STEM Equity, 'Good' Mentoring and the 'Hidden Curriculum'

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Biology Scholars Program

Founders

John Matsui

Director & Co-Founder

Caroline M. Kane

Co-Founder

Corey Goodman

Co-Founder

Gregory Aponte

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Nutritional Sciences & Toxicology

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Associate Dean of Diversity, Equity, and Inclusion

College of Chemistry

Diana Bautista

Professor of Cell & Developmental Biology and of Neurobiology

Molecular and Cell Biology

George Bentley

Professor of Integrative Biology

Integrative Biology

Stephanie Carlson

Professor of Fish Ecology

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Eva Harris, PhD

Professor of Infectious Diseases & Vaccinology and Director of Center for Global Public Health

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Bio 1B Study Group Leader

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Chem 1A Study Group Leader

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Clarise Rivera
Chem 3A Study Group Leader

Itzel Olmedo Robles
Chem 3A Study Group Leader

Johanna Samano Beltran
Chem 3B Study Group Leader

Snigdha Barua
Chem 3B Study Group Leader

Isaac Sloan
Data 8 Study Group Leader

Alex Linares
MCB 102 Study Group Leader

Khizur Kamran
MCB 102 Study Group Leader

Angelica Gonzalez
Physics 8A Study Group Leader

Viviana Rios
Physics 8A Study Group Leader

Study Group Leaders

Funders

Over the lifetime of BSP

Funders

Today

Vantage Point

- STEM Equity Work
- Practitioner => Researcher
- 'Lab' = Program
- 'Expts' – Remove Barriers Undergrad STEM Success
- Why Efforts Have 'Worked'
- Adapt and Scale 'What Works' => Institutional Change

How we'll proceed...

- Personal History/Professional is Personal
- Biology Scholars Program (BSP)
- 'Hidden Curriculum'
- 'Mentoring'
- Reflections - BSP, 'Program,' and STEM Equity Work

Personal History

Personal History

12.7.41

Personal History

Personal History

Professional is personal

"Outsiders at the Table"—Diversity Lessons from the Biology Scholars Program at the University of California, Berkeley

John T. Matsui ✉

Kenneth Gibbs, Monitoring Editor

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INTRODUCTION

In 2017, at two campus-wide events to discuss diversity efforts in science, two senior scientists, both of whom were white men from separate institutions, declared, "We know what to do to fix underrepresentation in STEM, all we need is to do it." I found what they said to be profoundly ironic. Their independent, nearly identical declarations captured the essence of why I think that, after 40 years of efforts to diversify science, technology, engineering, and mathematics (STEM), underrepresentation persists. Their words reminded me of when the special diversity edition of the journal *Science* was published in 1992, the same year that I cofounded the Biology Scholars Program (BSP), an undergraduate diversity program at the University of California, Berkeley (UC Berkeley), that to this day I direct. In the editorial "**Minorities in Science—The Pipeline Problem" (1992)**, the editor stated, with great certainty, "The low percentages of minorities in science reflect ... that prejudice did exist," and "The world fortunately has changed," and "Under these circumstances the opportunities for able young minority scientists or women should be good in future years."

Biology Scholars Program

BSP in Brief

- Established – 1992 with HHMI Funding
- Undergraduate STEM Equity Program
- 4,000 total Berkeley undergraduates

  - 60% 1st Gen, 60% Low-Income, 70% Women, 60% URM

BSP Scholars Ethnicity Breakdown
2019-20

Nat Am/Alaskan Nat
2% (CA)   1% (UCB)

22.7%

2.2%

10.6%

49.5%

15%

Hispanic/Latinx
38% (CA)   14% (UCB)

Black/African Am
7% (CA)   3% (UCB)

■ Hispanic (49.5%)   ■ Black/African Am. (15%)

■ White/Caucasian (10.6%)   ■ Native Am./Alaskan (2.2%)

■ Asian Am./Asian (22.7%)

BSP in Brief

- Estab. 1992 with HHMI Funding
- Undergraduate STEM Equity Program
- 4,000 students
  - 60% 1st Gen, 60% Low-Income, 70% Women, 60% URM
- <u>Objective => Goal</u>
  - Develop Talent (v. Skim Talent) => Diversify STEM

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- <u>Objective => Goal</u>
  - Develop Talent (v. Skim Talent) => Diversify STEM
- <u>Success</u>
  - Bio Degree + Competitive Exit GPA (Parity)
  - Post-Grad Programs/Careers (e.g., Healthcare, Research, Education)
  - Students Discover how Best to Express Their Passion for Science

BSP in Brief

- Selection – Predictors of Success
  - Don't use SATs and GPAs
  - Alternative Criteria – in addition to Passion for Science
    1. Resilience
    2. Persistence
    3. Authenticity
    4. Willingness to Give/Get Help
    5. Willingness to Re-Strategize when 'Fail'
- Treatment

'The List'
Program Components

- Application

- Interview/Selection

- All-Student Meeting

- Study Groups for 'Gateway' STEM Courses (e.g., Gen & O-Chem, Gen Bio)

- Required Courses – IDS c96 (F) and MCB 15 (SP)

- Advising/Counseling

- Workshops, Social Events, Service/Leadership Opportunities, Newsletter

- Paid Research/Internships

- BSP Community, Student Center, Graduation

- Mentoring at the core of all program components/aspects

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    1. Resilience
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    3. Authenticity
    4. Willingness to Give/Get Help
    5. Ability to Re-Group when 'Fail'
- Treatment - 'Help'
    1. One Size Does Not Fit All
    2. Recommend v. Decide
    3. Shared Responsibility for Success
    4. Listen to and Learn from Students' Experiences to Invent/Re-invent BSP
- Cost - ~$3,000/student/year; 400 members /year (100 graduate/100 new members)

BSP in the Oval Office
NSF 2015 PAESMEM Mentoring Award

So, what is BSP?

- 'Academic Support' Program
- 'Safe Space'
- 'STEM Equity' Program that identifies/fills Institutional Gaps
- Where 'Outsiders'* can learn through 'Good' Mentoring how to navigate STEM's 'Hidden Curriculum'

* Not fitting the profile of those that historically have succeeded in STEM

Hidden Curriculum

- Set of unspoken or implicit rules and values that students learn in school (Jackson, 1968)
- Contrasted with official curriculum that is spelled out in a school's mission statement or instructor's lesson plan
- Strong messages about the institution's
  - core values, attitudes and norms of behavior
  - what is important and what is not
  - what kind of behavior is acceptable and what is not, and
  - who is valued and who is not
- Remains 'hidden in plain sight'
- Goes unquestioned, unchallenged, accepted as 'normal' and 'true'

Quotes

- This is science. Leave your culture at the door. *(Lab PI)*

- I teach science, not students. *(Bio Instructor)*

- You may like science but science does not like you. *(College Advisor)*

- What's a 'good' test? Its simple. You get a curve. *(Math Instructor)*

- What's wrong with competition? Its natural. Its healthy. *(STEM Dean)*

- If we'd admit the right students, there'd be no 'diversity problem.'
  (Lab PI)

'Mentoring'

- <u>Relationship</u> - seasoned, experienced person - the *mentor*, and a less experienced person - the *protégé (Rhodes, 2005)*

- <u>Expectation</u> - protégé will develop professionally under the guidance of the mentor *(Eby et al, 2007)*

'Success'

Mentors should help their mentees

1. Learn science *(Content & Process Knowledge)*

2. Learn research design, lab techniques, to ask 'good' questions, share their science, etc. *(Skills)*

3. Gain confidence in their abilities *(Efficacy)*

4. See themselves persisting in science   *(Identity)*

5. Much more …

Content and Quality of Science Training Programs Matter: Longitudinal Study of the Biology Scholars Program

Mica Estrada ✉, Gerald R. Young, Lilibeth Flores, Brook Yu, and John Matsui

Erin L. Dolan, Monitoring Editor

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Abstract

Many science training programs are successful at supporting students in completing their degree programs. However, it is not clear which aspects of these programs meaningfully contribute toward achieving this goal. The current longitudinal study examined a well-established science training program, the Biology Scholars Program (BSP) at the University of California, Berkeley, to see whether social connections formed in BSP and/or enthusiasm about the BSP activities are key components in contributing to students' greater integration into their professional communities at 12 months and intentions to persist at 18 months into the program. Results indicated social connections and program enthusiasm at 6 months were unassociated with science efficacy, identity, and community values. However, social connections and program enthusiasm at 12 months were generally associated with higher levels of all these variables, with science identity and community values uniquely related to greater integration. Together, results show that students' connection to faculty, staff, and peers and enthusiasm for the program activities are both key components of successful, multiyear science training programs. Our results also suggest that, while connections and enthusiasm might develop quickly, their downstream consequences might only be observed after students build stronger social relations and enthusiasm for program activities in ways that foster greater integration.

'Gift It Forward' Study Results

- Positive interactions with BSP Staff, peers, social events, etc. helped members
  - Increase their confidence in their ability to do science (*Efficacy*)
  - Increase their perception of themselves as scientists (*Identity*)
  - Increase their affirmation of scientific community values (*Values*)
  - Maintain their intentions to purse a biology related career (*Persistence*)
- All correlate with long-term success and persistence in STEM (Estrada et al,2011)

National Academic Advising Association
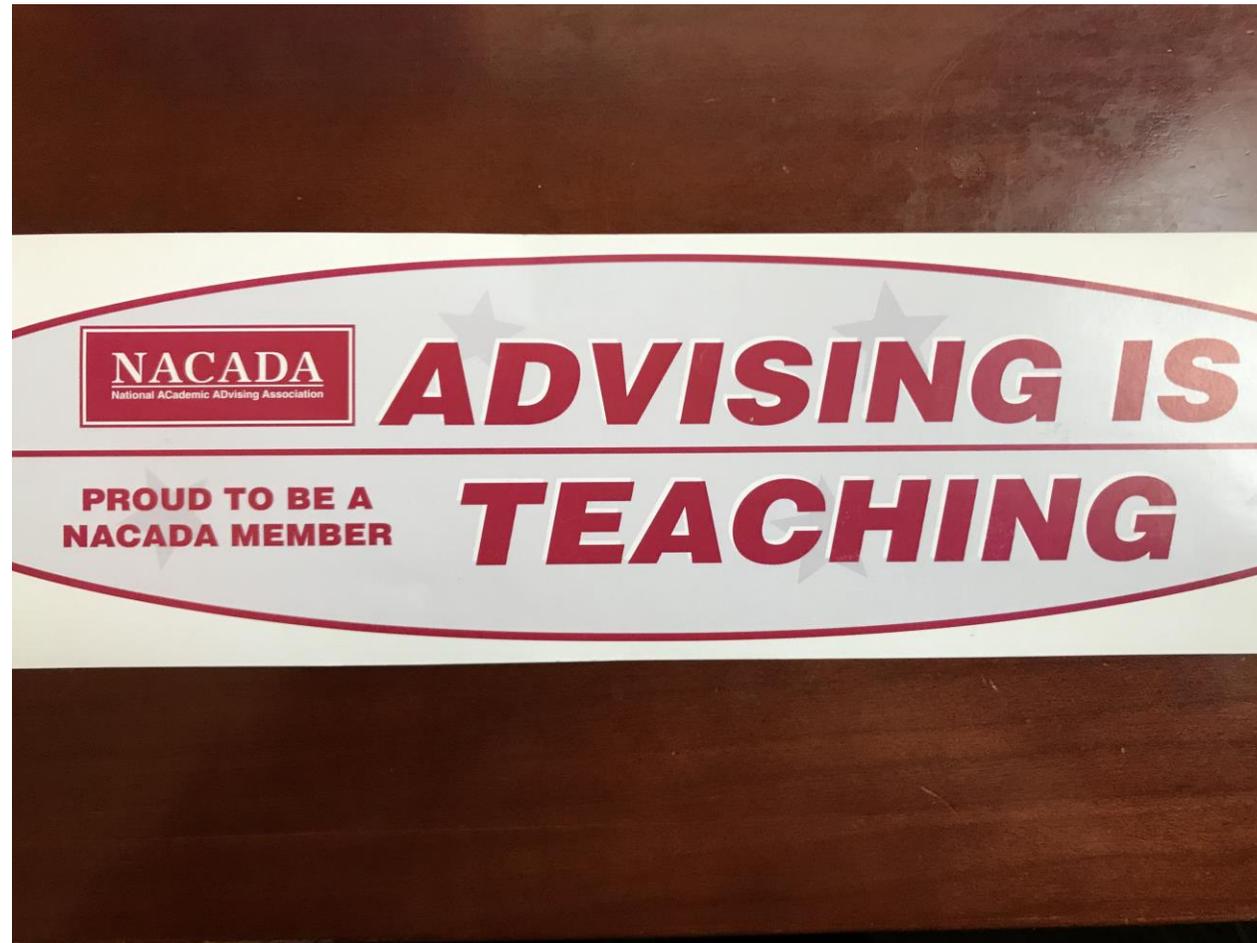
Similarities/Differences

Mentoring-Advising-Teaching

|_____|_____|_____|_____|_____|

1   2   3   4   5   6

More
Similar
than
Different

More
Different
than
Similar

BSP's Cross-Cutting Mentoring Stance

in red

1. 'Develop Talent' v. 'Skim Talent'

2. Achievement v. Aptitude

3. Opportunity/Access v. Ability

4. Growth Mindset v. Fixed Mindset

5. Strength-based v. Deficit-based

6. 'Starting Point' & 'Distance Travelled'

7. Different 'Clock' v. 'Normative' Time

8. 'Pathway B' v. 'Plan B'

Advising

What BSP Members Report
Advising outside of BSP

1. <u>Performance to date</u>
    e.g., GPA, Major, Career

2. <u>Preparation/Academic History</u>
    e.g., AP, SAT, GPA, HS/CC, Prior Courses

3. <u>Life Circumstances</u>
    e.g., Work, Non-academic Responsibilities, 'Life'

'Inverted' Advising
BSP's Approach

3. <u>Performance to date</u>
        e.g. GPA, Major, Career

2. <u>Preparation/Academic History</u>
        e.g. AP, SAT, GPA, HS/CC, Prior Courses

1. <u>Life Circumstances</u>
        e.g. Work, Non-academic Responsibilities, 'Life'

Teaching

Required BSP Course IDS c96
Studying the Biological Sciences

- Introduction to the culture of the University and University science

- Increase students' capacity to navigate and manage their interactions with the University

- Based on BSP students' FAQs and experiences

- Makes explicit the 'Hidden Curriculum' of Berkeley and culture of biology at Berkeley

- Provides 'reality checks' about their experiences and strategies to act on their own behalf

- Teaching = Mentoring

IDS c96 – Studying the Biological Sciences (F2019)
Using the Google Form Enter and Submit your Responses

1. Name 3 campus spaces that you would call a *Safe-Space* based on personal experience.

2. On a scale of 1 (Very Safe) - 4 (Very Unsafe) or 0 (no experience), rate each of the following spaces based on personal experience. Exercise your option of not replying to any item.

	Very Safe			Very Unsafe	No Experience
	1	2	3	4	0
a. Student Learning Center	|_____	|_____|_____|			0
b. Dept. Advising Office	|_____	|_____|_____|			0
c. STEM Class Office Hours	|_____	|_____|_____|			0
d. Financial Aid Office	|_____	|_____|_____|			0
e. EOP Office	|_____	|_____|_____|			0
f. STEM Discussion Section	|_____	|_____|_____|			0
g. STEM Research Lab	|_____	|_____|_____|			0

3. Briefly explain what makes a space safe for you. Unsafe for you. Remember your option to not reply.

Summary
Unsafe and Very Unsafe Spaces
Calculated percentages minus those without experience

	Unsafe (U)	Very Unsafe (VU)	TOTAL (U + VU)
EOP Office	0.0% (0)	0.0% (0)	0.0% (0/56)
Learning Center	16.7% (10)	1.7% (1)	18.4% (11/60)
Dept. Advising	20.3% (12)	6.8% (4)	27.1% (16/59)
Financial Aid Office	44.2% (23)	3.8% (2)	48.0% (25/52)
STEM Office Hours	49.0% (27)	9.1% (5)	58.1% (32/55)
STEM Disc Sections	50.0% (31)	9.6% (6)	59.6% (37/62)
STEM Research Labs	27.0% (4)	40% (6)	67.0% (10/15)

Progression to an Inclusive Institutional Environment
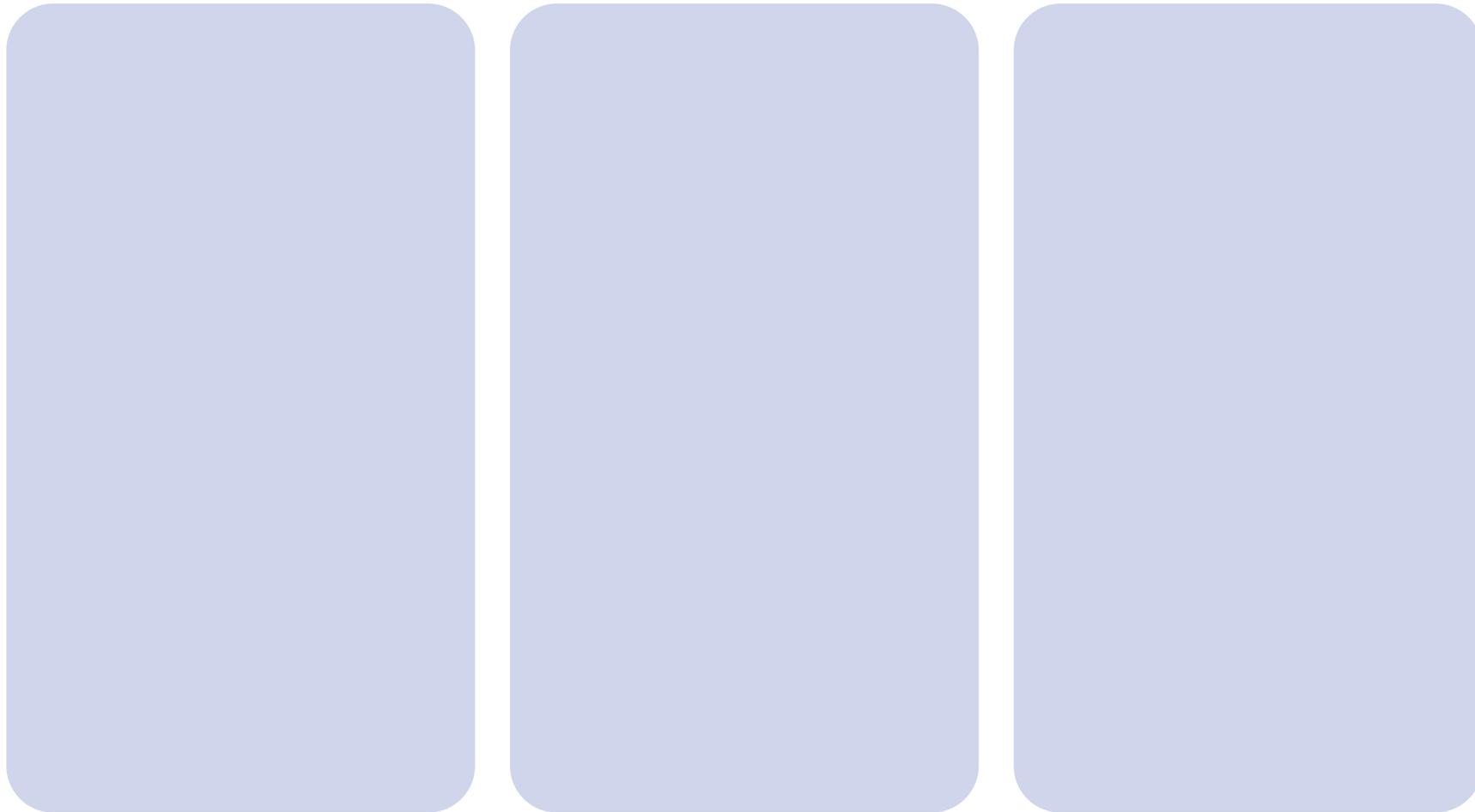
Progression to an Inclusive Institutional Environment

Prejudiced Institutional Environment	Ambiguous Institutional Environment	Inclusive Institutional Environment

The Influence of Affirming Kindness and Community on Broadening Participation in STEM Career Pathways.
Estrada, Eroy-Reveles, & Matsui, *Social Issues & Policy Review* (2018)

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Progression to an Inclusive Institutional Environment

Prejudiced Institutional Environment	Ambiguous Institutional Environment	Inclusive Institutional Environment
High Macro Aggression		
High Micro Aggression		
Low Macro Affirmation		
Low Micro Affirmation		

The Influence of Affirming Kindness and Community on Broadening Participation in STEM Career Pathways. Estrada, Eroy-Reveles, & Matsui, *Social Issues & Policy Review* (2018)

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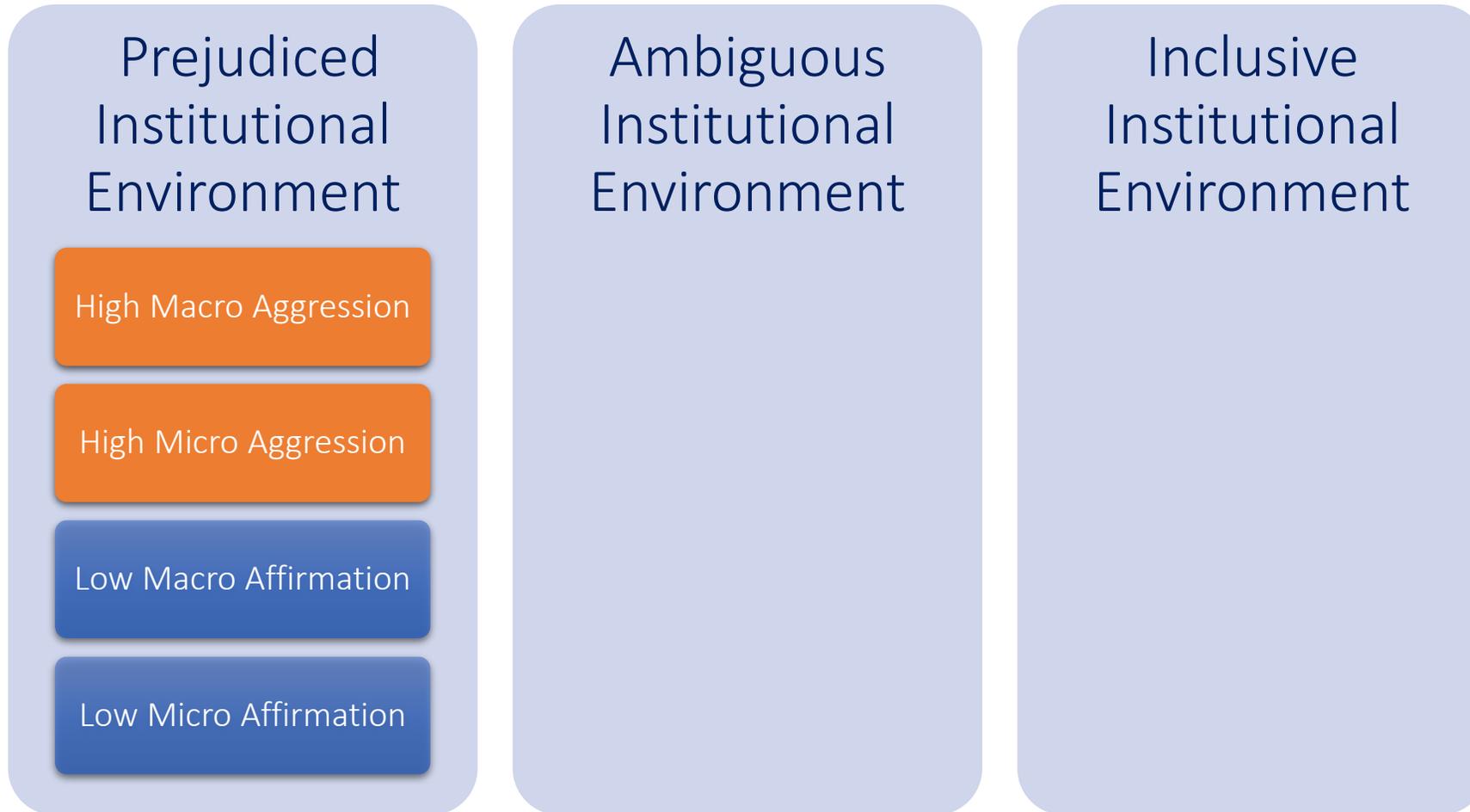# Progression to an Inclusive Institutional Environment

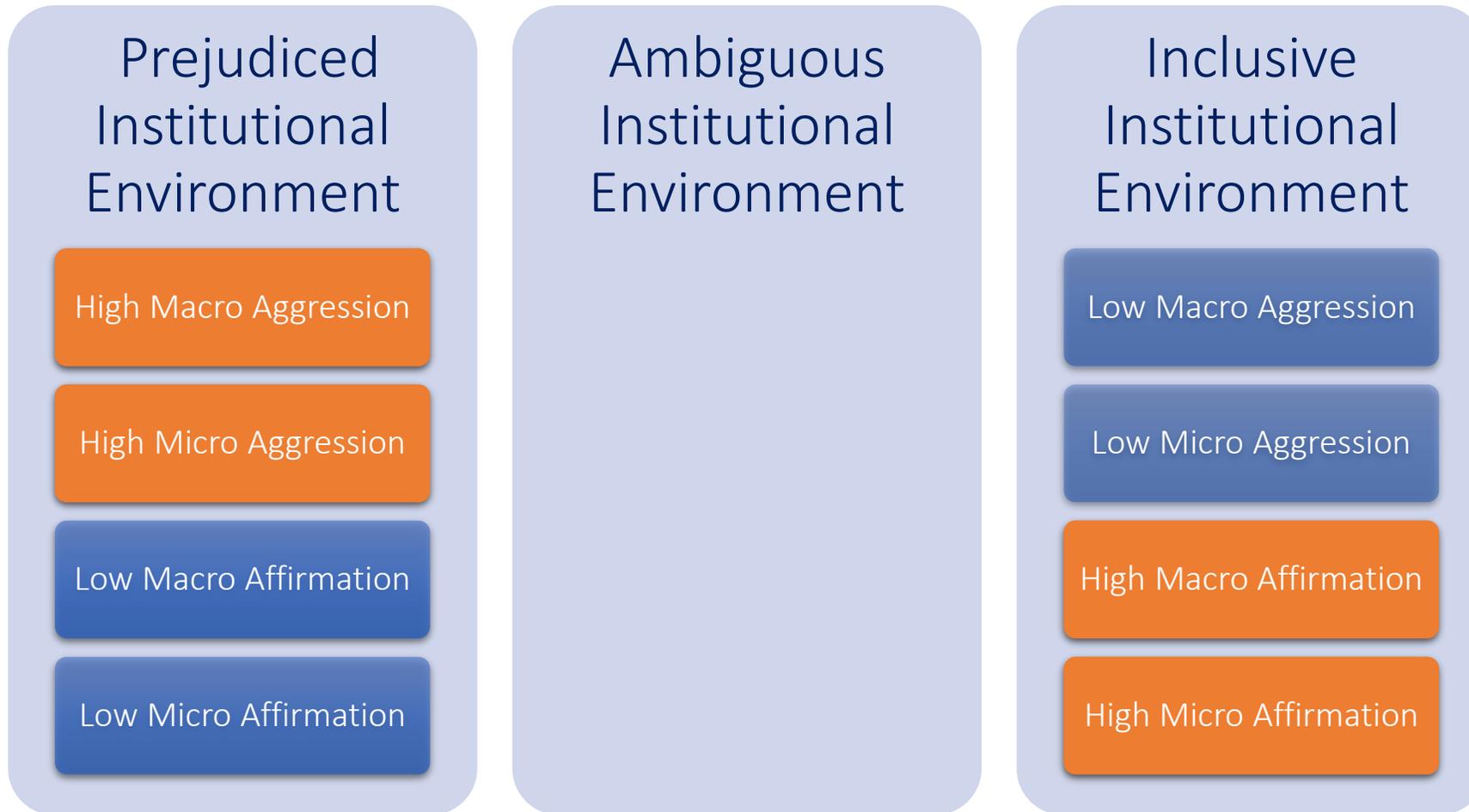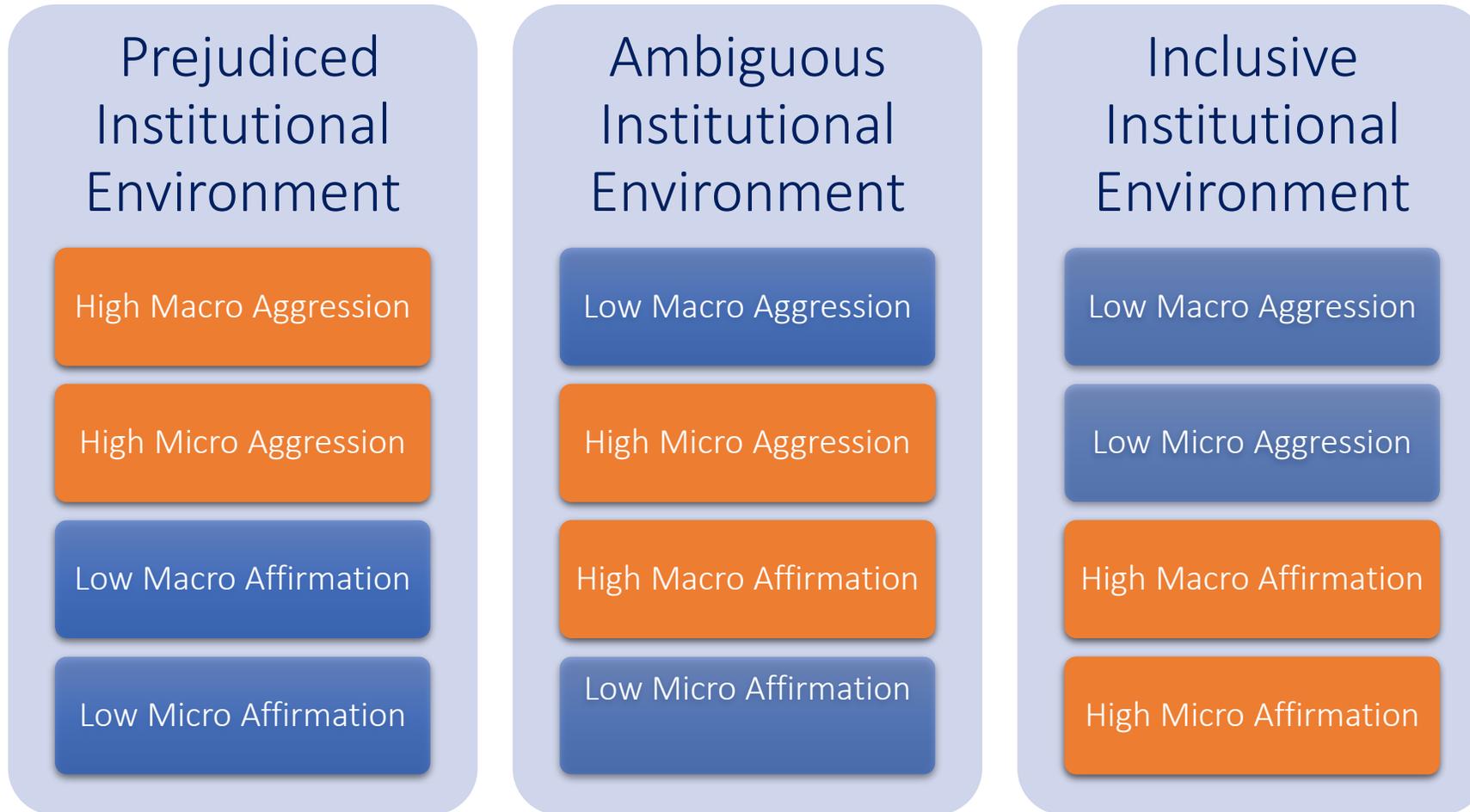| Prejudiced Institutional Environment	Ambiguous Institutional Environment	Inclusive Institutional Environment
High Macro Aggression		Low Macro Aggression
High Micro Aggression		Low Micro Aggression
Low Macro Affirmation		High Macro Affirmation
Low Micro Affirmation		High Micro Affirmation

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High Micro Aggression	High Micro Aggression	Low Micro Aggression
Low Macro Affirmation	High Macro Affirmation	High Macro Affirmation
Low Micro Affirmation	Low Micro Affirmation	High Micro Affirmation

The Influence of Affirming Kindness and Community on Broadening Participation in STEM Career Pathways. Estrada, Eroy-Reveles, & Matsui, *Social Issues & Policy Review* (2018)

Consider this statement

Effective mentoring is obvious when you see it and experience it. Less obvious is how to be an effective mentor to individuals from cultural, economic, and experiential backgrounds different from yours.

How do we go from describing to practicing 'Good' Mentoring?

'Good' Mentoring
From Concept to Practice

- <u>Cultural Humility</u> *vs*. <u>Cultural Competence</u>

  Listen and Learn *vs*. Assume and Generalize

- <u>Growth Mindset</u> – 'Talent Development' *vs*. 'Brilliance'

- <u>Competition</u> – We Win (Communal) *vs*. I Win (Individual)

- <u>Space and Time</u> to
  - Develop Talent
  - Develop Academic Identity that aligns with Personal Identity
  - Identify/Work toward Career – Intrinsically interesting. Make a Living. Positively Impact their World

So, what is BSP?

- 'Academic Support' Program

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- 'STEM Equity' Program that identifies/fills Institutional Gaps

- Where 'Outsiders' can learn through 'Good' Mentoring how to navigate STEM's 'Hidden Curriculum'

- Institutional 'Workaround' – a 'free pass' for Berkeley to maintain the status quo
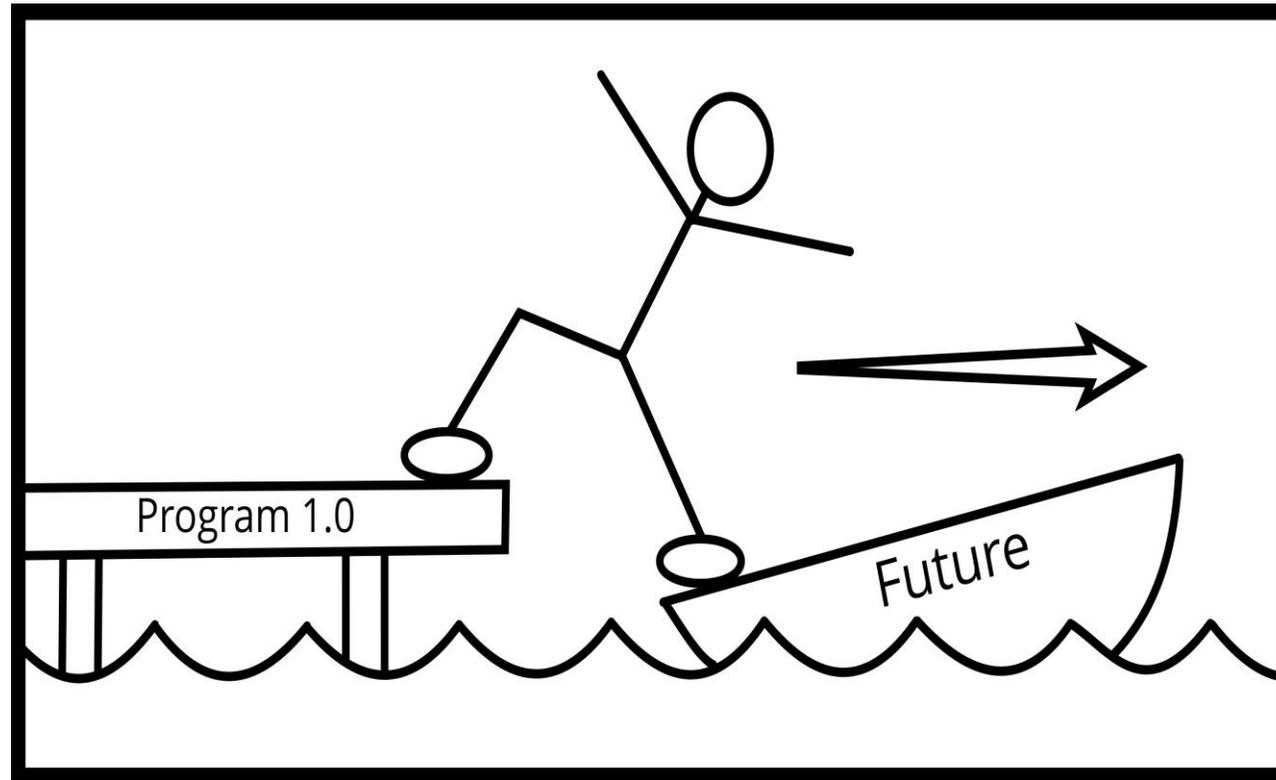
'Crisis'
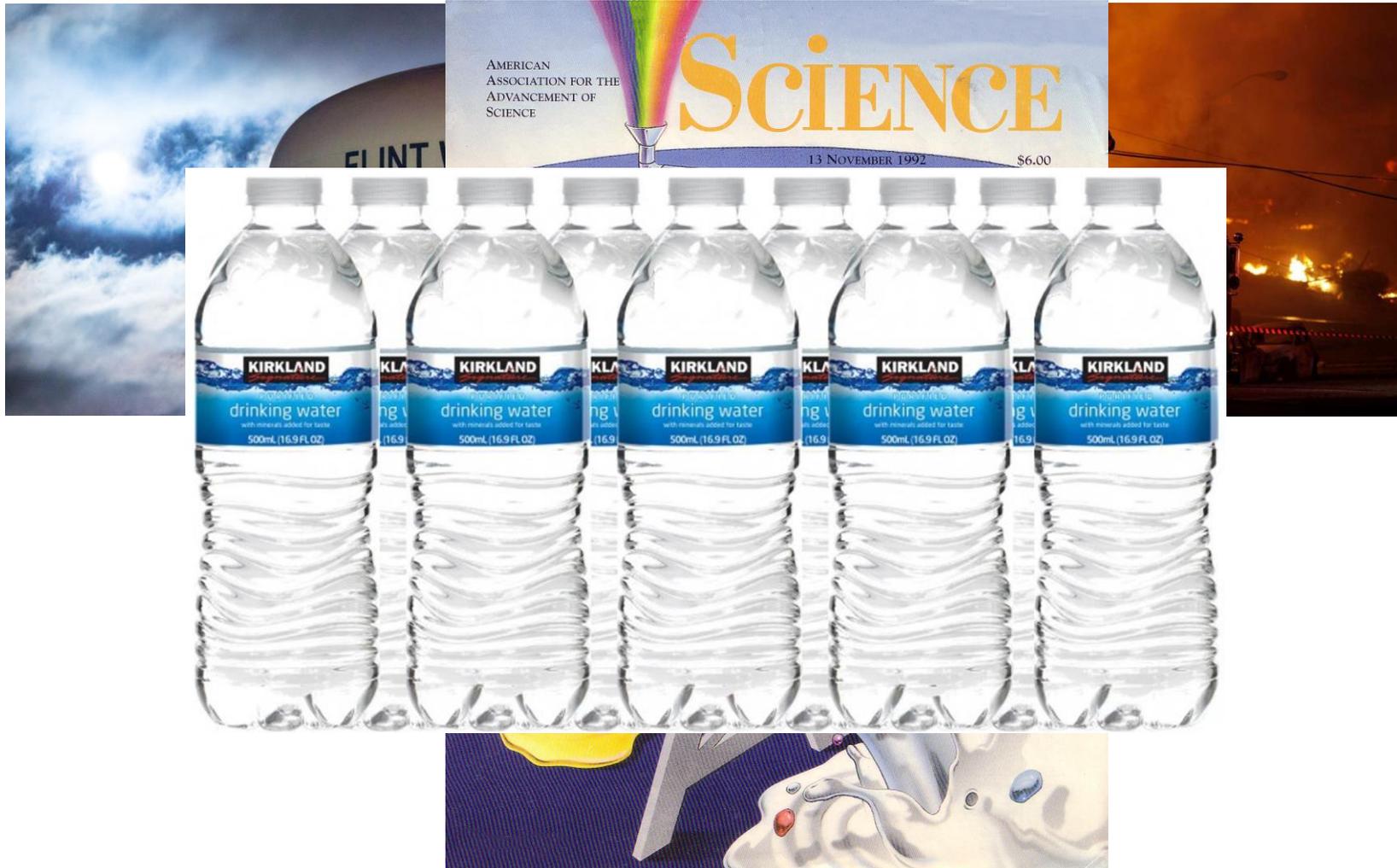
'Program 1.0'

Workarounds for 'Outsiders' to succeed
in a system not designed with them in mind

Need to Transition

Graphic by Brook Yu

Back in The Day ...

Back in The Day …

Today

Updated E&I Thinking

- Underrepresentation and Achievement Gaps are NOT the problem
- Rather = Symptoms
- <u>The Problem</u> = the system of practices, policies, attitudes, etc. that produces Underrepresentation and Achievement Gaps
- <u>The Solution</u> - 'Fix' our institutions, not our students

Institutional Change Initiatives
Some examples

- NSF ADVANCE – *Organizational Barriers Impede Equity*

- NSF INCLUDES – *Social Innovation, Scaling, Communities, Partnerships*

- NIH BUILD and NRMN – *Infrastructure, Networks, and Consortia*

- HHMI Inclusive Excellence – *Institutional Change*

- HHMI Driving Change – *Institutional Change*

'Program 2.0'
Our Thinking about 'Program' also Needs Updating

- <u>Think Beyond</u>
  - 'Super-Sizing' – larger programs with more members
  - 'Franchising' – replicating programs on campus and elsewhere
- <u>'Incubators' and 'Labs'</u> – develop approaches to advising, teaching, and mentoring that close equity gaps
- <u>Help Institutions</u>
  - Be the 'Program'
  - Using 'best' program practices that can be scaled, adapted, and sustained institution-wide
  - Support <u>all</u> students, especially those from under-represented groups

Institutional Change

Must be Data Driven

- Institutional Self-Assessment is critical
    - What resources exist
    - What's missing
    - 'Institutional Readiness' – Excellence through diversity (Nivet, 2011)
- Institutional Data = critical yet a universal challenge
- Must be disaggregated to understand
    - What works
    - For whom
    - Under what conditions
- Use *Quantitative and Qualitative* Data to interrogate the 'Narrative of Success'
- However, Data = *Necessary but not Sufficient*

Institutional Change

In Order to Adapt and Scale - 'What Works'

- Efforts must align with campus initiatives: upper admin political support and funding

- 'Champions' are critical

- Value Proposition – WIFM/'Carrots & Sticks'

- 'Marathon not a Sprint' – need distributed leadership and responsibilities; take the long-view; succession plan

Institutional Change

<u>Relevant Models</u>

- ADA (Americans with Disabilities Act) and Universal Design

- CBPR (Community Based Participatory Research)

- Which STEM Equity Models to Scale? – Must be
    - Inclusive
    - Generalizable
    - Cost Effective
    - Sustainable
    - Such as BSP

Institutional Change

Challenges & Barriers Abound

- History of Race, Power, Privilege
- Myths – Success, Meritocracy, Objectivity of Numbers, etc.
- 'Fairness' Often Comes Up – When do we start being fair?
- Institutional Roles – e.g., Research Scientists v. Program Staff
- Rewards & Consequences
- 'Success'
- Time and Resources
- And the list goes on …

Dr. Maya Angelou

4.4.28 – 5.28.14

"I've learned that people will forget what you said, people will forget what you did, but people will never forget how you made them feel."

'Continue'
a paraphrased version dedicated to my students

My wish for BSP members, past, present, and future is

To continue

    To be who and how they are

    To astonish a mean world

    With their acts of kindness

For them to continue

    To remind the people that

    Each is as good as the other

    And that no one is beneath

    Nor above them

'Continue'
a paraphrased version dedicated to my students

For our members to continue
> To let gratitude be the pillow
> Upon which they kneel

And finally, for BSP members to continue
> To dare to love deeply
> And risk everything
> For the good thing

And by doing so
> They and their work
> Will be able to continue
> Eternally

Thank You