Practices for Retaining Diverse Students

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Entry Characteristics: Inadequate Predictors

Experiences in learning environments are important

E.g., In CS, women leave with higher grades than the men who stay, suggesting that their departure is unrelated to entry characteristics or success on course assessments.

Braxton et al., 2014; Cohoon & Aspray, 2006; Katz, Allbritton, Aronis, Wilson, & Soffa, 2006; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006; Kuh, Kinzie, Schuh, & Whitt, 2010; Roberts, McGill, & Koppi, 2011; Strenta, Elliott, Adair, Matier, & Scott, 1994;Tinto, 2012

Real and Perceived Differences for Underrepresented Students

Less likely to have taken programming before a college course

Take computing classes under different conditions than White/Asian male peers

- » Implicit biases

- » Stereotype threats

- » Fixed mindset in field

- » Teaching choices limit sense of belonging

- » Curricular choices not aligned with interests

Barker & Garvin-Doxas, 2004; Beyer 1990; Beyer, Rynes, and Haller 2004; Brown and Gilligan, 1992; College Board, 2015; Farenga and Joyce 1999; Katz, et al. 2006; Margolis and Fisher 2002

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Special Groups Leave the "Ouch" in the Social Environment

» Students are taxed: have to do more than dominant group to get through the major

» Groups support only the students who choose to join

» Many avoid special groups because it makes them feel like needy or deficient

» Labeling a group reinforces a stereotype, draws negative attention

» Dominant group may believe groups exists to support stereotypical behavior, bashing

Bierema, 2005; Bystydzienski & Bird, 2005
Image: http://www.geekalerts.com/u/Ouch-Bite-Me-Bandages.jpg

Faculty Can Promote Belonging, Peer Relationships, and Shared Identity

» Collaborative learning approaches <u>in class</u>

» Shared learning in lab, discussions

» Inclusive, comfortable climate in class

» Set rules for professionalism

Better Approaches to Well-Intentioned, but Harmful Messages (Case Study 1)
Overcoming Stereotype Threat to Improve Retention

| K-12 Education | Undergraduate | Graduate |

EXPERIMENTS
BEST PRACTIC
Students often a
talents, rather t
believe that inte
to drop challeng
stereotype threa

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TECHNOLOGY

PAIR PROGRAMMING-IN-A-BOX
The Power of Collaborative Learning

Faculty Can Design Classroom Climate for Belonging

Don't let the experienced and the showoffs design your classroom environment (because they will)

Frame a context or perspective that strongly influences interpretation of events and behavior

- » Prime (pre-term, first week)
- » Ongoing (trading cards, in-class shared learning, pair programming)

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It's a Frame! (Case Study 4) or: Framing a Supportive Classroom Climate (or?)
Retaining Women through Inclusive Pedagogy

Undergraduate

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Many Techniques Allow Students to Learn Together

» Peer instruction

» Small group problem solving in class

» Peer-led team learning

» Pair programming

» "Flipped" classroom

» Repeated, randomized groupings (or not)

The Conversational Classroom (Case Study 1)
Retaining Women through Inclusive Pedagogy

🏛 Undergraduate   🎓 Graduate

This intervention, tested and repeated at the University of Colorado with excellent results, is based on the rationale that students could read their assigned

Avoid: Stereotypical Physical Settings

Décor, vocabulary, humor, dress, images

- » Trigger stereotype threat
- » Convey not belonging

You Cannot *Not* Communicate

Cheryan, 2010; Peterson, 2010; Seymour, 1995; Image: Cheryan

Faculty Can Make Content Meaningful

» Use examples, assignments, explanations relevant to students' life goals and interests (can survey students)

» Connect concepts to later choices (major, graduate school, career)

» Include a true introduction, bridge courses

» Course themes, tracks

» Early hands-on design projects: self expression

» Social learning outcomes (e.g., robots, graphic designs)

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How Does Engaging Curriculum Attract Students to Computing?
with Case Study 2

🏛 **Undergraduate**

Faculty Can Support Faculty-Student/TA-Student Interaction

» Train teaching assistants and lab tutors

» Encourage students

» Use "growth mindset": emphasize practice

» Give timely feedback about what grades mean

» Intentional role modeling

» REUs

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Encouragement Works in Academic Settings (Case Study 1)
Increasing Persistence in Computing Through Encouragement

| ✏ K-12 Education | 🏛 Undergraduate | 🎓 Graduate |

IMPACT OF ENCOURAGEMENT
A faculty member described how simple it is for him to

Avoid: Priming Stereotype Threat

Fear of confirming negative beliefs about my group…

Leads to harsh personal standards, opting out if not met

Hinders performance

Affects choices and aspirations

Masks ability

Appel, et al. 2011; Aronson, 2004; Correll 2004; Chasteen, et al. 2005; Good, et al. 2012; Steele, James, & Barnett, 2002; Image: National Public Radio

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Avoid: Good Intentions That Backfire

"You are so brave to major in computer science! I really admire you."

"Women earned three of the top four course averages in the class … The course average for you seven women was 2.6 points higher than for the thirteen men. You're showing that women can do just fine in CS: good work!"

What did you expect??

Image: My sister Nikki.

Avoid: Making Students Non-Learners by Emphasizing Innate Abilities Over Practice

"Many of the things we do to motivate people make them into non-learners."

– Carol Dweck

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Fixed v. Growth Mindset

Fixed mindset: a trait you either have or don't have

- Look talented at all costs.

- "If you're really good at something, you shouldn't have to work at it."

- Effort makes them feel dumb.

- Hide mistakes.
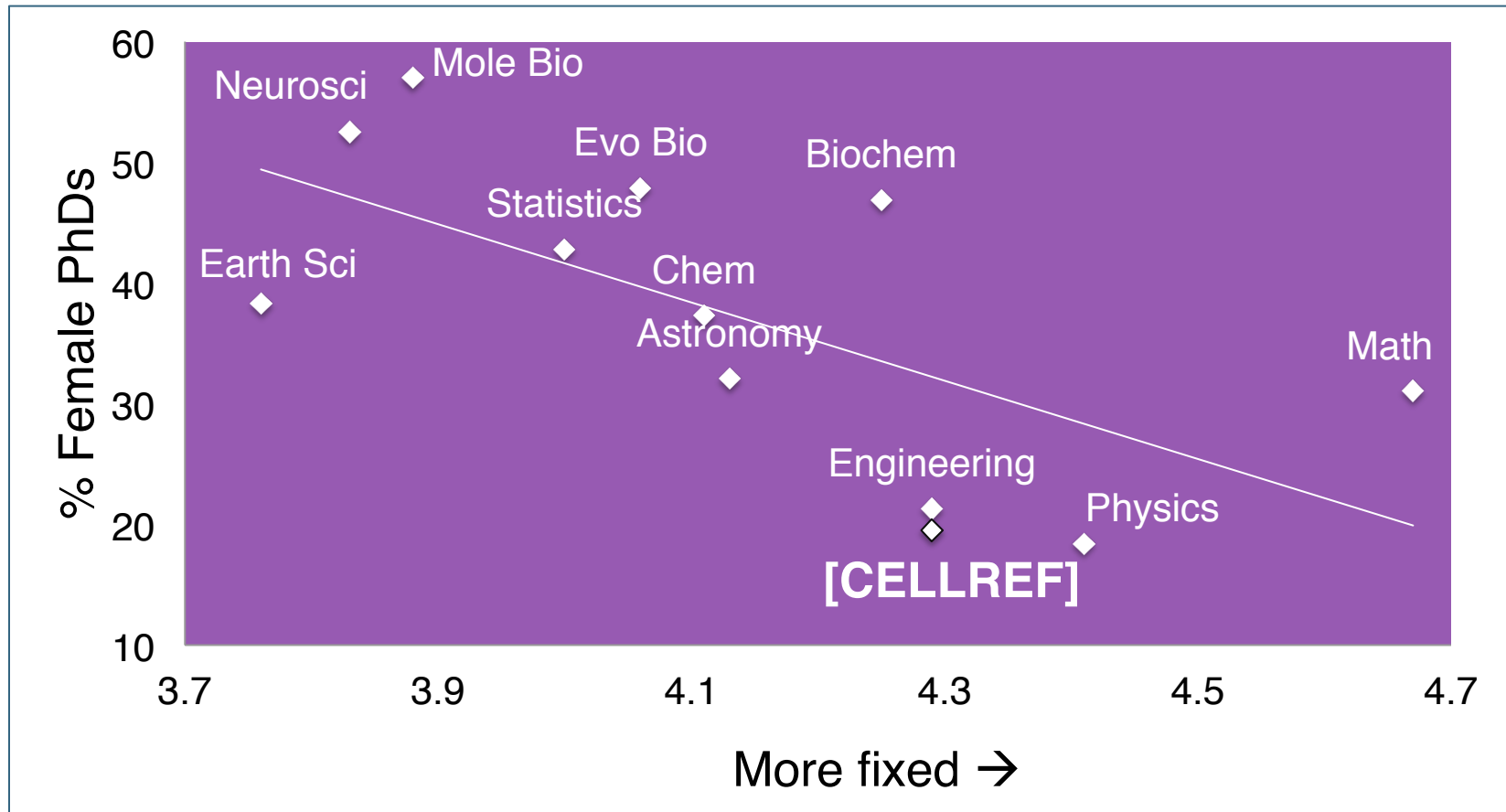
Growth mindset: intelligence and knowledge developed

- Learn at all costs.

- Work hard, effort is key to learning.

- Learn from mistakes. Confront deficiencies.

Dweck, 2006; Gunderson, Gripshover, Romero, Dweck, Goldin-Meadow, & Levine, 2013; Miele & Molden, 2010; Moser, Schroder, Heeter, Moran, & Lee, 2011; Pomerantz & Kempner, 2013; Image: Andy Falconer

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Fields Have Dominant Mindsets

r = -.64, p = .025   (n=1,820) in 30 disciplines

"Being a top scholar in [field] requires a special aptitude that just can't be taught"

"When it comes to [field] the most important factors for success are motivation and sustained effort; raw ability is secondary"

Leslie, Cimpian, Meyer, & Freeland, 2015

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Stereotypes imply that computing ability is innate, *fixed*, and women just don't have it.

Faculty Can Transmit the Growth Mindset

Fixed mindset praise:

"Wow, that's a good score. You must be smart at this."

"You got an A without really working. You're really good at programming!"

Growth mindset praise:

"Wow, that's a good score. You must have tried really hard."

You got an A without really working. An A is nice, but you must not be learning much.

Dweck, 2006; Gunderson, Gripshover, Romero, Dweck, Goldin-Meadow, & Levine, 2013; Miele & Molden, 2010; Moser, Schroder, Heeter, Moran, & Lee, 2011; Pomerantz & Kempner, 2013; Image: Andy Falconer

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