Culture of STEM Education

KAM YEE
DEPARTMENT OF SPACE STUDIES
UNIVERSITY OF NORTH DAKOTA

BRIDGE CONFERENCE 2015– SEATTLE
OCTOBER 19, 2015
Agenda

Introductions
Presentation
Silent Board Discussion
Small Group Activity
Mini-Presentations
Wrap-up
Community Norms

DO...

- Listen
- The goal is not to agree -- it is to gain a deeper understanding
- Challenge respectfully. Ask questions on the idea, not individuals.
- Be conscious of body language and nonverbal responses -- they can be as disrespectful as words
- Put questions in red paper bag
Why STEM matters on national level?

National Security

- “crucial to the Nation's health and economy” – National Science Foundation
- Workforce gap – America COMPETES 2007 & 2010

Societal Problem

- Domestic civil rights issue
- People of color and women are over 60% of US population.
- White House Council on Women and Girls (CWG)
- Title IX (1972)
STORY OF THE STEM PIPELINE
The STEM Education Narrative

Aspiration Interest

Elementary

Middle School

High School

College

Workforce

Academics Graduate

STEM job Income

Academics Interest

STEM major Internship
Representation Gap

STEM Degrees

- All STEM Degrees
- Women in STEM Workforce
- Women with STEM Degrees

39% 24%

Engineering Degrees

- All Engineering Degrees
- Women in Engineering Workforce
- Women with Engineering Degrees

20% 11%

(Fouad et al., 2012)
Science culture

- Science is a very cultured experience.
- Chilly environment (Fouad et al., 2012)
- Girls weighted effort vs combative environment. (Hernandez et al., 2013)
- Assimilation - “cultural crossing” (Aikenhead & Huntley, 2009)
- We need scientific “biculuralism” (Lee, 1999)
STEM Education

**Problem:** Girls avoid science

**Cause:**
- The parents just don't care
- Girls don't have enough exposure/experience
- Girls aren't ready for science
- Their families don't value STEM education
- Girls lack confidence in math & science
- They are coming from a "culture of poverty"

**Solution:** Fix student interest
Problem: Crew member avoids spacewalks

Cause:
- Suit problem?
- Airlock malfunction?
- Poor procedure?
- Workload?
- Mission unclear?

Solution: Fix suit, procedure, train and support
What does access mean?

- Constraints & Resources
- Exposure focused
- Deficit-based approach

Instead, think:
- Relational
- Validating
- Identity affirming

RELATING RESEARCH TO PRACTICE
http://relatingresearchtopractice.org
Relationship with science?
Inspire. Interest. Exposure.

#ModelMinorityMutiny
Who’s narrative is it?
Validating

Ways of Knowing
Who holds the power? Who approves?

Academic Gatekeeping
STEM knowledge vs. STEM achievement
Identity Affirming

**Capitalistic Narrative**
Conflicts with community.
Individual based.

**Stereotype Threat**
“I don’t like science and engineering.”
Research excerpt: Select which of the following elements are present in the program (check all that apply)

- >80% Visual Tactile Small Group
- 57% Movement Peer Feedback Student-driven
- >35% Auditory Pop Culture
- 19% Cultural Heritage Racial and Ethnic Identities

N=94
Silent Board Discussion

On each board think about:

- What cultural crossings are happening here?
- Who has the power?

First comments - 10 minutes
Respond to comments - 10 minutes
Community Norms

DO...

- Listen
- The goal is not to agree -- it is to gain a deeper understanding
- Challenge respectfully. Ask questions on the idea, not individuals.
- Be conscious of body language and nonverbal responses -- they can be as disrespectful as words
- Use the question box
Silent Board Discussion

Response:

- How do you change the power relationship?

First comments - 10 minutes
Respond to comments - 10 minutes
Team activity

1. Go to a board
2. Form teams of 3
3. Pick one comment thread
4. Create a poster or 30 second skit
5. Presentation at 4:30pm
Workshop Code: S3-2

Thank you!

QUESTIONS?
Kam Yee – kamyee@ymail.com - University of North Dakota
References


Bell et al. (2009). Learning science in informal environments: People, places, and pursuits.


Cannady et al. (2014). Problematizing the STEM pipeline metaphor: Is the STEM pipeline metaphor serving our students and the STEM workforce? Science Education, 98(3).

Committee on STEM Education. (2013). Federal science, technology, engineering, and mathematics (STEM) education 5-year strategic plan. National Science and Technology Council Report


National Science Foundation. (2014). Improving Undergraduate STEM Education.

