# Advancing Institutional Change and Inclusive Science



## Sylvia Hurtado, Professor UCLA GRC Conference June 23rd, 2019



HIGHER EDUCATION RESEARCH INSTITUTE AT UCLA HOME OF THE COOPERATIVE INSTITUTIONAL RESEARCH PROGRAM



# **Overview**

#### Institutional Transformation



#### **Post-Baccalaureate Outcomes**





- National project focusing on students and then moving towards understanding institutional change among productive institutions
- Mixed method study and case studies of
- institutions (unpublished)



Discussion of new directions, models and resources

# Following Student



SCIENCE 🗢 TECHNOLOGY 🗢 ENCINEER ING 🌣 MAIL





# Of students who aspired to major in the biological sciences in the beginning of their freshman year, what is their final major?



#### **Biomedical Science Completion versus Completion in** Another Field of Study 6th year (30, 614 biology aspi

296

colle

Prior Preparation	
Average high school GPA	+
Student-centered pedagogy factor (faculty survey)	+
SAT composite score (100)	+
Years of HS study: Mathematics or Biological science	+
Entering Aspirations and Expectations	
Communicate regularly with professors	+
TFS Academic Self-Concept	+
Ph.D./Ed.D. degree aspiration	+
Medical degree aspiration	+
Grading on a curve (faculty survey)	-



#### Proportion of STEMH Bachelor's Degree Holders on a STEM or Healthcare Career Pathway, by Race and Gender, 2016

■ Left STEMH ■ Healthcare

AAPI women (n=183)

AAPI men (n=143)

White women (n=775)

White men (n=609)

URM women (n=244)

URM men (n=167)



STFM

# Advancing Organizational Learning and Institutionaal Change in

ZE 🗢 TECHNOLOGY 🗢 ENGINEERING 🗢 MAT





QUANT Stochastic Frontier Analysis → efficiency scores → Selection of 11 diverse institutions with high efficiency scores

#### **SITE VISITS**

web scraping → 15-25 interviews per site (faculty, senior administrators, STEM program directors

#### CODING

wrote case study reports → Coded transcripts: open coding, axial coding, team inter-rater reliability 85%

#### ANALYSIS

cross-case analyses using matrices, institutional reports, codes, team discussions until themes became salient

# Theory: Institutions As Learning Organizations

A Learning Organization Is:

"an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights" (Garvin, Harvard Business Review, 1983p. 80).



# Elements Of Organizational Learning and Transformation: Knowledge Cycle



Leadership Support

# **Changing Mindsets: Grading Practices**

One of the biggest challenges...what I saw early in my career here is people said that my job was to 'profess' and students would learn or they wouldn't. And it's breaking that mindset—that we are here to facilitate learning, not just teach... Because if you think about a bell curve, it makes teaching improvement irrelevant because the same proportion of students are going to fail or get a C, no matter what you do... So, if you're really measuring what students learn and have a sense of what they should know at the end of a class – there should be grades actually improving through time... those are things that remain challenges in some pockets here." -Biology Professor/Dean



#### **Pedagogical Experimentation and Achievement Data**

I use interactive methods and hands-on methods from the physics education research...There are a lot of demos... They're making observations and forming ideas based on what they're actually seeing such that the knowledge is coming from that experience and it's created by them.... When I was hired here, I think they just needed someone to teach physics... I have student achievement data and [students] are doing well... I use [the data] to inform my instruction. I want to see that students are actually learning...and I'm trying to teach in a way so that they will learn physics on a deeper level.



### **Training Focused on Improving Student Learning**

I wasn't happy with the learning gains [my students] were making. I knew some people were getting it but I wanted almost *everybody* to get it. I think it was only after I started going to [the discipline-based education research meetings] that I started reading [about undergraduate STEM education reform and research] and started going to [the Center for the Advancement of Teaching] workshops. I started moving further and further away from lecture ... my golden chance came when I got the HHMI Fellowship and [the dept. gave me] my own learning assistants. At that point I said, 'okay this is my opportunity to show that if the learning assistants are there in class every single day, it can mean a huge difference.' And it did.

- Female Chemistry Professor



#### Evidence of Classroom Innovation for Institutional Buy-in

I had a statistician from the [Center for Teaching and Learning] working on it and it was clear that something good was going on. The Center wrote up a one page report and so I have to credit [an instructional consultant] in the center, who...sent it up the chain of command. He sent it to the provost right away. And they noticed, the chancellor, the provost, the deans they all noticed. And it got a lot of attention, but I kept feeling nervous like 'This isn't even published yet.'

Director of Instructional Innovation for the College of Arts and Sciences & Chemistry Instructor



#### **Connecting Efforts and Outcomes for Faculty Buy-in**

You have to have faculty who are able to be motivated, and there was a lot of discouraged faculty. But when you make a change and [and have data that shows] it works, people get encouraged by seeing the change working. So I think you have to talk that [change] up. You have to talk to your faculty and say, "Look here's what we're going to do, and here's going to be the outcome," and then when the outcome happens remind them that the outcome is connected to the change.

> Professor and Chair of Physics and Astronomy



#### Diffusing Knowledge to Scale and Sustain Change

Each semester, those of us engaged in this [course reform and active learning effort] make a list of who our potential targets are ... So we're trying to build up a cohort of about a third to a half of the department who has gone through this apprenticeship process [in active learning]... We don't expect to get 100% [of the faculty trained]. We expect to grow over a steady state as more young people come in because we have the expectation that every tenure track faculty member will teach a large enrollment course before the tenure decision is made. **Physics Professor** 



## Leadership Support

You have to be in [the change process] for the long run. They take a while, but it isn't something that just happens with one person, but it does require both commitment from the top down and excited ideas from the bottom up. The bottom up being faculty... the people that are doing it... And at big public universities, people don't have a lot of extra time [to do new innovative things to change their teaching]... So finding ways that you can do little things like extra support when they put a grant and you make those matching funds...That kind of recognition I think has a huge impact. And then I think if you're going to get new faculty hires to actually care about it, allowing them to care about it and have that not be considered something that goes against them in tenure.

#### **University Chancellor**



#### CASE STUDY PAPERS ON:

- How Institutions Are Leveraging Resources
- Perspectives on Talent Development and Strategies for Cultivating Talent
- Program Directors as Change Agents: Forms of Institutional Support and Strategies for Initiating Change



## Advancing Institutional Practice: Convergence of Commitment to Diversity and Science Training



## **Central NIH DPC Goal and Evaluation**

The primary goal is to increase participation rates of diverse researchers from college entry to career attainments and R01 applicants

#### **NEXT FIVE YEARS:**

BUILD campuses have a diverse student body and are expected to increase the number pursuing biomedical careers, extending to two new BUILD sites

NRMN will expand research coordination mentors and mentees trained and engage in biomedical research

PROGRAM

ERSIT

Increased Participation of Diverse Researchers



## Conclusion

Institutions collect a lot of data on students and faculty that can be put to use for improving STEM education. Institutions can strategically use these data for change.

Not only is evidence needed regarding student achievement during college, but we also need to understand what happens to STEM graduates when they leave—about 25% do not enter the STEM workforce or attend graduate school immediately after completion.

Advancing research and practice to all career stages with concerns of advancing diversity at all levels.





# **Resources for Evidence-Based Practice**

#### Local

- Teaching and Learning Research Centers
- Education and Social Science Researchers collaborations with STEM innovators, external evaluators
- NSC data for term to term completion, by major *National*
- National Research Mentoring Network (training and metrics)
- Understanding Interventions-sharing hypothesis based evidence on interventions in STEM, new journal
- NIH Diversity Program Consortium
- AAC&U Project Kaleidescope



#### **Contact Us**

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#### Papers and reports are available for download from

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