Teaching Strategy Dos and Don’ts for Increasing Diversity in STEM programs.

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Abstract (For reference)

Teaching Strategy Dos and Don’ts for Increasing Diversity in STEM programs.

Sometimes we think that challenges in increasing diversity in STEM are *only* a pipeline problem. This webinar will build upon the previous webinar to identify strategies for creating equitable and effective learning environments.
“Women are great collaborators”
Critical Listening Guide: Just Because You Always Hear It, Doesn't Mean It's True

Use this guide to help identify common misunderstandings that surface when people talk about how to increase the participation of women. Learn to spot “red flags” that indicate a particular discussion is headed in a direction that may not be research-based or effective.

View online.
What questions do you have?
Tailor your teaching with our Computer Science Teaching Tips!

Tips for Reducing Bias
- Make your expectations explicit to avoid unstated assumptions within your class.
- Grade anonymously to mitigate the effect of unconscious bias.
- Establish clear policies to ensure students are held to the same standards.
- Learn students’ names to enable you to engage all students equally.
- Acknowledge & manage your bias to mitigate and monitor the impact of your biases.
- Teach students about bias to educate your students and show you care.
- Listen to students’ experiences to learn how you can create a supportive environment.

Tips for Department Inclusivity
- Survey students regularly to identify institution-specific growth opportunities.
- Optimize the intro course to be welcoming regardless of CS exposure.
- Monitor performance patterns to identify structures or culture with differential impact.
- Support new pedagogies to improve students’ learning and experiences.
- Train faculty to respond to bias to address toxic culture in and out of the classroom.
- Foster student community to create effective peer mentoring programs.
- Show students the breadth of CS to engage beginning students with varied interests.

Tips for Lecturing
- Integrate active learning to increase students’ learning and engagement.
- Motivate lecture content to help students understand the relevance.
- Make learning goals explicit to help students identify what they understand.
- Encourage questions to have a chance to clarify unclear content.
- Require students to self-assess to help students identify what they understand.
- Ask students for feedback to adapt to their needs & show that you care.
- Explain your pedagogical moves to help students understand your teaching strategies.
Tips for Pair Programming

Below are the tip sheet and video about pair programming. If you'd like to print all the tip sheets together, you can do so here.

Video: Tips for Pair Programming

Printable Tip Sheet
## Browse All tips

<table>
<thead>
<tr>
<th>Search</th>
<th>Tags</th>
<th>Source</th>
<th>Sort by</th>
<th>Order</th>
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<table>
<thead>
<tr>
<th>Explain what counts as CS to help students realize that they are learning CS.</th>
<th>(5 Likes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volunteers: Defer to the teacher to be consistent with classroom norms.</td>
<td>(3 Likes)</td>
</tr>
<tr>
<td>Volunteers: Stay quiet during announcements to model respect for the teacher.</td>
<td>(3 Likes)</td>
</tr>
<tr>
<td>Move to students’ eye-level to connect with students as equals.</td>
<td>(2 Likes)</td>
</tr>
</tbody>
</table>
Emphasize that it’s never too late to get help.

Encourage students to ask questions about homework assignments in class because other students may have the same question.
“Men earn 82% of Bachelor's degrees in CS while women earn only 18%, and only 20% are Black/Latinx.”
“Low-income students and students of color are 12x less likely to have access to CS in their high schools.”
When you have a leaky pipe in your home, you don’t blame the water.
What questions do you have?
1

Make your expectations explicit

You’ll be graded based upon...

To get started you should...
Transparent Teaching

Make it explicit:
● What you want students to learn
● What students should do
● How you will grade students

Results (Winkelmes, 2015):
● 35 faculty applied this to two assignments in half
● 0.50-0.65 SD increase for 1st-gen, low-income, URMs
  ○ Academic confidence
  ○ Sense of belonging
  ○ Mastery of important skills
Grade anonymously

Put your name on the back of the exam.

Graders - don’t look at students’ names.
Unconscious Unintentional Bias

- 60 law firm partners evaluated flawed writing from:
  - Thomas Meyer, 3rd year associate, NYU Law School
  - Identified as either Caucasian or African American

<table>
<thead>
<tr>
<th></th>
<th>Caucasian</th>
<th>African American</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spelling/Grammar</td>
<td>41%</td>
<td>83%</td>
</tr>
<tr>
<td>Technical</td>
<td>68%</td>
<td>82%</td>
</tr>
<tr>
<td>Factual</td>
<td>64%</td>
<td>78%</td>
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</tbody>
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Unconscious Unintentional Bias

Caucasian
- “generally good writer but needs to work on…”
- “has potential”
- “good analytical skills”

African American
- “needs a lot of work”
- “can't believe he went to NYU”
- “average at best”

What would you say if... Your colleague says

“It is easier for Black and Latinx students to get jobs in tech.”

csteachingtips.org/tip-sheets
What questions do you have?
Establish clear policies

Everyone can use 3 late days.

The consequence for [X] is [Y].
Learn students names

I want to learn how to pronounce your name.

Thank you ___ for the question!
Acknowledge and manage your bias

I want to have a positive impact.

You have something racist in your teeth.

5

I want to have a positive impact.

You have something racist in your teeth.
https://youtu.be/MbdxeFcQtaU?t=458
Teach students about bias

Bias can impact our interactions and code!

Computer scientists need this knowledge
So you want to talk about race
Listen to students’ experiences

I’ll read more about this online

Thanks for sharing your experiences
What questions do you have?
Tips for Lecturing

CSTeachingTips.org/Tips-for-Lecturing

1. Integrate active learning to increase students’ learning and engagement.

Discuss the question with your partner.
Active Learning

Group problem solving (i.e., not *just* lecture)
● Have students try to apply what they learned in class

Results (Freeman et al., 2014)
● Reviewed 225 studies of STEM classrooms
● Students in lecture-only section
  ○ Had lower exams scores by 6% (0.64 SD)
  ○ Were 1.5 times more likely to fail
What questions do you have?
Tips for Encouraging Help Seeking

CSTeachingTips.org/Tips-for-Encouraging-Help-Seeking

1. Remind students about resources to set the expectations that everyone will need help.

I hope you’ll come to my office hours tomorrow at ...
“Even my professor told us that some people are just born that way, with that mental outlook that is compatible with CS… They feel it’s so easy for them… Yeah, and he told the rest of the people that some of you will try, but some of you won’t get it, and it’s just that your mental outlook isn’t made that way. It’s something you’re born with. You can’t help it.”

(Lewis, Yasuhara, & Anderson, 2011)
Believe students can learn

- 15,466 students (46.4% women; 89.1% White or Asian)
- Enrolled in 634 courses taught by 150 professors.

Canning, E. A., Muenks, K., Green, D. J. & Murphy, M.C. (2019) From: STEM faculty who believe ability is fixed have larger racial achievement gaps and inspire less student motivation in their classes. *Science Advances*. 5(2). DOI: 10.1126/sciadv.aau4734
Course evaluations

- How much did your instructor motivate you to do your best work?
- How much did the instructor emphasize learning & development?
- How likely would you be to recommend this course with this instructor?
- Compared to other courses you've taken, how much time did this course require?

** Fixed  Growth

* ns

**
A/A+ = 4.0
A− = 3.7
B+ = 3.3
B = 3.0
B− = 2.7
C+ = 2.3
C = 2.0
C− = 1.7
D+ = 1.3
D = 1.0
D− = 0.7
F = 0.0

STEM Course Grade

<table>
<thead>
<tr>
<th></th>
<th>Black, Hispanic, Native American</th>
<th>White, Asian</th>
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</thead>
<tbody>
<tr>
<td>Fixed Mindset</td>
<td>2.71</td>
<td>2.90</td>
</tr>
<tr>
<td>Growth Mindset</td>
<td>2.96</td>
<td>3.06</td>
</tr>
</tbody>
</table>

A/A+ = 4.0
A− = 3.7
B+ = 3.3
B = 3.0
B− = 2.7
C+ = 2.3
C = 2.0
C− = 1.7
D+ = 1.3
D = 1.0
D− = 0.7
F = 0.0
Believe Students Can Succeed

Tell students:
- You have high expectations for them
- You believe they can meet those expectations

Results (Steele, 2010)
- Telling students you believe in them can reduce stereotype threat.
What questions do you have?
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How important to you is it that your future career allows you to do each of the following?

**Communal Goals**

**Agentic Goals**
How important to you is it that your future career allows you to do each of the following?

Communal Goals

- Give back to my community
- Have a social impact
- Serve humanity
- Help others

Agentic Goals
How important to you is it that your future career allows you to do each of the following?

Communal Goals
- Give back to my community
- Have a social impact
- Serve humanity
- Help others

Agentic Goals
- Make a lot of money
- Work independently
- Make important decisions at work
- Become well-known in my field
Communal Goals

- Give back
- Social impact
- Serve humanity
- Help others

N = 5,821
Communal Goals

- Give back
- Social impact
- Serve humanity
- Help others
Goal-Congruuity Theory
   e.g., Diekman et al. (2017)

Predicting
   • Interest in STEM

Examining patterns by
   • Gender
Goal-Congruuity Theory

e.g., Diekman et al. (2017)

Predicting
- Interest in STEM

Examining patterns by
- Gender

Goal-Congruuity within CS

Lewis et al. (submitted)

Predicting
- Belonging in CS

Examining patterns by
- Gender, race, first generation status
Goal-Congruity Theory

e.g., Diekman et al. (2017)

Perceived Communal Affordances of STEM

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<tr>
<th>Low</th>
<th>High</th>
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<tr>
<td>Low</td>
<td></td>
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<tr>
<td>High</td>
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</table>
Perceived Communal Affordances of Computing

In your opinion, to what extent would a career in computing allow you to serve humanity?
Goal-Congruity Theory

e.g., Diekman et al. (2017)

Perceived Communal Affordances of STEM

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<tr>
<td>Low</td>
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<tr>
<td>High</td>
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</table>

Communal Orientation

Low

High
Goal-Congruity Theory

e.g., Diekman et al. (2017)
Goal-Congruity Theory

e.g., Diekman et al. (2017)

Perceived Communal Affordances of STEM

Low Interest

Low Interest

Low Communal Orientation

High Communal Orientation

High Interest

High Interest
Communal Orientation

Perceived Communal Affordances of Computing

- Low Communal Orientation (-1 SD)
- High Communal Orientation (+1 SD)