Advancing Institutional Change and Inclusive Science NCAPP POGIL Conference

Sylvia Hurtado, Professor UCLA June, 2019



I 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



Discussion of new directions, models and resources



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)	-



Advancing Organizational Learning and Institutional Change in

DE 🗢 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



Changing Mindsets: Cultivating Talent

Greater engagement with students resulted in broader conceptions of talent: Traditional Metrics Eagerness and Passion for STEM Thirst for Knowledge and Skill Development Grit/Stick-to-it-tive-ness Ingenuity/Creativity Acuity (get it quickly)

Cultivating Asset bundles:

Science socialization-opportunities for science work Network expansion-connecting students with opportunities, information, and people Material resources-scholarship support, less expensive course materials

Findings: Becoming a Scientist

Faculty Recognition

I had a good experience with my PIs [principal investigators] just because they made me feel like...as an undergrad, you kind of feel like on the bottom of the food chain and they kind of believe in you and say, "Yes, you can do this. I'm giving you this project to do and I know you can do it." *So it kind of builds your confidence and just them believing in you makes you feel like you can actually complete the project, because you can.* (Latina undergraduate)

Source: Hurtado, S., Cabrera, N. L., Lin, M. H., Arellano, L., & Espinosa, L. (2009). Diversifying science: Underrepresented student experiences in structured research programs. <u>Research in Higher Education, 50</u> (2), 189-214

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



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



Institutional Support for Talent Development

Structures Resources





Policies



Culture

Physical Spaces

New positions/job responsibilities

Distinguished teaching groups

Funding to Institutionalize or Match Grants

Seed Grants

FTE or additional faculty support

Course Release Time

Peer Learning Assistants Merit and promotion

Research requirements

Norms

Expectations

More people accepting TD as part of their daily work Having a regular learning lab releases time from faculty office hours, which can only accommodate very few students:

Structure: Physical Spaces for Advanced Learning

It would be really hard to not have the lab. I mean, it would bring a lot more people into the offices, but faculty only have certain times, so I just think [students] would be pushed out and not have a place to go. I think, beyond just getting help through your homework and learning the concepts, there is a really nice community in there...so there's 35 hours where students are often just coming in there, like I was in the building, I just got out of my class. I'm gonna hang out here and do my math homework or study. They all meet each other. It's just everyone's doing math. It's a really beautiful space. The community formed among students meeting each other that are also doing math and forming study groups is really cool.

-Math Lab Director, Southern

rivate University (HSI)

Resources: Peer Learning Assistants

Department provided Peer Learning Assistants to improve learning

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---Chemistry Professor, University of the Southeast

Better Monitoring of Faculty Impact on Students:

Policies on Merit, Promotion, and Tenure

So in this department, I renovated our pay, our raise methods when I took over. It had been a little loose... see our committee [in the past] looked at your research first, gave you points for that, and then they just looked at your teaching evaluations. Well, I made a set of **five areas for rewards, about three of which are teaching.** So they included how many do you teach . This is a proxy for teaching large sections. So one of my five areas is: what's the– just the **quantity. In other words, are you developing new courses? Or, are you just teaching the same thing you did for 20 years? And another one is are you mentoring graduate students?**

---Physics Department Chair,

University of the Southeast

Research Requirements

Provides Faculty with structured time to mentor a student for two years to conduct a research project

Yeah, so like I said, maintaining support for our research sequence, I think that's the most important thing we do. I think that is really the signature aspect of our program that not only sets it apart, but really makes it unique. Without it, I don't know what I could tell students what's special about [math]. When I meet with prospective students or incoming firstyear students, that's the thing I tell them about is our research sequence and going to conferences and presenting at conferences, and how much of a difference that makes, even if you're not going to graduate school. --Associate Professor, Math Department, Southern Private University

(HSI)

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



Diversity in Science to Engage Student Interest

Building on URM students' prosocial values to address career goals, students may be attracted to science if they can understand the benefits for their communities

Diversity Innovations in Science Curriculum involves health disparities research

New research questions are posed that address diverse populations, creating innovations in science *University of Alaska, Fairbanks*



Emerging Culturally Aware Practices in Science

Knowing their students identities as lowincome, first generation and URMs

Asset-based approach to learning and training for science UTEP

Inclusive Classroom Practices: Active learning reduces disparities and authentic science experiences at early stages creates greater ownership of the production of scientific knowledge

Training in Culturally Aware Mentoring NRMN

Culturally Aware Practices





Acknowledging Identity-development

Integrated race/gender and science identities Enhanced science identity (competence, performance, and recognition) now measured at key points in career trajectory

Emerging diverse scientists with leadership capacity in their fields

Cadre of faculty mentors better trained to sustain URM participation





Conclusion

Broader conceptions of talent emerge from greater engagement with students, understanding the whole student to develop their assets. Make a case for faculty support in talent development activity.

Continue to use evidence of practices that enhance student achievement in our classrooms, increasing organizational learning for student success.

Advancing inclusive science to address diversity and underrepresentation in important career fields.





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