marginalized communities
  - gaps in “opportunities to learn”
  - material/instructional resources + qualified educators
- Societal narratives of “not as good as” or “just not interested”
  - 24% of boys vs. 5% of girls interested in engineering
  - 74% of boys vs. 32% of girls believe computer science/computing is a good college major

American Association of University Women, 2010
3. Identity

• Identity = self-understanding
• but ... we construct our identities
  • from available social resources/categories (narratives)
  • within particular settings
  • alongside membership in cultural groups that provide/remove possibilities
• therefore, our own identities are not (actually) entirely up to us

Nakkula & Toshalis, 2006; Nasir, 2012
Learning & Identity

- **Learning** = changes in how we understand, solve problems, and participate in activities
- **Identity** = sense of self

Intertwined, but different
- both cultural and social processes, linked to contexts in which they occur
- students can achieve/perform [math], but don’t see themselves as “[math] people”

Nasir, 2012
Practice-linked identities

We can learn and develop identities when we engage in practices

[basketball, math] mistakes aren’t in opposition to an identity of competence

Professional “Heterogeneity of Practice”

there is no singular “right way” to practice (do) science.

Nasir, 2012; Rosebery & Warren, 2008
Within learning settings, available resources can support (or constrain) a student’s connection to a practice & his/her/their identity development

1. Material resources
   • physical environment, its organization, and the artifacts in it

2. Relational resources
   • positive relationships with others

3. Ideational resources
   • ideas about oneself & about what is valued/good

Nasir, 2012
new, national vision for science teaching & learning

Next Generation Science Standards

Problem-based, project-based, phenomena-based approaches

classroom community goal of “figuring out” defines important contributions from students
4. Teachers

What can teachers do to help all students find “Smart Science Student” identities compelling and accessible?
Who gets to be a “Smart Science Student”? 
Mrs. Sparrow & Ms. Wolfe

- no single “smart science student” identity
- locally constructed social roles in each classroom community
Mrs. Sparrow & Ms. Wolfe

- no single “smart science student” identity
- locally constructed social roles in each classroom community

Mrs. Sparrow’s classroom

- Know facts
- Answer the Teacher’s questions correctly
- Do science at home
Mrs. Sparrow & Ms. Wolfe

- no single “smart science student” identity
- locally constructed social roles in each classroom community

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<tr>
<th>Mrs. Sparrow’s classroom</th>
<th>Ms. Wolfe’s classroom</th>
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<tbody>
<tr>
<td>– Know facts</td>
<td>– Ask good questions</td>
</tr>
<tr>
<td>– Answer the Teacher’s questions correctly</td>
<td>– Are good observers</td>
</tr>
<tr>
<td>– Do science at home</td>
<td>– Are good group members</td>
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<tr>
<td></td>
<td>– Keep trying when wrong</td>
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Our goal is to support ALL children in finding “Smart Science Student” identities compelling and accessible
5. Your Next Steps & Resources

“Creating a ‘We’ Culture” article & Self-Assessment Checklist (Carlone & Smithenry, 2014)

Identify your take-away’s:
What will you share with colleagues?
(A few) Suggested Resources

• Who Gets to be a Smart Science Student? VideoScribe: bit.ly/SmartScienceStudents

• Report (2010) by the American Association of University Women (AAUW):
  • *Why So Few? Women in Science, Technology, Engineering, and Mathematics (STEM):*
    https://www.aauw.org/research/why-so-few/

• Books on Student Identity:

• Resources from NSTA press: https://www.nsta.org/publications/press/

• *Carbon TIME MS/HS units and teacher resources: http://carbontime.bscs.org*
Thank you!

- Christie Morrison Thomas

-SCECH code: BIOLOGY

Coming up next at MSTA:
4:00-4:45 - Governor’s Room
• Pro-Tips for (free) NGSS-Aligned Carbon TIME units

8:00-8:45 Saturday – Governor’s Rm
• Promoting 3D Science T&L through NGSS-aligned Curricula and a Teacher Support System

10:00-10:45 Saturday – Banquet 6
• Engaging with Socioscientific Issues Through the Media

https://tinyurl.com/CarbonTIMEMEMSTA20