

# STEM Faculty @ Exemplar Institutions: Perceptions of Talent & Teaching Practices

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## Framing of Study

- The classroom environment significantly shapes students' interest and academic success in STEM disciplines.
- Students, however, often confront STEM courses that are characterized by a reliance on lecture and passive learning, a lack of cultural relevancy, and a limited application to the real world.
- Such teaching practices result in low levels of student engagement in class; many students subsequently fail or lose an interest in STEM.
- These teaching practices have an especially adverse impact on underrepresented racial minority (URM) students, who are the least likely to persist in a STEM major.
- Since faculty decide which pedagogical practices to use in the classroom, a great deal can be learned from faculty teaching at "exemplar institutions" – institutions that have a better than average ability to produce STEM degrees among URM students relative to campuses that have similar resources.

## Purpose

The purpose of this study is to examine:

1. Faculty perceptions of student talent – or what faculty believe it means to achieve within a STEM classroom.
2. How their perceptions of talent correspond to their teaching practices.
3. Whether institutional context influences the way faculty perceive talent at their respective institutions.

## Contribution

This research contributes to an understanding of how institutions leverage faculty behavior to become more efficient in producing STEM bachelor degrees among URM students.

## Method and Sample

### Data Cases:

- 6 "exemplar institutions"
  - 2 Hispanic-serving institutions, 1 historically Black college, 2 selective predominately White institutions – one small and one large, and 1 Native American-serving institution.

### Sample:

36 STEM faculty across 6 institutions

### Analyses:

- Each institution was treated as an individual comprehensive case with data first open coded and analyzed for emergent within-institution themes.
- Cross-case analysis followed to allow for the comparison of commonalities and differences and to synthesize the information gained from each individual study.

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## RQ1: Definition of Talent is Shaped by Faculty's Understanding of the student population, including challenges & needs.

- Findings suggest that faculty understood that low academic performance may be a sign that students faced structural barriers to achievement (i.e. long commutes, disproportionate K-12 educational resources) or that a life event (i.e. death or job layoff in the family) is preventing students from better academic performance.
- Therefore, faculty seldom used standard academic achievement indicators (i.e. grades, test scores) to identify "talented" students and instead conceptualized talent as a fluid, developmental characteristic that many or most students can possess.
- Instructors seemed to also be reflective of the connection between their teaching practices and students' ability to perform well in their course.
- These reflections led many faculty to experiment with a variety of innovative course formats and instructional pedagogies in an effort to promote active learning and to also meet learning goals that go beyond the mastery of course concepts.

I think the big thing is changing ... this attitude towards survival of the fittest – just pick the best kids from the best high schools... They will do great... [But] so many more [students] can be successful in [STEM] if they had the good preparation [and] if they have all the good things that we know that [students] need to actually be successful – so let's do it.... We (the faculty) are here to help [students] succeed. So that is what [our institution] is doing really well.... [Faculty] are actually implementing [the best practices] that we know are out there and actually saying, "[Students] should all be able to be successful in whatever area [they] want to be in." So we (i.e. the faculty and institution) have to make it possible.  
– Physics Instructor, HSI

## RQ 2: Definition of talent varies & is often (but not always) related to the pedagogical practices used in the classroom.

**Most restrictive definition of talent is related to traditional instructional methods.**

- Talent is indicated by grades & test scores; corresponds to a heavy faculty reliance on lecturing.
- Especially when grades are given on a curve, this definition only allows for a few people to "have talent" and therefore positions students to be in competition with each other.
- The normative belief: If students don't understand class material, it is because they lack talent.

**Broader definition of talent is related to more engaging instructional methods.**

- Talent is indicated by the type of questions students ask in class, being a leader, and having an inquisitive mind.
- With this definition some people will be able to demonstrate talent, but not everyone will have this ability; the use of more engaging teaching practices allows those with talent (not just the A students) to shine.
- However, only students who are comfortable posing questions aloud and being in the spotlight seem to be identified as "talented."

**Broadest definition of talent is related to student-centered /hands-on instructional methods.**

- Indicated by simply being someone who is excited to "do" science, is persistent in the face of challenges, uses existing knowledge to mentor others, and desires to use science as a means to improve society.
- The use of hands-on, collaborative group activities and student-centered teaching allows everyone the opportunity to exhibit their talent.
- This definition of talent was tied to an acknowledgement that the scientific enterprise needed to be diversified across lines of race and sex as a social justice imperative.

**BUT...**

- There were cases wherein faculty had a more inclusive definitions of talent, but used traditional lecture pedagogy in their classes.

[It] is really understanding differences in people, diversity, and identity. And so we have work to do [with respect to racial differences and inclusion], because I don't think the students have to do anything. The students are who they are **and it's up to us – faculty owning that as well as our support staff.** In the past we've [said], 'Students are to blame and that's for staff to deal with.' And my message is, **'That's for us to deal with. It's our courses, our students interact with us, they look up to us.** And a few simple changes, even if you are not going to change your whole pedagogy, a few simple changes in the way you talk to students and demonstrate care, whether it's a diversity statement on your syllabus to a couple of key phrases throughout the semester.'... **[We have to think] about who our students are and what it feels like to be one of a few minority students in a room of predominantly white students.** Our faculty are predominantly white; none of us have experience with what [racial/ethnic underrepresentation] feels like-- that doesn't mean we can't learn to understand what the challenges are.  
– Biology Instructor, Large selective PWI

## RQ3: Faculty teaching practices are shaped by the context.

- Faculty at Minority-Serving Institutions (MSIs) were more likely to share similar backgrounds as their students (race/ethnicity, SES, first generation college student, coming from under-resourced K-12 schools), which helped them understand and address barriers to student achievement.
- At MSIs instructors grappled with how to fairly assess students (i.e. allocate grades) given students' circumstances, which calls into question the traditional meritocratic structure based almost exclusively on test scores and class attendance.
- Faculty enjoyed teaching – irrespective of whether they were employed at a teaching or research institution.



## Conclusions

- ✓ Broad definitions of talent and caring relationships with students are key to cultivating talent!
- ✓ Share teaching successes stories that are backed by empirical data to inspire inclusive pedagogy.
- ✓ Talent development at the institutional level requires top-down support!
  - Department chairs can ask excellent instructors to share their teaching practices in meetings and make their classrooms available for observation.
  - Department chairs may want to consult with an expert in STEM education research to provide recommendations.
  - Administrators ought to channel resources for talent development such as course release time to improve courses, a teaching center that can provide pedagogical support in STEM teaching and inclusive pedagogy, and teaching mentors for those faculty who request them.
- ✓ There needs to be a viable and rewarding teaching career path for faculty who are not on the tenure route, with full inclusion from the department (especially in faculty meetings) and long term "fixed" contracts to allow for innovation in teaching and job security. Changing from part-time to full-time members of a disciplinary community is key.