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Transforming Culture in  
Engineering Education

# Culturally Relevant Pedagogy for STEM Education

*Educational Practice that Embraces Diversity*

October 29, 2013  
11 am (Eastern)

**WEPAN Diversity Advancement Committee**

# WEPAN 2013-2014 Webinar Series



**Host: Diane Matt** – Executive Director, WEPAN



**Moderator: Shawna Fletcher** – Interim Director, Women in Engineering Program, The Ohio State University; WEPAN Director of Membership



**Speaker: Rose Pringle, PhD** – Associate Professor, Science Education, University of Florida (with acknowledgements to Natalie King, PhD Student Science Education, School of Teaching & Learning, University of Florida)



**Speaker: Lily Gossage** – Research Associate, Office of Engineering Education Research & Assessment, California State University, Long Beach; WEPAN Director of Diversity Advancement



# General Info and Q&A

- The webinar uses Voice Over Internet. If your sound quality is not good, a teleconference line is available:
  - Phone: +1 (415) 655-0057, Access Code: 978-912-757
  - Audio Pin: Check your screen once you dial in.
- Participant microphones are muted for quality.
- Undock, expand “Questions” pane in control panel.
- We will stop for questions at the end of the webinar. Please post your questions during the webinar.
- Presenters will stay on the line for an additional 10 minutes after the webinar. We will open the microphones for you to ask them questions directly.
- Stay with us if we are temporarily disconnected.
- Download PowerPoint and link to recorded webinar at [www.wepan.org](http://www.wepan.org) > Webinars.

# WEPAN's Core Purpose

- **To propel higher education to increase the number and advance the prominence of diverse communities of women in engineering.**



## About WEPAN [www.wepan.org](http://www.wepan.org)

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- **Core Values:**  
**Knowledge, Collaboration, Inclusion and Leadership**
- **880 members from 200 engineering schools, corporations, government and non-profits**
- **Support WEPAN's work! Join and make a donation at [www.wepan.org](http://www.wepan.org)**

# WEPAN Knowledge Center

<http://wepanknowledgecenter.org>

**Goal:** Increase the number, scope and effectiveness of initiatives to advance women in engineering.



- **Catalogued and fully cited resources-1,400+**  
Research, reports, data and statistics, agenda papers, bibliographies, best practices,
- **Online Professional Community**  
Network, collaborate, identify experts, share information



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# Culturally Relevant Pedagogy for STEM Education

*Educational Practice that Embraces Diversity*

# WEPAN's Diversity Statement

WEPAN strives to model a culture and an inclusive community that consciously embraces and celebrates rich dimensions of diverse communities of women, allies, and stakeholders. WEPAN advances best practices for increasing inclusive excellence through an education- and industry-based network of members. WEPAN demonstrates these values by creating a welcoming environment characterized by:

- Practicing mutual respect for those unique experiences and qualities that are different from our own;
- Recognizing that diversity includes ways of knowing as well as ways of behaving;
- Acknowledging that bias is a conscious and unconscious practice that manifests itself in the everyday discourse and actions of individuals and institutions;
- Building alliances across the range of individual and group differences, including the engagement of male allies;
- Sharing best practices to ensure the equity and the success of all women engineers;
- Working collaboratively with other advocacy groups



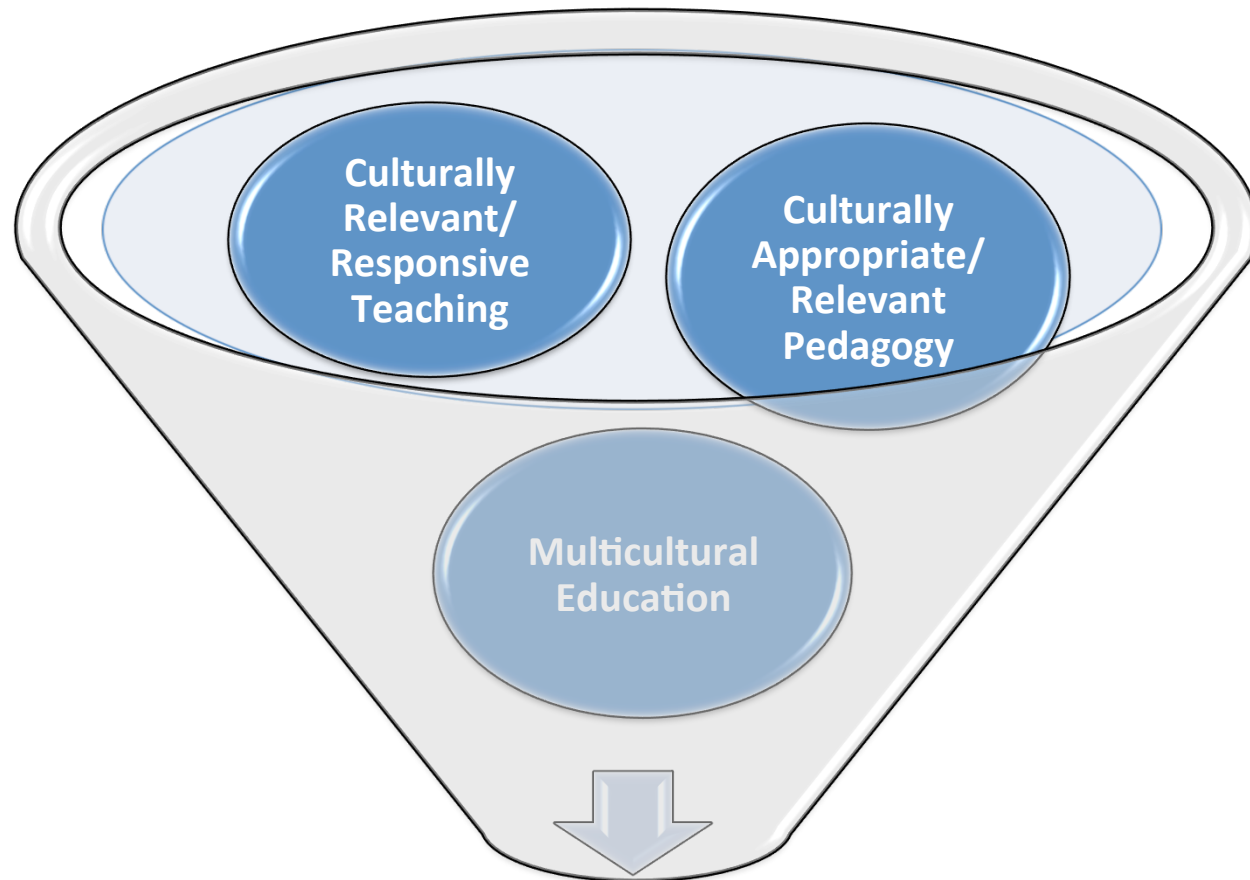
# Poll Question #1

**Why did you register for this webinar on Culturally Relevant Pedagogy (CRP)? Select all that apply.**

- a) I have never heard of CRP, and I want to learn more about it.
- b) I have heard of CRP, but I want to know how to implement it (either in my classroom or in my program).
- c) My student population is becoming increasingly diverse, and I want to explore new approaches to reach them.
- d) STEM graduation rates for my institution's under-represented minority students continue to lag, so I am interested in CRP as a way to boost academic success.

# Culturally Relevant Pedagogy

*Many Labels – Same Ideas*



**Attention to culture and its role in students' learning**

# What is Culturally Relevant Pedagogy (CRP)?

## □ Theoretical model

- Addresses student achievement
- Students accept/affirm their cultural identity
- Facilitates development of critical perspectives to challenge institutional inequities

## □ Theoretical underpinnings; Learning . . .

- Is a socially mediated process
- Is related to cultural experiences
- May differ across cultures

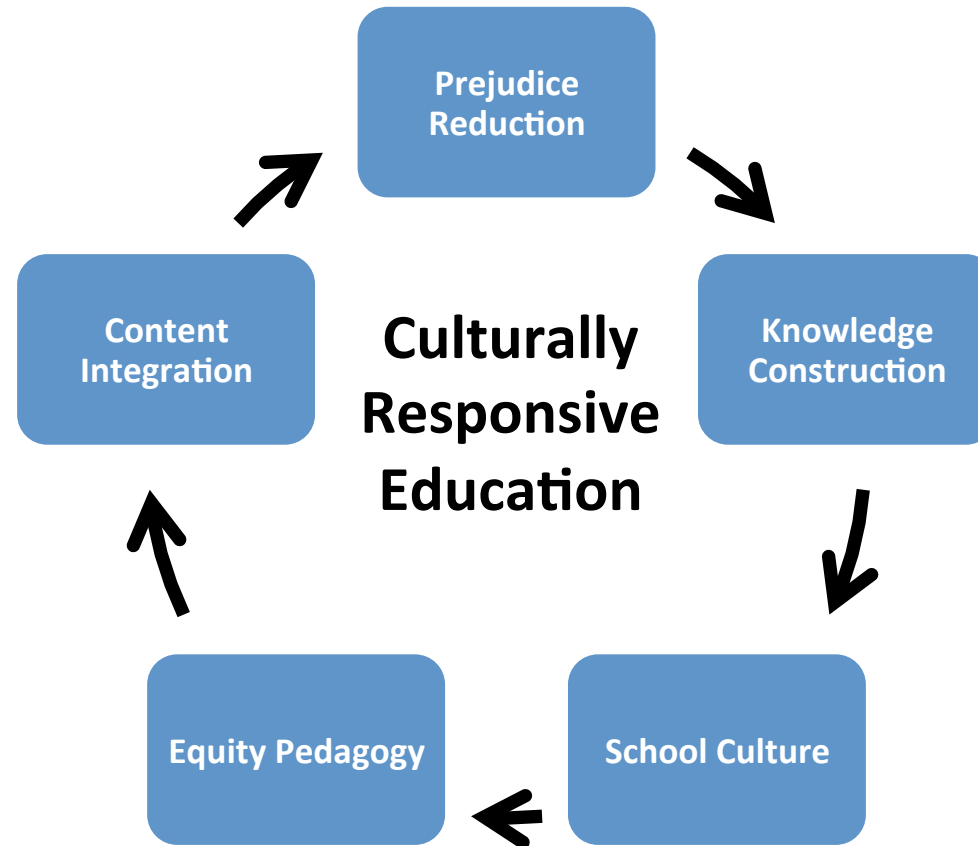
Relevant Teaching Strategies

Relevant Content



Maximizes learning for ALL students

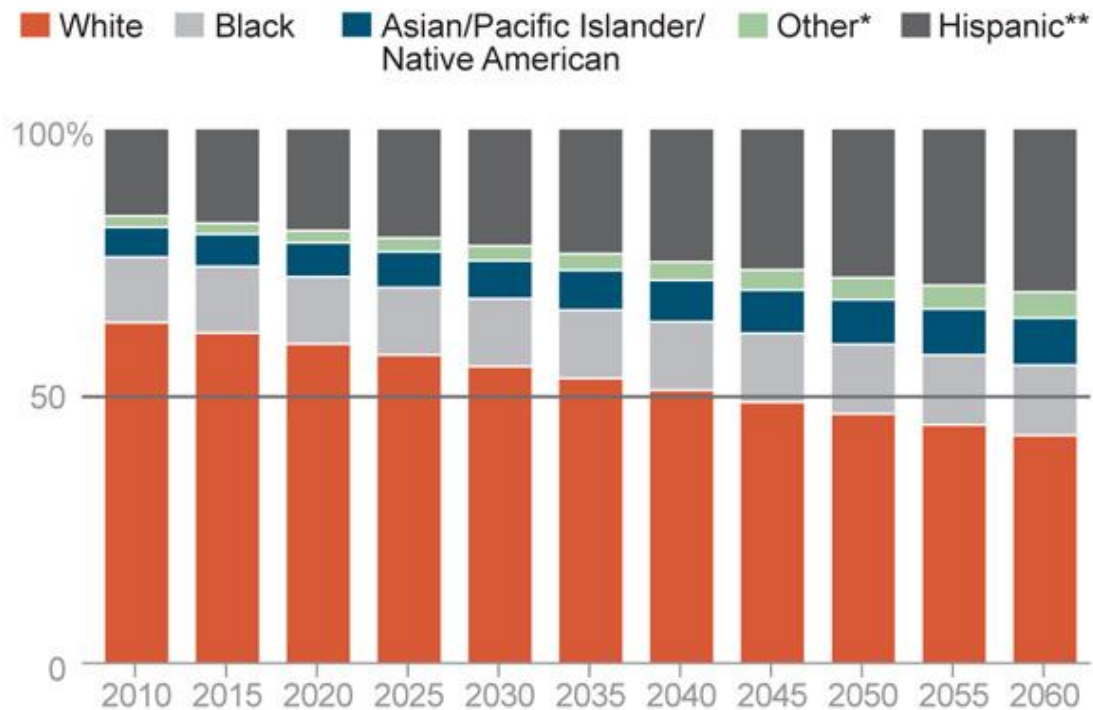
# Dimensions of Culturally Responsive Education (same as CRP)



Source: Reproduced from 2008 National Center for Culturally Responsive Educational Systems, [www.NCCRESt.org](http://www.NCCRESt.org)

# Tipping Toward a White Minority

**Non-Hispanic Whites will drop below 50% of the U.S. population sometime around 2043.**

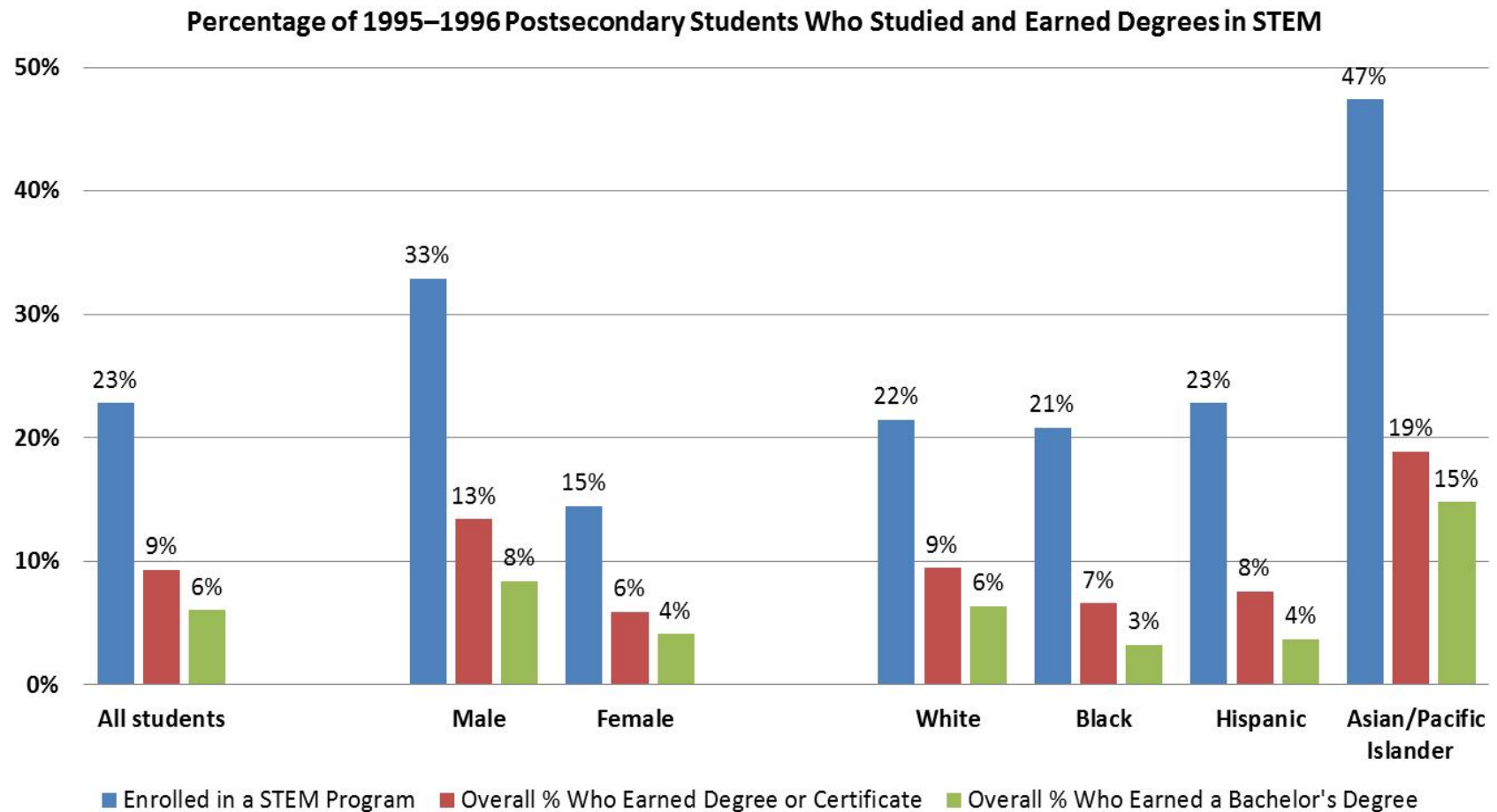


\*Includes people of more than one race

\*\*Considered an ethnicity; Hispanics may be any race

Source: U.S. Census Bureau, 2012.

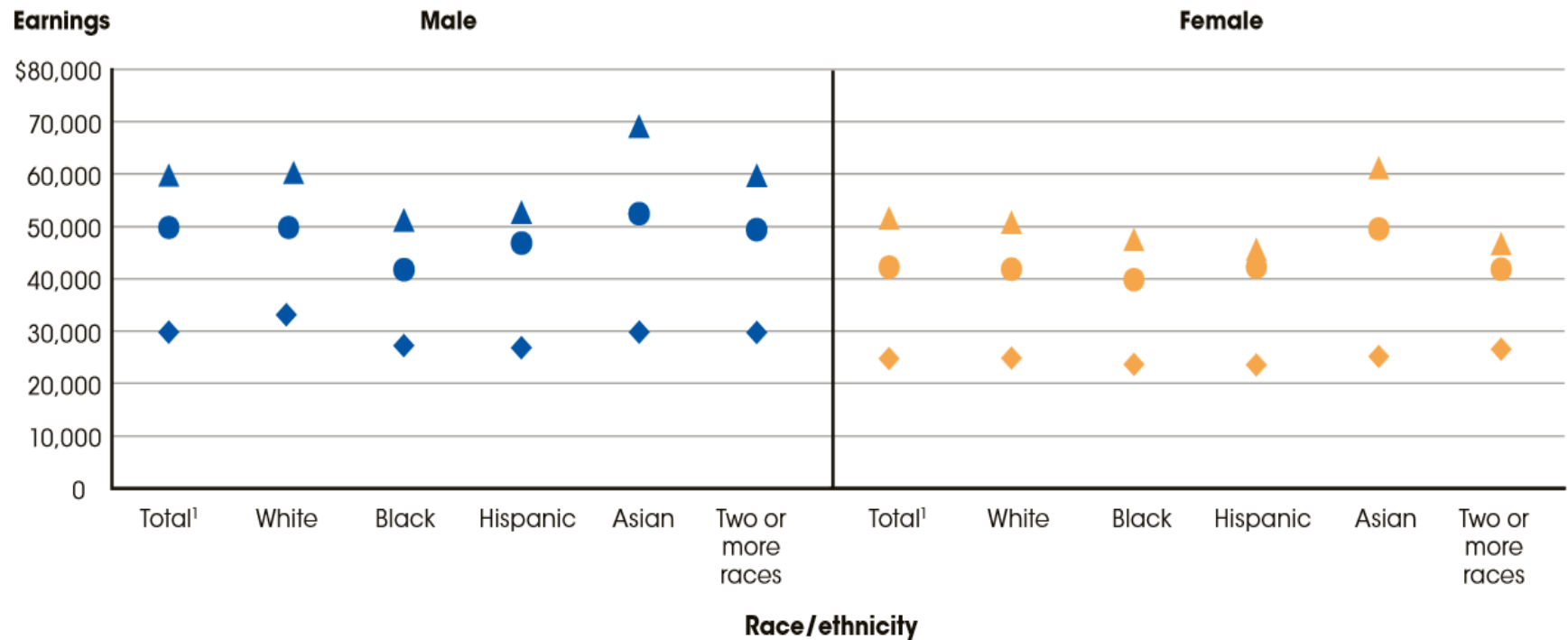
# STEM Fields by Gender, Race, Ethnicity



Source: National Center for Education Statistics, 1996 and 2001

# STEM Labor Work Force

Median annual earnings of full-time, full-year wage, and salary workers (age 25-34) and highest level of educational attainment.



♦ High school completion      ● Bachelor's or higher degree with bachelor's degree in a non-STEM field      ▲ Bachelor's or higher degree with bachelor's degree in a STEM field

Source: U.S. Department of Commerce, Census Bureau, American Community Survey (ACS), 2010.

# Impact of Perceptions



**What does this photo communicate? How about the caption?**

**Caption:** “When there is a manned shuttle mission at the Kennedy Space Center, you’ll find us on hand for lift-off and landing. Because of the incredible capabilities of our University of Florida physicians and healthcare team, NASA turns to us for medical support and guidance. We’re proud to be a medical provider to NASA and even prouder to bring that care to you.



# Impact of Perceptions (cont'd)

**How about this photo?**



Space race: Dorothy Metcalf-Lindenburger, Naoko Yamazaki and Stephanie Wilson prepare for their voyage to the International Space Station.

# Role of Culture in Students' Learning

- ❑ A respect for cultural differences should exist in a place where student populations are becoming more diverse (Nguyen, Terlouw, & Pilot, 2006)
- ❑ Encourages students to examine academic content while questioning how this knowledge contributes to a democratic multicultural society (Howard, 2003; Ladson-Billings, 1992)
- ❑ Acknowledges, values, and integrates students' cultural identities/experiences in ways that enhance quality of learning (Banks et al., 2005; Villegas & Lucas, 2002)
- ❑ Students' strengths are identified, valued, and utilized in order to promote student achievement (Villegas & Lucas, 2002; Richards, Brown, & Ford, 2007)

# Myths of CRP *and* What it is Not

- ❑ Only teachers of color can express culturally relevance
- ❑ Not appropriate for White students
- ❑ Help minority students feel good about themselves
- ❑ Feeds into stereotypes of learning styles
  - Give African Americans kinesthetic activities and Asians Americans independent activities
- ❑ Watering down curriculum
- ❑ Being generous with grades; Giving minorities a “free” pass
- ❑ Acknowledging ethnic holidays
- ❑ Adopting colloquial speech, dress, and mannerism
  - Using the phrase “my bad” with African American students

# Examples of Poor Attempts at Incorporating CRP in the Learning Environment

- ❑ “Slavery-Math Questions Cause Uproar At Manhattan Public School” (CBS News, February 22, 2013)
  - “In a slave ship, there can be 3,799 slaves. One day, the slaves took over the ship. 1,897 are dead. How many slaves are alive?”
- ❑ Creating a separate course section of Hispanic students and teaching them about Hispanic scientists and engineers
  - Hispanic Serving Institution grants should not be used to exclusively target Hispanic students or tailor content for Hispanic students

# What does CRP Look Like in a College Environment or Classroom

- Multiple representations of knowledge
- Validate and leverage students' cultural identities
- Equity and mutual respect (between students/instructors)
- Implement instructional conversations (e.g., discussion posts, Google chats)
- Rethink assignments to include activities that connect to experiences outside the walls of the university (e.g., community-based projects, service learning)
- Attend to a variety of learning styles (e.g., small group discussions)

# Examples of Where CRP can be “Soft” Incorporated in the Learning Environment

- ❑ Summer Bridge or “Jump Start” Programs
  - Challenges: Not typically available to all students
  - Benefits: Typically includes high-minority participation
- ❑ Introductory Course to the Discipline (e.g., ENGR101)
  - Challenges: Modifications approve via curriculum committee
  - Benefits: Available to all students
- ❑ G.E. Foundation course “paired” with Fundamental STEM course (e.g., ENGR101 + ENGL100)
  - Challenges: Complex scheduling and teaching coordination
  - Benefits: Diversity across the curriculum

# CRP in a Beginning Engineering Course

- ❑ ENGR101 (“Introduction to the Engineering Profession”)
  - California State University, Long Beach
  - 1.0-unit required major course, double-counted G.E.
- ❑ Specific Course Activities and Assignments
  - “Intake” and “Exit” surveys (includes background info, socio-cultural items)
  - Engineering Profile paper
  - Green Energy Project (i.e., social justice framework, etc.)
  - Discussion Posts
  - Lectures include historical-global context (i.e., Teotihuacan, Angkor Wat, Machu Pichu, Biete Gyiorgis, Obelisk of Axum, Dong Sonian sites in Vietnam)

# CRP in ENGR101

## *Survey Items*

It is important for me to maintain my cultural identity, and this is why I am a member of (or will join) a culturally-based engineering student organization (e.g., AISES, MAES, NSBE, SHPE, .

- Yes - that statement is true, and I want to promote my culture.
- Yes - I am part of a culturally-based engineering student organization but only for socialization purposes (not culture).
- Yes - I am part of a culturally-based engineering student organization but only for exploration purposes (I am not of that culture).
- No - I am not interested in joining culturally-based engineering student organizations.
- No - I do not believe in culturally-based engineering student organizations (I think only major-based students organizations are acceptable).

Which of the following topics would make ENGR101 most interesting to me?

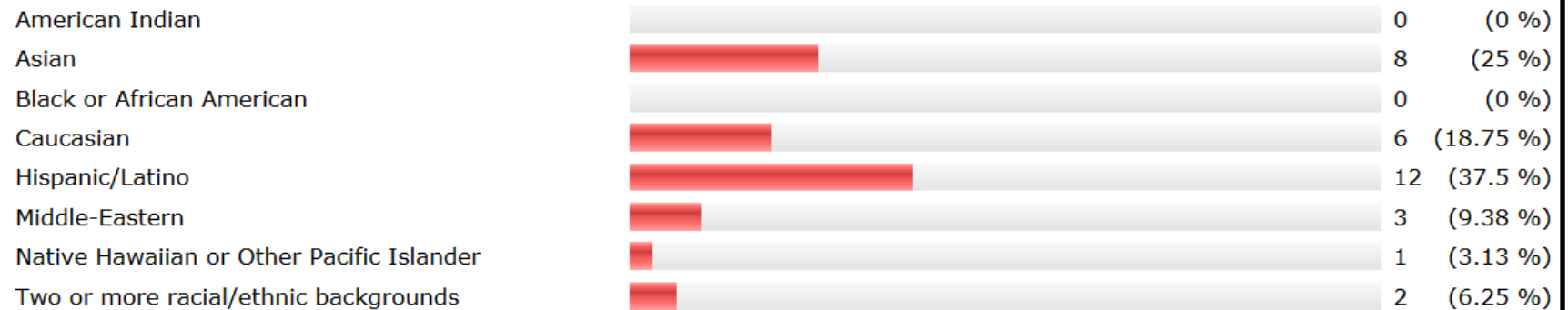
- More emphasis on engineering innovation (e.g., devices/products, etc.)
- More emphasis on engineering research (i.e., heavy focus on theory)
- Community-based projects (serving my own racial/ethnic community)
- Community-based projects (serving any racial/ethnic community)



# CRP in ENGR101

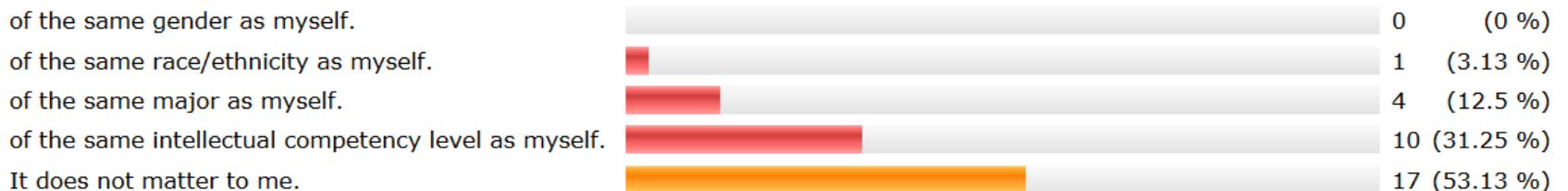
## Survey Results

What is your ethnic/racial background?



Number of Responses: 32

I would feel more comfortable studying with peers who are \_\_\_\_\_.

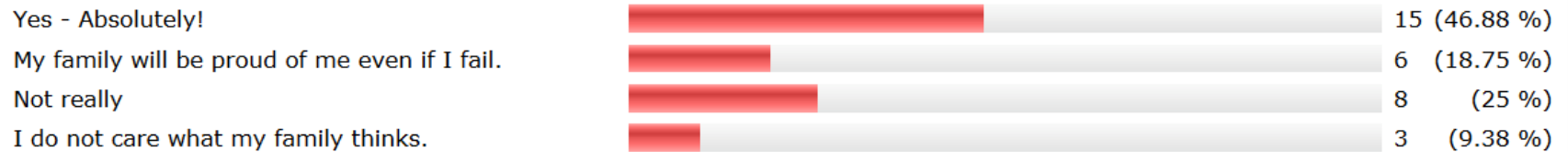


Number of Responses: 32

# CRP in ENGR101

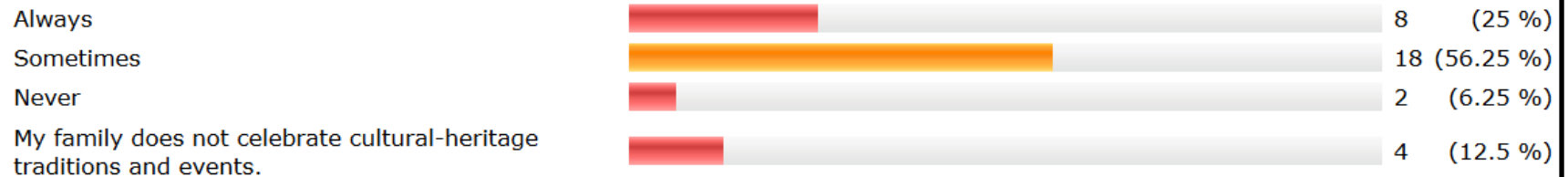
## Survey Results (cont'd)

Failing academically brings shame to my family.



Number of Responses: 32

Even though I am busy with school, I find time to participate in my family's cultural-heritage traditions and events.

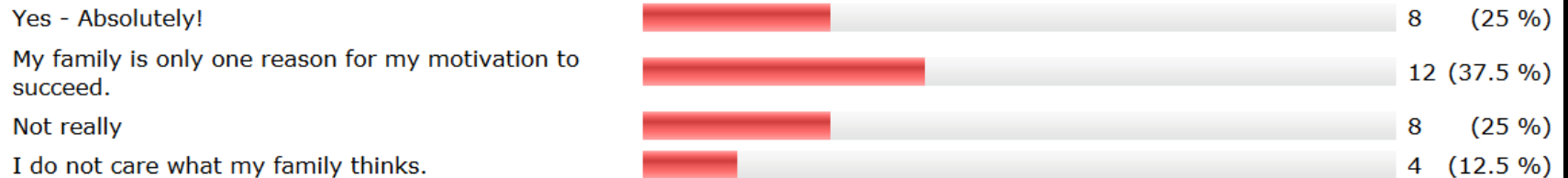


Number of Responses: 32

# CRP in ENGR101

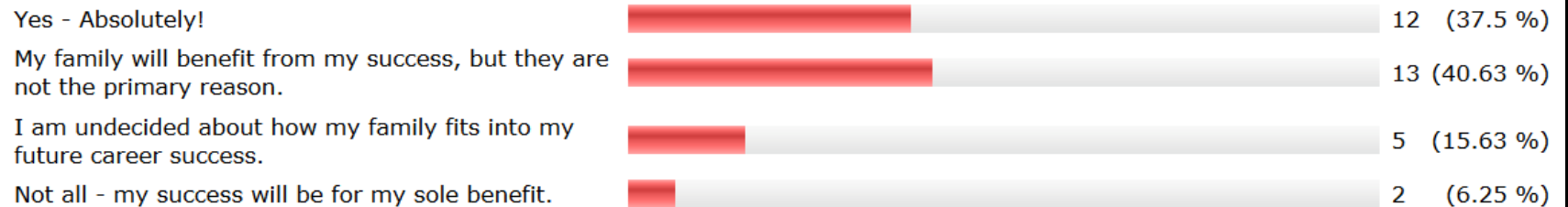
## Survey Results (cont'd)

Succeeding occupationally in engineering is a way to make my family proud (it reflects on my family's reputation).



Number of Responses: 32

Aside from my own personal interests in pursuing an engineering career, I also want to secure my family's financial status.



Number of Responses: 32

# CRP in ENGR101

## Example 2: Scholarly Discussion Post

### Post #2: "Raising the Bar" [Due October 8, 2013]

74 messages - **74 unread**

#### Prompt

*The Economist* magazine (an English-language weekly news and international affairs publication, edited in London) recently posted an article, "Raising the bar" (2013) about academic standards in math and reading in American schools. Described in the article were the definition of "proficiency" and a map of where states ranked in terms of fourth-grade reading proficiency. Further, this YouTube, ("Did You Know 3.0") offers a *matter-of-fact* sense of where American standards are today.

#### Instructions

1. **Read the article:** "[Raising the bar](#)" (The Economist, 2013)
2. **View the YouTube:** [Did you know 3.0](#) (Exton, J., 2011)
3. **Post your Response (no more than 200 words):** Give your feedback as to where you think American educational standards are today in relation to those of our international counterparts. How can we improve preparation of students (i.e., in K-12, remediation in college, etc.) and at what expense to tax payers?
4. **Post a Reply to a Colleague (no more than 100 words):** Respond to one of your colleague's discussion; either agree with what your colleague stated by expounding on her or his views - or offer constructive criticism.

References:



Exton, J. (2011, November 2). *Did you know 3.0 (official video edition)*. [Video file]. Retrieved from: <http://www.youtube.com/watch?v=m-SZeeN57-4>

Raising the bar (2013, June 15). *The Economist*. Retrieved from <http://www.economist.com/news/united-states/21579484-battle-over-school-standards-raising-bar>

# CRP in ENGR101

## Example 2: Scholarly Discussion Response



**Re: Keeping Pace**

  Oct 8, 2013 5:01 PM **Latina – 1<sup>st</sup> generation** 1 unread of 1 messages - 1 author(s)

[Mark Read](#) [\[Reply\]](#) [More actions...](#)

I agree but it's also not just a matter of successfully competing with other countries but sustaining our pace in the global industry. If we fall behind, if we haven't already, the game of catch-up does not seem like a very attractive option in today's world of exponentially growing amounts of information. What we do need is an overhaul of the system in order to get students up to speed in the world's knowledge, and not just what is acceptable in the American education system as of now. Additionally, programs making workers want to retire later would be beneficial so that the oldest generation may still be there with information that they can deluge to the newest generation of workers so that, overall, America may not fall behind and may be able to contribute as much as it should to the technologies of the world.

**American Education**



  Oct 8, 2013 11:11 PM **African American Male – 1<sup>st</sup> generation** 1 unread of 1 messages - 1 author(s)

[Mark Read](#) [\[Reply\]](#) [More actions...](#)

It's a well known fact around the world that the USA's education system is lacking and falling behind other many other countries. School in other countries such as South Korea is taking much more seriously. Roads are cleared and planes forbidden to fly over when high school students take their SATs. The reason that we have been behind is not because we no longer care about our education, but because education has been overshadowed by something. Greed. " if the federal government penalises states where pupils do badly in school, but lets the states themselves set the pass mark, will the states a) make the tests harder; or b) dumb them down?" (The Economist, 2013). Money is the reason our education system is subpar. If we can solve our financial problems in America, our education system will follow suit.

Education: Raising the bar | The Economist. (n.d.). *The Economist - World News, Politics, Economics, Business & Finance*. Retrieved October 9, 2013, from <http://www.economist.com/news/united-states/21579484-battle-over-school-standards-raising-bar>

**Re: America's Education Level**

  Oct 8, 2013 11:53 PM **Latino – 2<sup>nd</sup> generation** 1 unread of 1 messages - 1 author(s)

[Mark Read](#) [\[Reply\]](#) [More actions...](#)

I also believe that the government should not hesitate to raise taxes if they truly want to compete with other nations who focus more on education. It is also true what you say many people already believe that America is behind the other developed nations in terms of education which is very disheartening.

# CRP in ENGR101

## *Example: History of Engineering*



Biete Giorgis (Lalibela, Ethiopia)



Angkor Wat (Siem Reap, Cambodia)

# CRP in ENGR101

## *Use of Twitter and other Social Media*



The image shows a screenshot of a Twitter profile for CSULBEngrHonors. A red box labeled "My 'tweeps'" with a red arrow points to the profile name. The profile name is CSULBEngrHonors, with the handle @CSULBEngrHonors and the bio "CSULB Engineering Honors Students, Long Beach, California". The profile statistics are 54 TWEETS, 37 FOLLOWING, and 38 FOLLOWERS. There is an "Edit profile" button. The "Tweets" section shows three tweets from CSULBEngrHonors:

- 13s: ENGR101 (Fall 2013 freshmen): For your group paper, remember to cite each time you use another person's work.
- 11 Sep: CSULB IEEE soldering workshop Friday, Sept. 13th. EN4-124 to inquire. See Professor Gossage if you want to buy a soldering iron+matl.
- 7 Sep: CrownPeak Technology (Internet software company) has paid internships + entry level positions; See Professor Gossage if interested.

# Awareness and Stereotype Threat

- ❑ Be aware of your own assumptions, values, and biases to understand diverse learners
  - Resource: Harvard Implicit Bias Association Test (Greenwald, 1998)
- ❑ Students treated as competent are likely to demonstrate competence – self-fulfilling prophecy
- ❑ The condition of being at risk of confirming a negative stereotype about a group to which one belongs (Steele & Aronson, 1995)
- ❑ Ironically, the fear of confirming stereotypes negatively impacts performance (Schmader, Johns, & Forbes, 2008)



# Invitation to 2014 ASEE Zone IV Conference

## *Theme: Diversity*

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### ☐ **ASEE Zone IV**

- Pacific Southwest (Arizona, California, Hawaii, and Nevada)
- Pacific Northwest (Alaska, Idaho, Montana, Oregon, Washington, and Canada-Alberta, British Columbia and Saskatchewan)
- Rocky Mountain (Colorado, South Dakota, Utah, and Wyoming)

### ☐ **ASEE Zone IV conference**

- Theme: “Student Success Is Our Success: Developing Diverse Engineers for a Changing World through Engineering Pedagogy & Practice”
- Dates: April 24-26, 2014
- Abstracts due: November 15, 2013
- Registration: \$130 (before March 15<sup>th</sup>); \$150 (after March 15<sup>th</sup>); \$80 (students)
- Website: [www.csulb.edu/colleges/coe/2014-asee-zoneiv/](http://www.csulb.edu/colleges/coe/2014-asee-zoneiv/)
- Contact: [ASEE@csulb.edu](mailto:ASEE@csulb.edu) (Co-Chairs: Lily Gossage & Panadda Marayong)

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## Poll Question #2

**How likely is it that you will attempt to incorporate Culturally Relevant Pedagogy in your work (either in a course, program, or workshop)?**

- a) Highly Likely
- b) Likely
- c) Neither Likely nor Unlikely
- d) Unlikely
- e) High Unlikely

# Asking Questions and Discussion

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- **Participant microphones are muted for webinar quality.**
- **Undock and expand the “Questions” pane in the webinar control panel**

# Questions & Discussion



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# Thank You for Attending

## We Hope You Enjoyed the Webinar!

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- Links to the PowerPoint and recorded webinar will be posted at [www.wepan.org](http://www.wepan.org) > Webinars
- Share with your colleagues!
- Survey following the webinar—please respond!
- Support WEPAN—make a donation at [www.wepan.org](http://www.wepan.org) > Donate
- Pay a personal tribute to someone who has made a difference to women in engineering
- Thank you for attending today!