

**Institutional
Policies & Practices
that Support
Undergraduate STEM
Talent Development:
Lessons from
Exemplar Institutions**

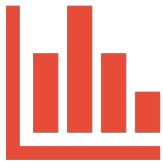


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Understanding Interventions
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Overview



National interest in institutional transformation, how data/evidence informs organizational learning for change within institutions



Institutional examples of change agents from 11 case study institutions



Implications for gaining institutional support



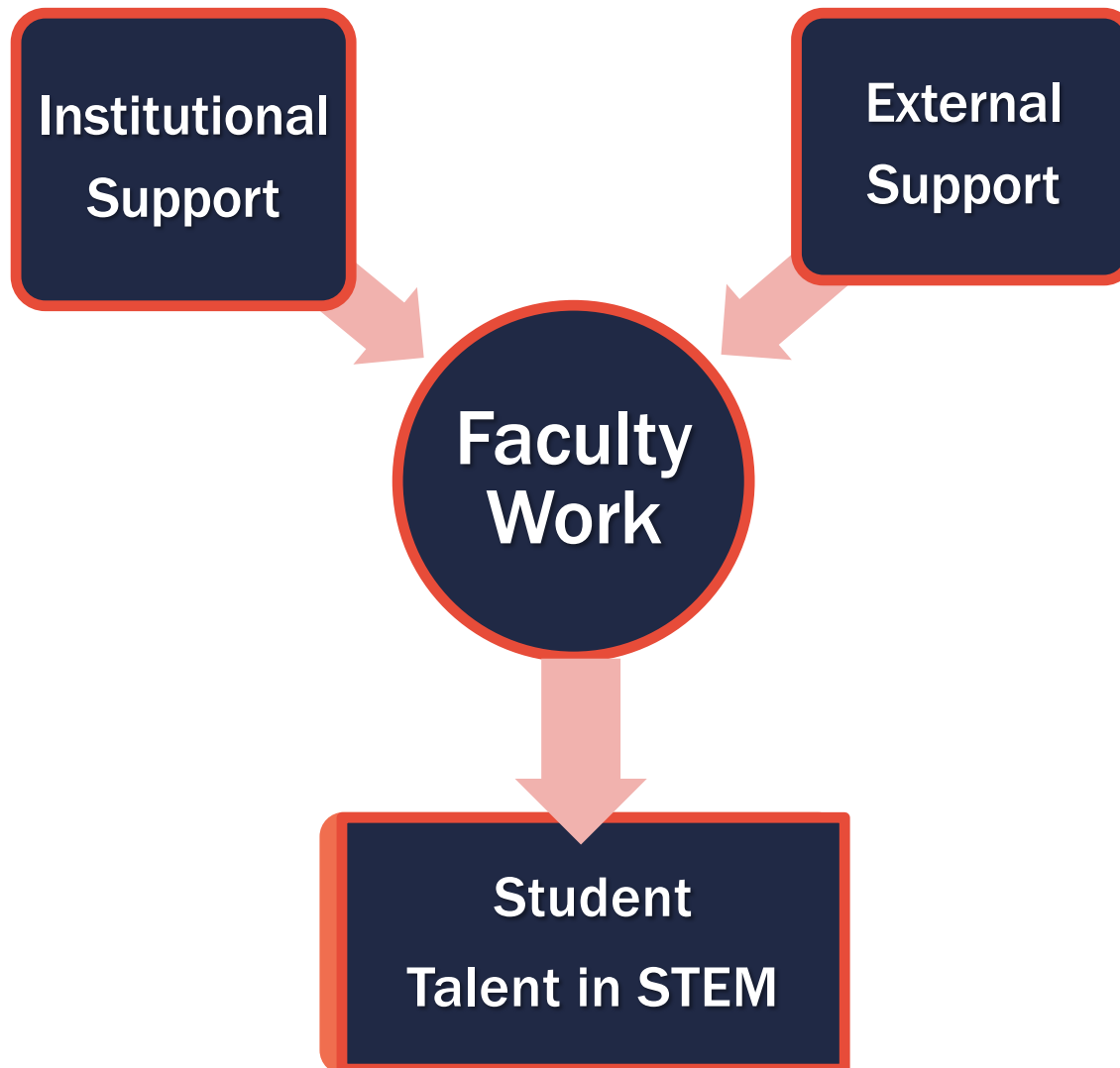
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Purpose



Identify what **institutions** do to support **faculty** efforts to cultivate undergraduate STEM talent, particularly for URM students

Conceptual Framework



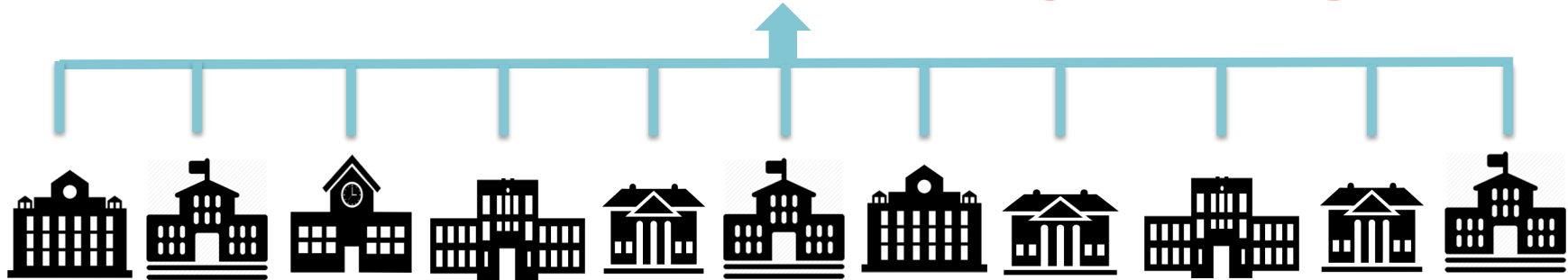
Methods



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Methods

Multiple Case Study Design



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

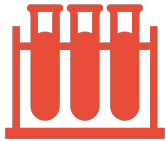
cross-case analyses using matrices, institutional reports, codes, team discussions until themes became salient

Institutional Pseudonym	Control	MSI Status	Classification	STEM Bachelor's Degree Efficiency Score
Southeast State University	Public	HSI	Doctoral Universities: Highest Research Activity	.82 Latinx .53 Black .35 American Indian
West Coast State University	Public	HSI	Master's Colleges & Universities: Larger Programs	.83 Latinx .37 American Indian .27 Black
East Coast State University	Public	HSI	Doctoral Universities: Higher Research Activity	.81 All STEM
Southern Private University	Private	HSI	Master's Colleges & Universities: Larger Programs	.65 Latinx .35 American Indian .12 Black
Central Plains University	Public	Am. Indian serving	Doctoral Universities: Higher Research Activity	.96 American Indian .44 Latinx .35 Black
Northern Mountain University	Public	Am. Indian serving	Doctoral Universities: Higher Research Activity	.94 American Indian .75 Latinx .25 Black
Atlantic Southern University	Public	HBCU	Master's Colleges & Universities: Medium Programs	.89 American Indian .84 Black .52 Latinx
Mid-Atlantic University	Private	HBCU	Doctoral Universities: Higher Research Activity	.81 Black & All STEM
Western Private College	Private	PWI	Baccalaureate Colleges: Arts & Sciences Focus	.73 All STEM
University of the Southeast	Public	PWI	Doctoral Universities: Highest Research Activity	.79 All STEM
Midwest State University	Public	PWI	Doctoral Universities: Highest Research Activity	.75 All STEM

Faculty Work that Cultivates Talent



Teaching- Classroom pedagogy, quality and quantity of students served



Mentoring- Formal and informal research training



Program or campus-wide leadership roles



Intervention Coordination

Findings



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Institutional Support for Talent Development



Structures

Physical Spaces

New positions/job responsibilities

Distinguished teaching groups



Resources

Funding to Institutionalize or Match Grants

Seed Grants

FTE or additional faculty support

Course Release Time

Peer Learning Assistants



Policies

Merit and promotion

Research requirements



Culture

Norms

Expectations

More people accepting TD as part of their daily work



Structures

Physical spaces

New positions/job responsibilities

Distinguished teaching groups

Structure: Physical Spaces for Advanced Learning

Having a regular learning lab releases time from faculty office hours, which can only accommodate very few students:

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 Private University (HSI)



Resources

- **\$: Funding to Institutionalize or Match Grants**
- **\$: Seed Grants**
- **\$: Money Directly to Students**
- **Human Resources: FTE or Additional Faculty Support**
- **Human Resources Peer Learning Assistants**
- **Time: Course Release Time**

Resource: Peer Learning Assistants

Department provided Peer Learning Assistants to improve 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.

—Chemistry Professor, University of the Southeast

Resource: Funding to match grant \$

Supporting Faculty change agents by matching funding to institutionalize or increase capacity of a grant-funded program

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, University of the Southeast

Resource: Funding for Student Research

Supporting Faculty by providing funding for students to do research and travel to conferences with faculty

I would say giving them opportunities and resources while they're at [Western Private], we go above and beyond. I mean if a student wants a specific research opportunity or present at a specific conference, even if it's on another continent, yes. We allow them to do that. If faculty want to do some work with students, we provide financial resources to do that as well.

In terms of research opportunities over the summer, in STEM, at other institutions, we help financially with that. By financially I mean airfare, room and board if they need money for food and whatnot.

—STEM faculty, Western Private University



Policies

Merit and Promotion

Research Requirements for Major



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Policies on Merit, Promotion, and Tenure

Better Monitoring of Faculty Impact on Students:

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?** So of the five things that I have on this map—, the other two by the way are *grant funding*. And also I do have [research]. But of the five [areas of rewards], these three are teaching.

—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 first-year 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)



Culture

Norms

Expectations

Bringing Talent Development into Daily Work



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Culture: Talent Development Norms

Part of the Culture for Faculty to work with undergraduate students on research

Interviewer: There's so many students within your department. How many do you think get a research experience before they graduate?

Associate Dean: I would say college-wide and in my department, it's probably about 75 percent. I don't have the stats.

Interviewer: Do you think most faculty here work with undergraduates on research in your department?

Associate Dean: Yes. I would say 100 percent. This is part of the culture.

Interviewer: Of the entire institution or the department?

Associate Dean: The college [of life sciences].

–Midwest State University

Conclusion & Implications

Upper level administrators support program directors and faculty in talent development activities.

A comprehensive, multi-prong approach is needed for the talent development of students – one intervention alone will not drive enough change.

Administration can do their part by:

- Creating structures that give faculty influence and support to disseminate practices that cultivate STEM talent
- Reallocating resources to support faculty in sparking innovative practices in and out of the classroom
- Using incentives (monetary or via policies for promotion and tenure) to expand the pool of faculty that can cultivate STEM talent

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