

Inclusive Excellence 1&2  
Capstone Report

57

Journeys

57

Stories

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# From Excellence and Inclusion to Inclusive Excellence

The year 2015 was a period of deep reflection and change for HHMI's Undergraduate Science Education Program (now called Inclusive Learning of HHMI's [Center for Advancement of Science Leadership and Culture](#)). Between 1988 and 2015, HHMI held 16 competitions for public and private four-year colleges and universities. For each competition, we invited approximately 200 schools to apply; the average number of applications we received across the 16 competitions was 174. Invitation eligibility was determined by past performance – i.e., what schools had the best track records of producing bachelor's degree recipients who went on to graduate or medical school. The program awarded 774 four- or five-year grants to 285 colleges and universities, providing a total of nearly \$1 billion over the 27-year period. A significant number of institutions received multiple HHMI grants – seven received seven grants, 23 received six grants, and 125 received at least three grants.

A major part of the program's reflection during 2015 was taking stock of the grantees' accomplishments. That process revealed significant impact on the culture of undergraduate science education (such as democratizing undergraduate research at primarily undergraduate institutions and elevating the value of teaching at research institutions). In addition, there were impressive outputs, including involvement in apprentice-based research by over 100,000 undergraduates, 59% of whom were women and 25% of whom were PEERs (persons excluded due to ethnicity or race); over 400 new tenure-track faculty appointments; new professional development opportunities for existing faculty; hundreds of courses updated with new content and pedagogy; and science outreach opportunities for over 130,000 precollege teachers. In 2017, the 2012 grantees shared their lessons learned in a [Compendium of Major Accomplishments](#).

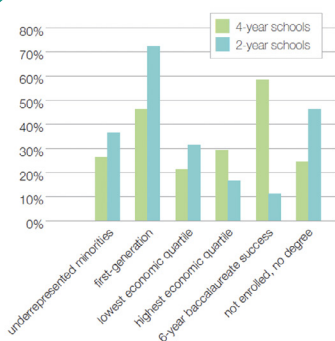


Figure 1. Characteristics of undergraduates who enter college at 4-year schools (green) and 2-year schools (blue). Half of all undergraduates begin at 2-year institutions. Students who begin at a community college are more likely to be underrepresented minorities, first-generation, and from the lowest economic quartile. There is a nearly sixfold greater probability for successful completion of the baccalaureate in all disciplines among students who begin at 4-year institutions. Data from Skomsvold et al., 2011.

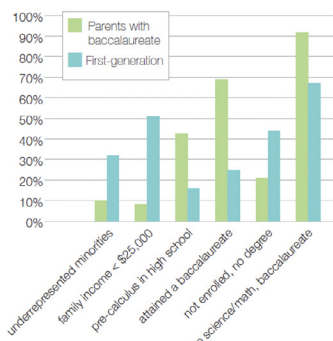


Figure 2. Characteristics of undergraduates with a parent who earned a baccalaureate degree (green) and undergraduates who are first-generation students (blue). First-generation students are more likely to be underrepresented minorities and from a poor background and are also more likely to have attended a high school where pre-calculus (or higher) was not offered. There is a nearly threefold-greater probability of attaining the baccalaureate degree for students whose parents have a baccalaureate degree. For students majoring in science and math, first-generation students have a lower success rate. Data are from a longitudinal study of students from 1992 to 2000 (Chen and Carroll, 2005).

Despite these substantial outputs, the program realized that if it continued along the same path, its benefits would remain localized to a relatively small and static population of similar institutions and it stood little chance of making a national impact with the urgency needed to address the persistently difficult problem of the underrepresentation of “[new majority](#)” students<sup>1</sup> (see Figures 1 and 2). To widen and accelerate its impact, the program reconceived and reconfigured its funding paradigm – from competitions accessible to an exclusive pool of invited institutions to open competitions, and from supporting well-intentioned programs aimed at “fixing” students to encouraging systemic, institutional change aimed at removing barriers that impede success for all but historically well-represented students.

[2018 HHMI Inclusive Excellence: Engaging all students in science](#)

<sup>1</sup> Schneider, C.G. (2005). “Making excellence inclusive,” *Liberal Education*, Spring: 6-17.

# Inclusive Excellence (IE) 1 & 2

## The Principles

In **2016** HHMI launched **Inclusive Excellence**. The new initiative had a laser focus on the following:


- Inclusion (an environment welcoming to those of all backgrounds) – more than representation (numbers of people from diverse demographic groups).
- Building sustainable institutional capacity for inclusion – rather than creating add-on programs that often disappear when grant funds end.
- Broad institutional ownership (a core leadership team for the grant, representing diverse institutional roles and units) – as an alternative to a lone program director.
- Post-competition collaboration among a cohort of grantees, nurtured via grantee clusters.
- A clear intent that the awards were to provide a one-time catalyst to promulgate institutional change.

*“Most science education grants provide support for activities that are intended to immediately and directly benefit the students, such as undergraduate research experiences, or outreach activities for K-12 students and teachers,” said David Asai, senior director of undergraduate and graduate programs at HHMI. “The HHMI Inclusive Excellence initiative shifts the emphasis away from ‘fixing the students’ to improving the institution’s capacity for inclusion. We hope that this approach will ultimately benefit students through lasting changes in the school’s practices, policies, and culture.”*

*~ HHMI press release May 2016*


**hhmi**

## INCLUSIVE EXCELLENCE



**OBJECTIVE**

To help institutions build their capacity to engage *all* students in science, especially those who come to college via nontraditional pathways



**PLAN**

HHMI will select ~ 60 four-year colleges and universities over two competition rounds, awarding each institution a five-year, \$1 million grant

**A NEW STRATEGY**

**Institutional capacity change**  
focus on improving students' environments

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**Open competition**  
open to more than 1,800 colleges and universities

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**Collective experiment**  
grantee community will share results of their work

**DID YOU KNOW?**

**Underrepresented minorities in STEM**

	<b>33%</b>
	<b>16%</b>
	<b>10%</b>

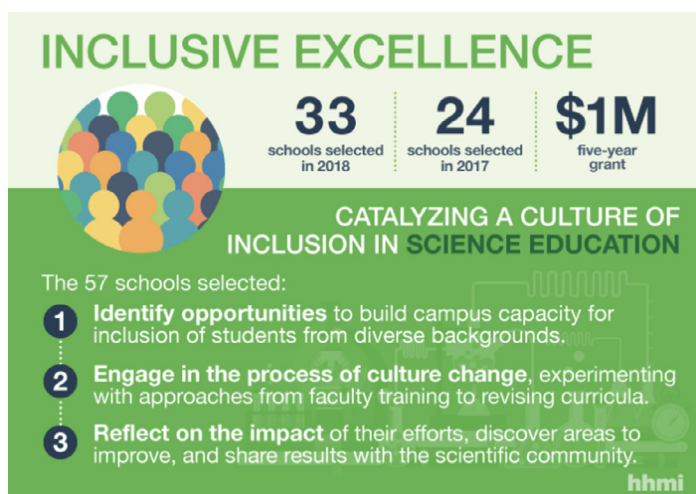
■ Students entering college interested in studying STEM  
■ Students who earn STEM baccalaureates  
■ Students who earn STEM PhDs

A third of U.S. first-year undergrads intending to study STEM are underrepresented minorities (URMs). But only one-sixth of STEM baccalaureate degree recipients and one-tenth of STEM PhDs are URMs.  
Source: NCSES, 2015



In both competitions, institutions proposed a range of [capacity building strategies](#), such as the following:

- Professional development for faculty members to improve the efficacy of their teaching practices and their ability to facilitate inclusive learning environments.
- Structural revisions in the introductory curriculum so that students from all backgrounds have access to learning opportunities and are provided resources that enable them to excel in science courses.
- Enhanced and coordinated cross-campus student supports, including supporting faculty and staff mentoring skills and providing in-time advising.
- Development of data analytics dashboards to improve understanding of academic trajectories and to enable timely advising of all students.



## The Awards

Following an open call to the nearly 1,800 not-for-profit U.S. four-year colleges and universities that grant natural science degrees, 511 institutions submitted preproposals to the first round of the [IE initiative](#) in 2016. HHMI then invited [91](#) of them to submit full proposals, based on evidence in their preproposals of their commitment and readiness to engage in institutional transformation toward inclusive science education.

In **2017** HHMI awarded five-year \$1M IE grants to each of 24 schools representing a range of institutional types. All 24 schools were committed to making structural changes to improve the retention in science of all students, including PEERs and first-generation students.

In **2018** HHMI awarded a second round of IE grants. In another shift from the previous funding paradigm, 65 applicants whose full proposals were not funded in 2017 were encouraged to submit preproposals with revisions informed by the previous year's reviewers' comments. A total of 301 schools applied, and another 33 institutions received five-year IE grants of \$1 million each.

Altogether, 595 unique institutions applied for IE1 and/or IE2. A total of 57 schools were awarded grants and became the IE1&2 cohort. Of the 57 institutions, 29 are doctoral-granting, 17 are master's-granting, and 11 are primarily baccalaureate-granting institutions; 16 are "minority-serving" and 27 had never received a science education grant from HHMI.

## Inclusive Excellence Grantee Institutions



## The IE Commission

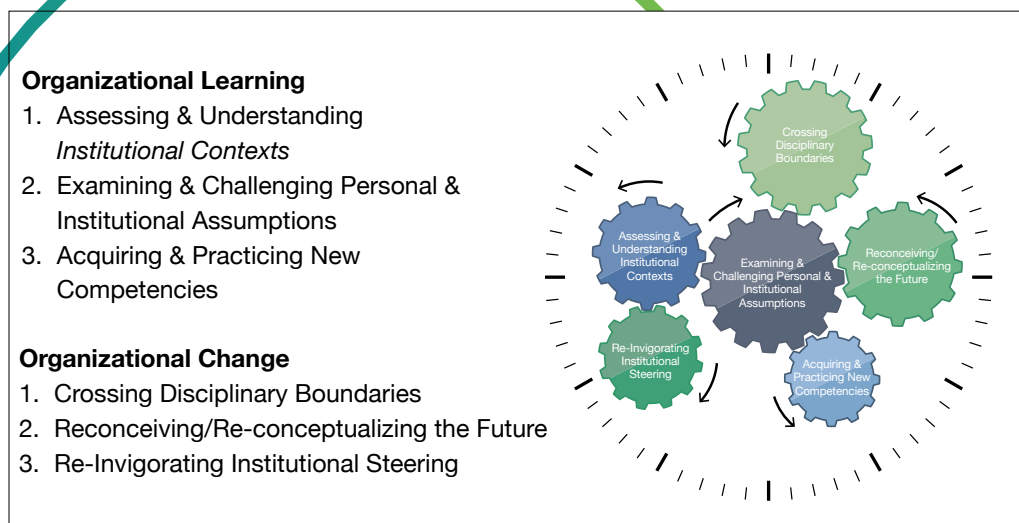
Shifting the paradigm from programmatic to institutional change meant there would be steep learning curves for both grantees and HHMI staff, especially in acquiring knowledge about and skills to navigate and assess organizational change. It was clear that a body of experts was needed to help guide the initiative; the American Association of Colleges and Universities (AAC&U) was well positioned to provide such guidance.

The AAC&U's deep engagement in IE began in 2002, when the organization's vice president, Alma Clayton-Pedersen, coined the term "inclusive excellence." In 2015, the organization published [Committing to Equity and Inclusive Excellence](#). With a grant from HHMI beginning in 2016, AAC&U created the [Inclusive Excellence Commission](#) (IEC). The commission comprised experts in science education and educational and organizational research: Drs. Kelly Mack (chair), Melvin Hall, John Matsui, Patrice McDermott, Tykeia Robinson, and Kate Winter. Its first endeavor was the release of a booklet titled [Excellence – A Renewed Call for Change in Undergraduate Science Education](#), which defined the key concept of IE as a dynamic stance – not a determinate destination, but a mindset characterized by a school's engagement in continuous self-reflection and assessment of their capacity for IE.



The IEC (from left, Drs. Melvin Hall, Patrice McDermott, John Matsui, Kate Winter, Tykeia Robinson, and Kelly Mack) at the July 2018 kick-off meeting for IE2.

Next, the IEC produced a tool called *Progress towards Inclusive Excellence Reflection (PIER)*; see Figure 3. It was developed to intentionally steer grantees away from the typical listing of grant activities in annual reports and instead to encourage the grants' core leadership teams to produce annual written reflections on institutional culture change to be shared with the IEC and HHMI. Key elements of organizational change informed the PIER prompts, helping the grantees reflect on the emergent impact of IE on their institutional 1) values and culture, 2) competencies and collaborations, and 3) policies and practices. The PIER was a tool that assisted the grantees in distinguishing first-order institutional change (incremental and reversible) from second-order institutional change (fundamental shifts in assumptions and values that govern institutional behavior), because the ultimate objective of IE was to prompt significant movement toward fundamental change.



**FIGURE 3:** PIER strategies of institutional learning and change, based on Boyce 2003<sup>2</sup>.

<sup>2</sup> Boyce, M.E. (2003). "Organizational learning is essential to achieving and sustaining change in higher education," *Innovative Higher Education*, 28(2): 119-136.



## PIER: Progress towards Inclusive Excellence through Reflection

# SUMMARY

Inclusive Excellence Commission, Association of American Colleges and Universities

## Introduction

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*Inclusive Excellence is more than an end goal; it is a core dynamic stance taken to ensure that institutions and individuals are predisposed and positioned to desire, foster, recognize, and require the actions and outcomes that are: (1) necessary for inclusion to occur, and (2) indistinguishable from excellence in scientific discovery and innovation.*

The goal of the HHMI Inclusive Excellence (IE) initiative is to build institutional capacity to effectively engage all students in the sciences throughout their undergraduate years, especially those who come to college via nontraditional pathways. Through this initiative, HHMI supports colleges and universities in implementing activities that will lead to deep and sustained change in the institution's capacity for inclusion. Change of this nature cannot be achieved or sustained by merely considering normative perspectives of the dominant cultures within higher education or implementing traditional "fix the student" approaches. Rather, the process of deep transformative institutional change requires the iterative and challenging work of: (1) being simultaneously conscious and critical of current ideologies, systems, and practices that disproportionately marginalize some; and (2) acquiring and implementing new knowledge, perspectives, and competencies that lend themselves to the kind of inclusive mindsets and leadership stances that inextricably link the domains of inclusion and excellence. Only then can we reasonably expect to see improvements and transformations in institutional policies, infrastructure, and culture.

For HHMI grantee project directors, the work of building capacity for Inclusive Excellence requires a deep level of reflection that not only considers the institutional context, but also the potential for the HHMI project to influence it. More specifically, this level of reflection should address two critical questions: How is your Inclusive Excellence project being influenced by the dynamic environment in which it operates? And how is your Inclusive Excellence project influencing that environment?

The **Progress towards Inclusive Excellence through Reflection** (PIER) is a useful tool for facilitating the kind of reflection, in real-time, that will allow you to: 1) reflect on these questions with your leadership team; 2) document changes in your institutional context and capacity building as they are occurring and from year to year; and 3) share what is being learned with the Inclusive Excellence community (HHMI, IE grantees, and the IE Commission). More importantly, the PIER offers you and your team deeper insight into *how* your institution is experiencing and responding to change, and what that means for your work as you look toward the future. This is especially useful amid the challenges imposed onto higher education by COVID-19.

First page of the [PIER](#), which guided the grantees' reflections on institutional change.

*“A common critique of current programs and initiatives designed to address and eradicate persistent racial disparities in undergraduate STEM education is the focus on student outcomes as an indicator of project performance. Student grades, and rates of enrollment and persistence are used to gauge whether and the degree to which institutions, departments, and programs are successfully and equitably recruiting and supporting students of marginalized identities. Not only does this place the burden of responsibility for addressing persistent disparities on underrepresented students on students themselves, it also fails to acknowledge the ways that institutional systems, structures, policies, and practices exist as barriers to equity and inclusion.”*

~ Robinson, T. (2022). “The myths and misconceptions of change for STEM reform: From fixing students to fixing institutions,” *New Directions for Higher Education*, 97: 79-89. <https://doi.org/10.1002/HE.20429>

The IEC will release a report of its analysis of the PIERs. In the interim, it has produced a nine-episode podcast series titled [The Excellence Experiment](#). Each episode explores the process of organizational learning and change at nine IE1&2 institutions.





## Peer Implementation Clusters (PICs)

In addition to hosting annual gatherings of representatives from the 57 IE1&2 schools, the program sought additional opportunities to foster “productive collisions” among smaller groups of grantee institutions. Each school received an annual award of \$10,000 to support interactions in smaller groups, known as Peer Implementation Clusters (PICs), on each other’s campuses. Each of the 14 PICs comprised four or five schools in roughly the same geographic area, and each PIC was liaised with an HHMI IE1&2 team member to serve as a cross-initiative knowledge resource.

During the first few years of the IE grants, HHMI observed a wide spectrum of interactivity within the PICs – from some that were highly interactive (participants described each other as critical friends) to some that reported that their institutional types or grant strategies were too different to form a basis for peer learning or collaboration. Most PICs were somewhere in the middle, with many meeting only annually until they discovered an issue that created traction leading to closer interaction. Unfortunately, the COVID pandemic forced the closure of schools, putting an end to the in-person PIC meetings and consuming faculty members’ attention because of the urgent need to shift to online teaching. There was thus a lull in PIC activity during 2020 and 2021.

There was a gradual resumption of online and in-person meetings among the PICs beginning in mid-2022. As was the case pre-COVID, there continues to be a wide spectrum of interactivity among the PICs, with some schools committed to meeting and learning within their PICs.

In addition, the liberal arts colleges formed an additional cluster, which they referred to as Some Liberal Arts Colleges (SLACs), which was highly interactive online during the pandemic as these schools learned from each other about hybrid teaching and course development.

## Leaning into Crises, 2020-2021

Both COVID-19 and the renewed nationwide demand for a racial reckoning had deep impacts on IE. In some cases, such as those events’ effects on PIC meetings and other in-person gatherings, they impeded grant activity. But on almost all campuses, the events of 2020 had the ultimately positive effect of bringing into sharp focus the economic and educational inequities that exist for many students. Having already begun building capacity for inclusion, the IE1&2 programs began being sought out by faculty colleagues and administrators as resources, including as models for institution-wide DEI initiatives. In this way, IE efforts were integrated into systemic efforts to change institutional policies and practices. For example, many institutions’ centers for teaching and learning adopted and expanded IE-initiated equity and inclusion workshops; some IE core team members were promoted to key administrative positions; IE-engaged students were invited to bring their voices to institution-wide committees on equity and inclusion; and conversations about equity and inclusion, including their influence on tenure and promotion, were incorporated into weekly departmental meetings.

# 57 Journeys

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# 57 Stories

## From Fixing Students to Fixing Institutions: 57 Journeys, 57 Stories

Although institutional readiness to build capacity for IE was a criterion for the grants, each institution had its own baseline and unique context and thus its own arc of progress from fixing students to fixing institutions. This is evident from their individual stories in this report. Still, there are some key principles among their reflections that other institutions embarking on their own IE journeys might find helpful. They include the following:

- It is important to critically reflect on self-study data so as not to perpetuate stereotypes or make instructors feel defensive but instead to reveal systemic barriers.
- Nimbleness that allows the grants’ core leadership teams to adapt to unforeseen challenges is important. Such challenges may include changes in senior administration, budgets, or state anti-DEI legislation; a health pandemic; or social upheaval. There might also be unforeseen opportunities that accompany challenges, such as new campus-wide DEI initiatives.

- Build productive relationships, from alliances to full-on collaborations and partnerships, to ensure that ownership of the initiative is integral among diverse institutional units and roles – and possibly beyond the institution.
- Integrate IE into structures/partnerships/networks that already exist on the campus to ensure wider distribution and sustainability.

## Reflections of the IE1&2 Team

- “In the grants world, one often thinks of tangible downstream outputs to justify the expenses, but I came to realize that some of the most powerful effects of the grants occurred upstream, specifically to give faculty time to engage in a process of self-reflection and changes in mindset and practices, which requires substantial mental and emotional bandwidth, and to build trust with others engaged in the work. The tangible outputs, such as an improvement in students’ sense of belonging, occur much later in the grant term than in grants not centered on personal and organizational development.”
- “There are some contradictory aspects to institutional support. Some institutions publicly express a strong commitment to issues of diversity, equity, inclusion, and justice – and devote significant financial resources to them – but have not recognized instructional reform as an important component of that effort.”
- “Faculty development appears to be structured in three dimensions: 1) intrapersonal development, or a focus on having faculty understand the intrinsic factors and experiences that contribute to how faculty show up and engage in the classroom; 2) horizontal development, or how faculty form collaborative groups and communities with peers that help them learn from and through each other; and 3) circular development, or a focus on how faculty develop skills to better relate to – and understand – students, and how that creates a feedback loop that improves both the quality of instruction and optimal student learning.”
- “State institutions are using a variety of strategies to address restrictions on the use of state funds for DEI efforts, which in some cases, have had the effect of virtually undoing the grant’s progress. Some are applying for external funding to sustain the programs. Some understand that some colleagues needed to move to positions without state restrictions and are being strategic about the limited capacities of those who chose or have no option but to stay.”

## The Way Forward: From Projects, Not People to People, Not Projects

*People, Not Projects: “HHMI provides its researchers long-term, flexible funding that gives them the freedom to explore and, if necessary, change direction. Our philosophy of selecting “people, not projects” seeks researchers who bring innovative approaches to the study of many different biological problems.” [www.hhmi.org/scientists](http://www.hhmi.org/scientists)*

An interesting phenomenon has occurred at HHMI along its IE journey. The longtime mantra of HHMI’s Science Department is “people, not projects.” In contrast, HHMI’s undergraduate science education initiatives had a longtime practice of emphasizing “programs, not people.” But as IE1&2 draws to a close, the IE1&2 team has pivoted to a philosophy that IE too is about “people, not programs.”



As the 57 grantees' individual journeys toward building capacity for IE suggest, there is no formulaic way forward for the IE1&2 institutions. How each will sustain its progress depends on many variables that contribute to its context from within and outside its environs. It is beyond HHMI's capacity to control what happens at an institution after its grant funding has ended. But, like its grantees, the staff has learned that IE has been about relationship-building – among the grants' core leadership teams, within and across the PICs, and among the HHMI team and its grantees.

The grants will go away but not so easily the experiences, such as the learning about oneself and others and the relationships. This is why the team has invested in continuing to nurture a self-sustaining community of IE1&2 champions, beginning in earnest with the October 2021 HHMI meeting (hosted online), *Reestablishing Our Collective Urgency for Inclusive Excellence*. The agenda for the 2021 meeting was developed so that the grantees would begin to see themselves and their cohort as valued resources. At the meeting, several grantee core leadership team members gave workshops on expertise they had gained as a result of their work, including sessions on using DEI data responsibly and addressing in real time unplanned acts of racial or other aggression among students in the classroom.

The following year's meeting, in October 2022 (also online), *The IE Movement: From Fixing Students to Fixing Institutions*, reinforced the idea that IE1&2 institutions would be able to sustain their progress, but also sustain themselves as a peer learning community. An advisory committee of IE1&2 grantees informed the meeting's planning, in which small and recombined learning circles, facilitated by the participants, worked together to learn about each other's progress to date and to help each other develop strategies to sustain IE at their institutions and as a broader movement.

Meeting in person in March 2023 for the first time in more than three years, the grantees were encouraged to dive into envisioning a network of IE1&2 champions or alternatively, several affinity-topic groups. Participants broke into groups centered on themes of initiative assessment, preparing the next generation of IE1&2 champions, and publishing/disseminating knowledge gained, as well as developing an all-encompassing network. The meeting participants also began an internal-facing repository of resources and a [LinkedIn](#) group.



Participants at the October 2018 IE1&2 annual meeting at HHMI.

All groups have been offered a chance to extend their envisioning and planning for a network or affinity group at HHMI in October 2023 and possibly March 2024. To date, two affinity groups are planned – one on assessing change in professional identity for IE faculty, and the other on building capacity for inclusion of Indigenous students.

We are reminded of the vital importance of nimbleness nearly daily, as we reflect on recent challenges to equity and inclusion in higher education – for example, the Supreme Court's elimination of race-based admissions and the “anti-woke” policies and legislation in a growing number of states. These challenges are likely to inspire the development of still more affinity groups.

“To make large-scale change, leaders need to set forth an agenda that addresses the organization at multiple levels, including gatekeepers, leaders, mid-level management, and administration, with the appropriate resources in terms of person hours and funds. Antiracism, diversity, equity, and inclusion do not serve as compliance metrics, but rather act as goals or concepts that require sustained effort and learning to maintain. Often, these changes come with dedicated action from all levels and a sense of collective responsibility across the organization to uphold the values of antiracism, diversity, equity, and inclusion.”

~ National Academies of Sciences, Engineering, and Medicine (2023). *Advancing Antiracism, Diversity, Equity, and Inclusion in STEMM Organizations: Beyond Broadening Participation*. Washington, D.C.: The National Academies Press. <https://doi.org/10.17226/26803>.



## IE3

IE1&2 was followed by IE3 in 2022. The goal continues to be increasing institutional capacity for inclusion, but the mechanism has changed. IE3 emphasizes collaboration and collective decision-making. Instead of a competition that would eventually yield no more than 30 grantees, IE3 created a learning community of 134 schools that shared \$60 million over six years. The schools were organized into seven Learning Community Clusters (LCCs), with each LCC focused on one of three IE3 themes, which were derived from what we learned from IE1&2. The three IE3 themes are:

- 1 **The content of the introductory STEM experience,**
- 2 **An evaluation of inclusive teaching as part of promotion and tenure, and**
- 3 **Genuine partnerships between two- and four-year institutions.**

Each LCC developed a collaborative project, decided how to distribute the grant funds among its member institutions, and is responsible for holding themselves accountable.

# 57 Colleges + Universities

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# Arizona State University

## Tempe, Arizona

The critical question motivating our program was and remains: Is the emerging, rapid adoption of relatively poorly understood online learning practices adding to the plight of institutions seeking to advance inclusive excellence? Because online learning at scale is comparatively new in higher education, we are building IE capacity by employing diverse approaches in our research and our institutional change efforts, including self-study via quantitative and qualitative methods. We disseminate results in various ways to students, faculty members, and administrators at Arizona State University (ASU) and beyond. ASU is a singularly good place for this work. We are one of the largest providers of fully online undergraduate degree programs, including entire majors, but unlike some institutions using online learning, we are an Association of American Universities-member/R1 institution conducting research in the IE space.

We pursued our central question by asking: What outcomes enable building IE capacity in the short and long terms? What are IE obstacles and sources of support? How can we use multiple lines of research to uncover how institutional practices advance or retard IE? Here are some highlights from our findings:

- A “baseline analysis” used 10,000 course-enrollments to compare grade equity between in-person and analogous online degree programs. Online and in-person courses had most of the same equity issues from the standpoint of student demographics, but students online had systematically lower grades, raising important concerns for programs expected to foster inclusion through accessibility.
- Students enrolled during the COVID-19–impacted spring 2020 semester earned higher grades than in previous years, with no significant decrease in grade equity. While students generally thought the quality of learning diminished during the pandemic, these impacts did not exacerbate prepandemic grade inequities.
- Interviews with 24 undergraduates with perceived depression revealed how their depression affected learning and how online science courses affected depression. A complementary national survey of more than 2,000 undergraduates found that in large, online science courses, more than 50% of students experienced depression; LGBTQ+, financially unstable, and lower-division students experienced severe depression more often. In both studies, the flexibility of online courses coupled with a caring instructor alleviated depression, while difficulty building relationships with other students and the fast pace of online courses exacerbated it.
- Three studies explored the experiences of students with disabilities in online learning settings: 1) Interviews with 66 STEM undergraduates explored how the pandemic-driven online transition impacted learning and found students had difficulty accessing prepandemic learning accommodations. 2) More than half of 114 students surveyed reported improper accommodations and a sense that they were not universally available. 3) We used institutional data to test if online students with disabilities received equivalent forms of accommodation and whether those students earned grades comparable to those of their online peers without disabilities. By several metrics, online students with disabilities were not as well supported as they would have been in person; however, grade outcomes were more favorable for online students with disabilities, suggesting that accommodations inherent to the online mode are beneficial.

How will we sustain our IE advances after the HHMI award expires, including addressing barriers that persist? Examples of our sustainability efforts include the following:

- Our initial focus is the School of Life Sciences (SOLS), the home of biology, ASU's largest online science major (with some 3,500 students). We developed and implemented a needs assessment survey for students in the online program to assess their feelings of inclusion and ways to improve it. We shared the results with faculty members, instructors, and staff so they could address the issues. We developed a Faculty Fund for Inclusive Pedagogy in collaboration with the College of Liberal Arts and Sciences and our Provost's Office. This program awarded support to faculty members with plans for making measurable changes in their teaching to foster IE.
- Stimulated by the HHMI award, coprincipal investigator Sara Brownell founded the Research for Inclusive STEM Education (RISE) Center. Our institutional change and outreach efforts now operate through RISE. RISE collaborated with the Society for the Advancement of Biology Education Research (SABER) to host 26 diversity and inclusion seminars over three years, with speakers who work on issues ranging from critical race theory to student finances to gender. Each week, from 30 to 900 people participated. In fall 2022, we hosted 300 attendees for a Natural Sciences Inclusion Summit. Speakers included our provost, dean of the College of Natural Sciences, faculty members, and graduate students. We will host another meeting in fall 2023.
- We hosted 15 IE and teaching workshops or seminars that will continue beyond the award. HHMI funding also led to notable allied projects.
- ASU is one of 10 institutional participants in the Sloan Equity and Inclusion in STEM Introductory Courses (SEISMIC) project. SEISMIC promotes parallel data analyses to understand which patterns of (in)equity are common across multiple higher ed institutions. The SEISMIC alliance highlights new ways of looking at educational equity and new ways to drive positive change in this area.
- Members of our team are leading a Bill and Melinda Gates Foundation-funded project to develop digital courseware for general chemistry that enhances the success of Black, Hispanic, and Native American students. The ASU-based project is co-led by Carnegie Mellon University's Open Learning Initiative and will deploy nationally. Our HHMI IE award strongly influenced the project's concept, development team, and plans for evaluation and research.

## Reflections

**We enjoyed significant success using our research results and activities like the Inclusion Summit to help us advance new, and revise old, policies to sustain our accomplishments.**

We helped initiate our school's creation of a DEI committee and our college's appointment of a DEI committee and chief diversity officer. Our school revised promotion and tenure guidelines to require a summary of DEI efforts, while our annual workload agreements also now require summarizing DEI accomplishments. The RISE Center provides a strong, institutional foundation to sustain our project's impact. A major lesson learned is that changing policies can relatively quickly initiate institutional transformation in sustainable ways.

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# Bates College

## Lewiston, Maine

At Bates College, our institutional data demonstrated that race, socioeconomic status, and first-generation college status predicted student outcomes (i.e., grades, DFW rates [a grade of D or F or a withdrawal from a course], and persistence to graduation with a STEM degree) across STEM disciplines. Specifically, students of color (particularly Black students), students of lower socioeconomic means, and students who were the first in their family to attend college had lower grades, higher DFW rates, and lower persistence to graduation than white, economically advantaged, and continuing-generation students. As well, student narratives, particularly for these target students, indicated that they did not always feel supported or have a sense of belonging in STEM at Bates.

With our HHMI IE grant, we set three primary strategies to build our capacity for inclusion and address our disparities in delivering an equitable and inclusive learning experience for our students. The main strategies were to engage faculty and staff in robust and ongoing professional development in both racial equity and inclusive pedagogies. As we built capacity for inclusion through changing faculty and staff mindsets and skill sets, we supported our STEM departments and programs as they changed courses, curricula, and practices in ways that were informed by their own data and student experiences. We also built a cohort-based community of STEM scholars through academic and peer engagement to address student belonging and to center an atmosphere of support so that our students who have been marginalized in STEM at Bates are able to thrive.

Over the last several years, we have made considerable gains in reducing the opportunity gaps for students who belong to demographic groups that have not been well-served in STEM at Bates. Most significantly, a substantial decrease in deficit-minded thinking toward our students, combined with the application of new knowledge and skills in inclusive practices, have allowed STEM departments and programs to reimagine STEM culture at Bates. We believe that the ongoing engagement in IE efforts across departments, programs, and the institution has been key in transforming our practices. The changes are not the result of the efforts of a few, but the result of many members of the community engaging in self-reflection, as well as of units within the institution engaging in critical and evidence-based deliberation on how to increase the success and belonging for all of our students. By changing pathways through our gateway courses; expanding first-year course-based research; increasing accessibility, the use of active learning, and student-led and project-based work; engaging students in identity and metacognitive development; enhancing student support structures; and fundamentally changing grading and assessment strategies, our STEM departments and programs have built a capacity for inclusion.

We encountered many obstacles, including, but not limited to, ingrained beliefs about how STEM education “should” be done, fixed mindsets, implicit biases, and all of the “-isms” (e.g., racism, ableism, sexism, classism). However, we found that with ongoing education and professional development, engagement with data, and evidence-based practices for inclusion, as well as hearing the narratives of our own students and other students and scientists who have faced barriers to their inclusion, the mindsets of faculty and staff began to change. Authentic engagement, time on task, peer and institutional support, and the joy of being liberated from deficit mindsets were key to achieving many of our outcomes.

Beyond giving us the ability to invest in the faculty, staff, and students at Bates who are working to transform STEM culture and practices, the IE grant has helped us build continued capacity for inclusion. One tangible outcome of the grant was the support for a new Center for Inclusive Teaching and Learning. Led by Dr. Lindsey Hamilton, our new Center for Inclusive Teaching and

Learning was founded on principles of IE and “promotes student success by supporting faculty and staff educators through ongoing professional development, including work in developing reflective, innovative, and inclusive pedagogies. Holding the values of collaboration and cocreation, the center aspires to be a hub where Bates celebrates its educators while helping them hone their skills to ensure that all students experience equitable and learner-centered spaces that contribute to their thriving at Bates.”

Another way we are now better positioned to continue to advance toward inclusive excellence is the passage and implementation of new tenure and promotion guidelines at Bates that name excellent and effective teaching as “evidenced by self-reflection, exploration, and a continuing commitment to pedagogical development and growth” and “embracing inclusive pedagogies and evidence-based strategies” and that also honor faculty “leadership of or engagement with initiatives that identify and remove institutional or educational barriers due to racism, sexism, classism, or ableism.” These new structures, combined with institutional commitment at multiple levels (e.g., institutional researchers trained in DEI methods who will continually evaluate qualitative and quantitative data and a vice president-led Office of Equity and Inclusion) will help us continue to discover and address barriers that persist.

## “Fix the system” & “change the culture.”

Early on, many of the ideas from faculty and staff remained focused on “fixing students.” We learned that barriers are created and sustained by those in power and that we needed to “fix the system” and “change the culture.” We also learned that it is a continual challenge to work against that system, that there is no easy fix, and that equity and educational justice have to be our guiding principles in order for change to be made. Most recently, we have been engaged with disciplinary experts in department- and program-level “foundational dialogues” on race, power, privilege, white supremacy, and colonialism. Each academic unit is working to “build the intellectual and emotional capacity as well as background knowledge to continue curricular transformation work,” especially as it relates to the academic unit’s curricula and pedagogies. In 2023, our faculty passed a two-course curricular requirement addressing race, power, privilege, and colonialism, with at least one of the courses taught by faculty associated with the unit offering that major. Thus all STEM units at Bates will need to sustain their work into the future as we integrate IE principles into our curricular content as well as into our practices and pedagogies.

### Grant-Derived Dissemination Products

#### Presentations

Lori Banks (June 2023) STEM Identity and Octavia Butler. Gordon Undergraduate Biology Education Research Conference. A New Vision for Change: Re-imagining Biology Education Through Social Justice. Lewiston, ME.

April Hill (June 2023) Course and Curricular Reform across STEM Disciplines with Equity and Justice as the Guiding Principle: A Case Study at Bates College. Gordon Undergraduate Biology Education Research Conference. A New Vision for Change: Re-imagining Biology Education Through Social Justice. Lewiston, ME.

Koviach-Côté, Jennifer (March 2022) Development and implementation of the STEM scholars program at Bates College. 263rd National American Chemical Society Meeting, San Diego, CA



# Brandeis University

## Waltham, Massachusetts

Our IE journey at Brandeis University began with the recognition that, despite the success of our STEM Posse program in enhancing the inclusion of students from historically underrepresented and marginalized groups in STEM, their retention and performance in STEM were still lower than we were seeing for majority students. Interviews and focus groups with students revealed that there were structures and attitudes, among both faculty and students, that hampered all students' full inclusion within STEM. Our primary strategies utilized a cohort approach, similar to the Posse model, both to reach a broader segment of the student population and to create a faculty community that would deepen its awareness of and work to address issues of inclusion in STEM. We also introduced a model in which students partner with faculty to strengthen pedagogy, with a focus on inclusion, in a set of key introductory courses. The three major components of our IE effort are described below.

### **Galaxy**

The Galaxy program was initially designed to mitigate the effects of differing levels of preparation by giving students from historically underrepresented backgrounds a supportive first-year cohort as they entered Brandeis and a mentor to help them navigate the inevitable hurdles they would encounter in STEM. Each Galaxy cohort consists of 10–12 students who meet weekly with a trained graduate student mentor to discuss such topics as the importance of attending office hours, overcoming impostor syndrome, defining intrinsic success in college aside from grades, reflecting on assignments that don't go as expected, and building a cooperative culture, plus multiple workshops with on-campus partners focusing on career development, mental health, and summer internships/research. After an initial noncredit rollout, Galaxy became a credit-bearing class in order to recognize the time and effort involved and to provide students with a cushion in case they dropped a class during their first two semesters. During the pandemic, the program was expanded to include a virtual summer boot camp to teach students how to use the online tools essential to success in remote classes, build community within the cohort, and guide their first-semester course selection. Class credit is earned upon satisfactory attendance at both individual and group meetings, reading and discussing papers relevant to IE, and reflecting on their experiences throughout the first year. The number of cohorts has grown from three in the initial year of the grant to 11 this year. Students who participated in Galaxy during 2020 or 2021 were 5% to 6% more likely to remain at Brandeis after their first year than students who did not participate.

### **Justice League**

Our faculty learning community, the Justice League, has continued to grow in membership (from nine participants initially to 31 this year), as well as in scope. As we have continued to return to prepandemic operations, we alternate sessions between in-person, informal group meetings and Zoom-based content gatherings. We established a mentoring program between seasoned teaching faculty and new lecturers and assistant professors. The group has spearheaded efforts to reform grading practices (e.g., eliminating grading on a curve) and the way retaken courses are counted toward a student's GPA. We have discussed topics like ChatGPT, specifications grading, student-authored scientist spotlights, first-year mentoring pilots, active learning strategies, universal design, and student accessibility support. We have partnered with the Center for Teaching and Learning (CTL) to provide justice, equity, diversity, and inclusion (JEDI) training workshops as part of our Justice League offerings. Participants collaborate on rethinking their syllabi to use more inclusive, culturally responsive language in a consistent, predictable format. Additionally, we are piloting a new effort, the Inclusive Door Project, to provide more welcoming environments and potential conversation topics for students who attend office hours.

## Pedagogical Partnerships

In the Pedagogical Partnerships program, student-faculty pairs work together to imbue classrooms with a sense of community that helps students to develop a sense of belonging. The semester begins as a classroom-focused pedagogical partnership, in which CTL staff and a faculty program leader meet with the student partners each week to train them in how to make classroom observations, hold office hours, set up surveys, and share feedback with their faculty partners. The program then evolves into a curriculum-focused partnership, as student partners suggest revisions in syllabi and draft “how to succeed in this class” guides for future iterations of the course. The CTL meets weekly with the student partners, as well as monthly with the faculty partners, to help them consider how to respond to the partners’ feedback. Faculty participants report that they made their courses “much more interactive,” that they “took conscious efforts to clarify the ‘why’ of [their course],” and that they appreciated the opportunities to “see the course from students’ perspectives more.”

## Sustainability

Sustaining these and other JEDI initiatives beyond the duration of the grant will require buy-in from a wider segment of the faculty and administration. The Division of Science Curriculum Task Force, which includes several department chairs, has endorsed several of the goals identified by the Justice League. The active participation of the CTL, which is now funding several pedagogical partnerships, is an important step forward. Expansion of programs beyond the sciences enhances the likelihood that they will become permanent, and we have already enlisted several non-STEM faculty in the Justice League and Pedagogical Partnerships programs and have held discussions with colleagues about establishing a Galaxy-like program in the humanities. Perhaps most encouragingly, the administration has embraced our efforts toward inclusion in Brandeis’s upcoming capital campaign, and one mid–six-figure pledge has already been received.

## Some Lessons Learned

- At a research university, enlisting tenured faculty in IE initiatives is critical but challenging.
- Faculty who teach introductory STEM courses encounter common issues, but may not be aware that they have potential allies unless they are brought together.
- Administrators and governing board members need to be kept informed about your successes; they are eager for good news.
- If a program (e.g., the Justice League) proves successful, faculty will participate even without monetary incentives.
- It is important to confront majority student attitudes that hinder inclusion.

## Reflections

**Although it can be challenging to filter and refine,** the inclusion of the student voice in curricular decisions is critical to IE programmatic success.

# California State Polytechnic University Humboldt

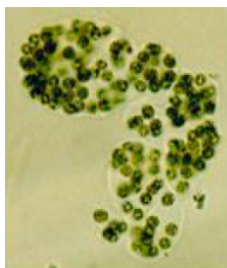
## Humboldt, California

Our HHMI IE journey at California State Polytechnic Institute-Humboldt (formerly Humboldt State University) began with the premise that our place-based learning communities (PBLCs) would improve undergraduate STEM retention and close equity gaps in academic achievement and graduation rates for all first-year STEM students. Our PBLCs included both high-impact cocurricular practices (peer mentoring, block scheduling, a presemester experience, blocked-enrolled courses, a first-year experience course, and connections to student support services) and curricula that weave interdisciplinary themes about our location throughout the first year. We collaborated with faculty from the STEM departments included (biological sciences, chemistry, environmental engineering, environmental science, fisheries, forestry, geology, math, physics, and wildlife), as well as others who taught the general education courses taken by PBLC students (i.e., English, communications, math, and Native American studies). We also worked with government leaders, scientists, and cultural practitioners from the Karuk, Wiyot, Yurok tribe and the Trinidad and Blue Lake Rancherias to create experiences that illustrate the relatedness between first-year STEM coursework and the values and social justice concerns of our local Indigenous communities.

A



B



**FIGURE 1:** Klamath Connection students explored the science and culture of the Karuk and Yurok people through a water-quality laboratory (WQL). A: In 2002, water quality scientists from the Karuk Tribe discovered levels of *Microcystis aeruginosa* in the reservoirs behind the dams on the Klamath River that were nearly 100 times greater than the level approved by the World Health Organization. These blooms occur during the time of year that Karuk people are in and around the river gathering food, basketry materials, and performing ceremonies. B: Klamath Connection students conducted a basic eutrophication experiment to see if nitrogen is the factor limiting harmful algal blooms downstream of the dams. Students sampled Klamath River water and analyzed their cultures for the presence of algae, using relative fluorescence units of their cultures and microscopy after adding ammonium nitrate (not shown). (From Sprowles et al., in review).

The assessments of the first cohort demonstrated that, indeed, PBLC students had gains in their sense of belonging, academic achievement, retention, retention in STEM, and graduation rates (Johnson et al., 2019; Johnson et al., 2023; Johnson et al., in press). Furthermore, equity gaps narrowed in each of these categories. It is of interest that the PEER (person excluded due to ethnicity or race) students in the first three cohorts of the Klamath Connection PBLC who learned about social justice issues impacting Native American people through a water-quality laboratory (see Figure 1) showed increased academic achievement, STEM retention, and graduation rates (Sprowles et al., in review). However, both formal assessments (Wynand et al., 2017; Risling-Baldy et al., in press) and informal communications with PBLC students who identify as PEERs and the educators who worked closely with them suggested that the campus cultural environment was not supportive of these students' attainment of important nonacademic attributes for success (Wynand et al., 2019), such as academic self-concept (Cuellar, 2014, 2015), salient racial/ethnic identity (Garcia, Patro'n, Ramirez, and Hudson, 2016; Guardia and Evans, 2008), and sense of belonging (Strayhorn, 2018; Dueñas and Gloria, 2020). We also learned the importance of authentic collaboration and reciprocal partnerships with our campus and Indigenous partners. In 2017, the campus partnered with ESCALA Educational



Services to create a Latinx-focused professional learning program: the Professional Learning Community for Culturally Responsive Campus Environments (PBLC for CRCEs). Our primary goals were to improve our understanding, intention, ability, and implementation efforts to modify our practices to serve Latinx and other minoritized students, both in their own educational spaces and throughout campus. We were also interested in impacts on personal growth, collegial relationships, and empowerment of participants to become agents of change. A total of 53 faculty, staff, and administrators participated. Our analyses show that participation in the PBLC for CRCEs impacted educators' understanding and efforts to modify their practices to better serve diverse learners. They also show significant gains in implementing highly equitable pedagogical practices and working to create equitable environments in other dimensions of their professional and personal lives (Sprowles et al., in preparation).

Seven years after the first cohort of PBLC students, we are pleased that Cal Poly Humboldt has institutionalized PBLC programming so that all incoming first-year students can participate. The university has also supported the launch of the HHMI IE-funded Humboldt version of the PBLC for CRCEs, *Creando Conciencia*, which was designed by four Latine faculty under the mentorship of ESCALA Educational Services.

## Reflections

As we enter the first academic year where both programs are fully institutionalized, we will continue to work to ensure the programming is grounded in the experiences, thoughts, and ideas of participating students, staff, faculty, and community partners.

## Grant-Derived Dissemination Products

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# California State University Los Angeles

## Los Angeles, California

### When we began our journey

We envisioned that in five years we would have a community of transformed faculty and students in the sciences who work collaboratively to achieve academic excellence inclusive of marginalized racial and ethnic groups. At the time, California State University-Los Angeles (Cal State-LA) was nationally recognized as the #1 institution in terms of the upward mobility of its students. However, there remained an academic achievement gap represented partly in demographics: Latinx and Black students' achievement, on average, was significantly lower than that of students of other ethnic and racial identities; measures of academic achievement include course grades, course completion, and graduation rates. In summary, our overarching goal was to eliminate this achievement gap through transformed pedagogy that reached all students, particularly Latinx and Black students.

We proposed a multifaceted implementation plan to transform pedagogy in the sciences by these means:

- 1 **Instituting equity – focused professional development programming.**
- 2 **Increasing student engagement across demographics with the Science Campus Activities for Fostering Engagement (Sci-CAFÉ) app.**

To measure and monitor the changes in Cal State-LA's capacity for inclusive excellence, we planned to use and develop qualitative and quantitative assessment tools to identify what was most effective for our students. We proposed to use institutional research data to monitor our primary target – student achievement gaps – as well as graduation rates, persistence rates, and student engagement.

### During our journey

We engaged in the following activities:

- **Professional development (developing equity-minded faculty and university leaders):** Over time, we placed more emphasis on the role of faculty in mitigating equity gaps than on student engagement. We have trained over 115 faculty members, department chairs, and administrators in our Inclusive Excellence and Equity (IE&E) Fellows Program, well surpassing our initial goal of 75 trainees. Developed in collaboration with the Center of Urban Education at the University of Southern California, these workshops have helped participants identify blind spots in engaging with minoritized students and explore tangible ways to mitigate racial and ethnic inequities in their classrooms. Because we understand that the entire institution must work together to support science students, participants have included faculty from eight colleges and 40 STEM and non-STEM departments. Past participants gather in our monthly Coffee Collective series to continue their collective growth toward equity-mindedness.
- **Student resource development:** The development of the Sci-CAFÉ app allowed the faculty to think across the institution's science community and beyond departments and programs. The programming was reimaged after COVID-19, once the need for more collective campus experiences was apparent. In addition, students assisted in evaluating and running workshops. They also participated in the analysis of the assessment data that was gathered.

- **Institutional development:** Five of the original members of our HHMI IE core leadership team served or are serving in leadership positions throughout the university. Their positions include(d) science and engineering department chairs (chemistry and biochemistry, biological sciences, and psychology); the dean of the College of Engineering, Computer Science and Technology (ECST); and the university's associate vice president of diversity, equity, and inclusion. In partnership with our colleagues, we are positioned to transform Cal State-LA into an equity-minded institution free of racial and ethnic equity gaps that hinder the development of the science talent imperative to our future.
- **Measures of equity in academic achievement for Latinx and African American students:** To examine issues of equity in knowledge-building, three focus groups were conducted with undergraduate students, who reported that lasting knowledge occurs when it is co created with a caring and knowledgeable instructor. As part of a multimethod, multisource study on equity in higher education, instructional faculty from various departments participated in three focus groups. The themes that emerged mirrored many of the themes that surfaced in student focus groups conducted on the same subject, including knowledge-building as a psychosocial endeavor. The bottom line was that it is important to build trusting and supportive relationships while co creating knowledge. Furthermore, faculty voiced a need for resources to fully engage in lessening current equity gaps in higher education. Finally, a survey on college persistence was also conducted, which revealed that a sense of belonging predicts persistence for both first-generation and non-first-generation college students.

## Sustaining our journey beyond HHMI

As we complete our project, we continue to realign our aspirations given the circumstances of our time and place. As we reimagine the future, we continue to think beyond the immediate future to consider the sustainability and longevity of this project beyond the framework of HHMI.

We will continue to provide our training workshops through a no-cost extension. However, a plan has been developed to gradually shift the funding of these workshops from HHMI to the University Office of Diversity, Equity, and Inclusion, with new facilitators coming up the ranks each term. These workshops have been highly successful in building community and providing support to our faculty (and thus our students). Faculty, as culture shifters, are undervalued on a commuter campus like Cal State-LA, and this program has helped inject support where it was needed and offer a space for faculty to feel heard.

We can continue to offer development and support to faculty using mechanisms put in place recently, namely the Coffee Collective. As in the faculty development workshops, leadership roles are diffuse within the Coffee Collective, which allows all participants to take ownership of and develop programming in collaboration with all faculty participants.

We plan to expand our collaboration with other programs – like Eco-STEM, a program funded by the National Science Foundation to work toward equity and inclusion in STEM at Cal State-LA – to share tools and practices. Specifically, we plan to implement a peer evaluation tool borrowed from the Eco-STEM grant in our HHMI activities. This new tool has been successfully implemented in the College of ECST, and our hope is to institutionalize it in the campus-wide review, tenure, and promotion process.

## Reflections

In summary, the HHMI IE project at Cal State-LA has shifted over time to invest in faculty development in service to our students. Students and administrators come and go. However, by changing the cultural perspectives of our faculty, we can contribute to a sustainable and transformative shift toward inclusivity for all minoritized groups, including African American and Latinx students.



## Grant-Derived Dissemination Products

Joseph, M.S., Talavera-Bustillos, V., and Salmassi, T.M. "Grant Projects: A Tool for Campus Equity," Association of Ethnic Studies, 50th conference, Los Angeles, Calif., November 5, 2022.

Bowen, C.L., Bower, C., Fernando, G., Joseph, M., Morales-Chicas, J., Salmassi, T., Sanchez, M., Sode, O., Szabo, Y.Z., and Talavera-Bustillos, V. "Education Without Borders: Interdisciplinary Approaches to Increasing Equity in Higher Education," Western Psychological Association convention, Riverside, Calif., April 26, 2023.

Sarkissyan, T., Fernando, G., and Szabo, Y. "Knowledge-Building and Equity in Higher Education: Student Perspectives" in "Relationships Matter: Student and Faculty Perspectives on Equity and Knowledge-Building in Higher Education," Western Psychological Association convention, Riverside, Calif., April 30, 2023.

Fernando, G., Sode, O., and Sarkissyan, T. "Knowledge-Building and Equity in Higher Education: Faculty Perspectives" in "Relationships Matter: Student and Faculty Perspectives on Equity and Knowledge-Building in Higher Education," Western Psychological Association convention, Riverside, Calif., April 30, 2023.

Bower, C., Szabo, Y., Bowen, C., and Fernando, G. "To Professors with Love: The Role of Instructor Support in College Persistence" in "Relationships Matter: Student and Faculty Perspectives on Equity and Knowledge-Building in Higher Education," Western Psychological Association convention, Riverside, Calif., April 30, 2023.

# California State University San Marcos

## San Marcos, California

### When we began our journey

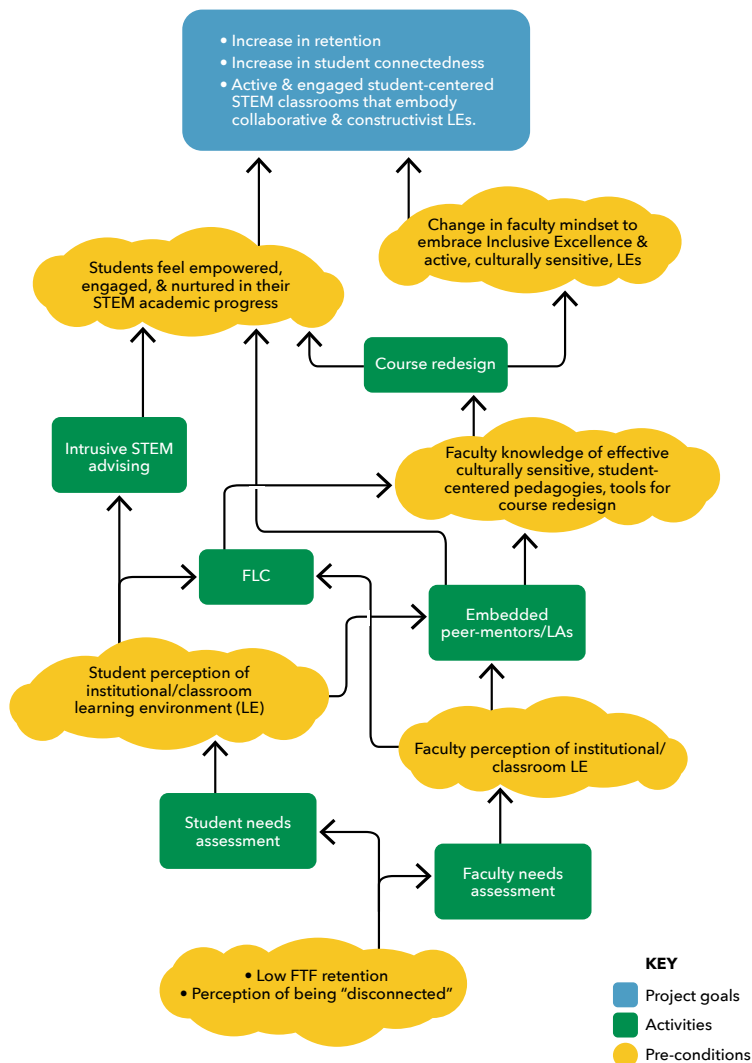
In 2018, we conducted a self-study at California State University-San Marcos (CSUSM) prior to submitting our HHMI IE proposal and found that the two-year retention rate for first-time freshmen (FTF) was 44%, and the rate for transfer students exceeded 80%. Upon further reflection, we identified several potential barriers to student success and retention within the College of Science, Technology, Engineering, and Mathematics (CSTEM), which provided the impetus for the activities conducted by our project. These barriers included the following:

- Insufficient faculty training in research-based instructional strategies and cultural competency, which caused students to be disinterested in and disengaged from their education.
- A lack of mechanisms to develop early disciplinary identity, which caused FTF to feel unwelcome and not part of an academic community.
- A lack of timely access to required courses, which caused FTF to leave STEM majors for those in which graduation is faster and easier.
- A lack of sustained, discipline-specific advising, which increased time to graduation.

### During our journey

At the beginning of our journey, we had both survey and anecdotal information from students on the institutional obstacles to inclusion. Based on these, we developed a theory of change (see Figure 1) that consisted of several strategies to reduce and/or eliminate these obstacles, including the following:

- **Increasing the inclusive teaching competence of STEM faculty:** We developed a faculty learning community (FLC) that meets annually to provide faculty with knowledge of inclusive teaching pedagogies, appreciation for diverse student perspectives, and tools required for reforming the learning environment so it is more welcoming, engaging, and supportive. Our FLC was based on the program at the UC Berkeley Center for Teaching and Learning, and we added a module on cultural sensitivity and modes of culturally affirming instruction.



**FIGURE 1:** Theory of change diagram at the beginning Year 1 of the CSUSM-IE project.

- **Providing academic support:** Lack of academic support was one of the main reasons for low student retention. CSUSM had existing academic support programs, such as supplemental instruction (SI), which employs undergraduates as peer instructors in courses that have higher rates of failure or withdrawal. However, SI is voluntary, and many students did not take advantage of it even when they would benefit. Thus we embedded SI within all of the required upper- and lower-division biology courses to eliminate the need for students to self-identify as being in need of assistance. Our program, called Course Embedded Learning Support (CELS), links a CELS SI instructor, who is an undergraduate trained in active and cooperative learning strategies, with the lecture instructor. Peer instruction occurs in a one-unit discussion section, called a learning CEL, that was added to each course to provide mandatory peer instruction. CELS instructors also act as learning assistants (LAs) in the lecture section, which allows the instructor to implement and expand active learning strategies in their curriculum. The CELS section does not add units to the major due to changes in the biology curriculum. Students universally feel that CELS has been effective at increasing their performance and building a sense of belonging in the classroom.
- **Increasing student sense of belonging:** We recently developed a freshman seminar course (BIOL 101) to help FTF meet their peers and faculty and create a more welcoming environment. This course will be taught for the first time in fall 2023.
- **Student academic advising:** CSUSM has a centralized advising system that has not adequately served STEM students. For example, advising has always been self-driven and optional, so many students don't understand the need for frequent academic advising, which often increases time to graduation. Thus our project implemented the biology student success coordinator (BSSC) to provide students with a familiar face, advertise advising opportunities, develop programming associated with academic and career advising, and provide personal services to help students plan their academic path.

## Sustaining our journey

We feel that there is great momentum for increasing inclusiveness within CSTEM because we have administrators (from the university president down to department chairs) who are committed to this cause. However, sustaining our HHMI-supported initiatives will require resources that are scarce within the CSU system. Thus while some of our initiatives have already been institutionalized, others will require creativity to be sustained. For example:

- Aspects of the FLC that we developed will likely be folded into other institutional initiatives, such as the New Faculty Institute, an onboarding program for new faculty.
- CELS is now embedded in all required lower- and upper-division biology courses, and the importance and efficacy of peer instruction has been recognized by the CSTEM dean and department chairs. We are now working with other deans and department chairs to institutionalize peer instruction in biology, and, hopefully, other CSTEM courses.
- Given the campus investment in centralized advising, sustaining the BSSC is likely not possible. However, there have been active discussions between the CSTEM dean and department chairs about the need to have a BSSC-like person within CSTEM, and the idea is gaining traction at higher administrative levels. Regardless, we have now incorporated many of the aspects of the BSSC into our new freshman seminar, so biology majors will continue to get the guidance they would have received from the BSSC as part of their BIOL 101 curriculum.

# Reflections

Our thinking about inclusive excellence has not changed during our journey; rather, our approach to increasing inclusion has (see our revised theory of change in Figure 2). We have had to be nimble, which is probably the most important lesson we learned, because of changes in administrators, system-wide changes in curriculum, pandemics, and other unforeseen circumstances. So, for example, we realized that if students need better academic advice than what is provided by the current institutional structure, other avenues, such as within a freshman seminar, are needed to provide this support. Another crucial lesson that we learned is to embed critical allies into the university structure, so that a unified message about the need for increased inclusion is heard far, wide, and repeatedly. This has been critical for the success of our project and will likely be critical for sustaining strategies that are reducing or eliminating barriers to inclusion. Finally, we learned we need to listen to student voices, as they are the ones who have to navigate the labyrinth of obstacles that are in place, or erected, along their academic path.

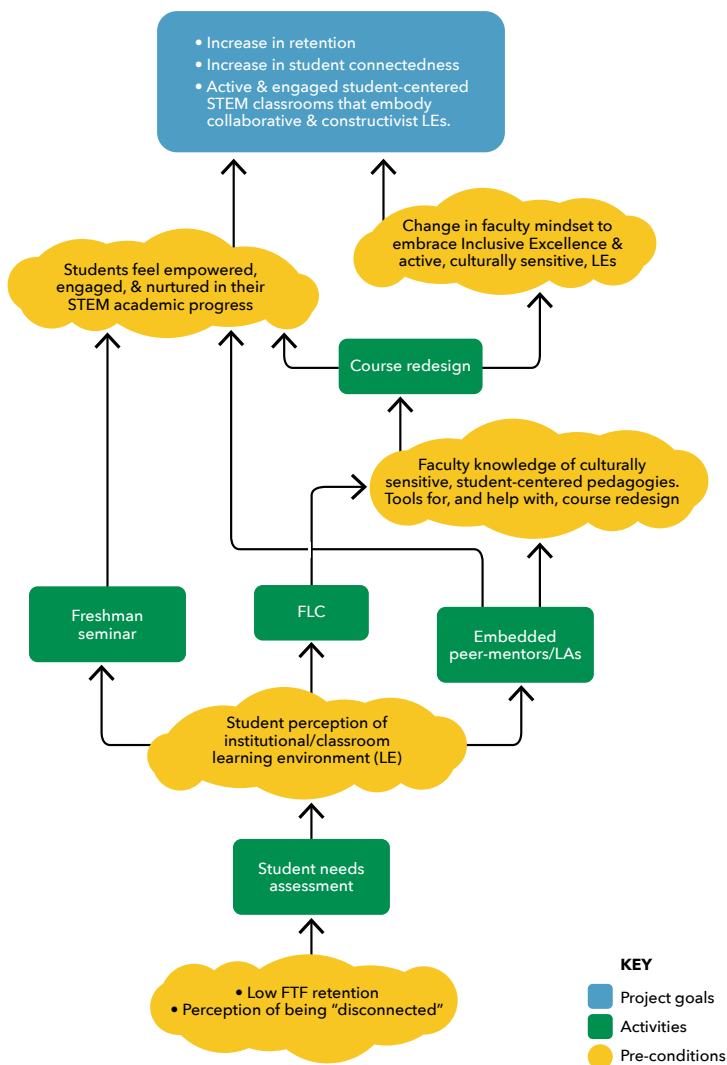


FIGURE 2: Theory of change diagram at the beginning of Year 5 of the CSUSM-IE project.



# Chaminade University of Honolulu

## Honolulu, Hawaii

### When we began our journey

Chaminade University of Honolulu sits at the interfaces between Western and Pacific epistemologies, faith and science, Indigenous and non-Indigenous identities, privilege and precarity. The IE team at Chaminade asked these questions: How can we fully live out the social justice mission of the university? How do we achieve inclusion and justice for minoritized and marginalized students against a backdrop of inequity and neocolonialism, while addressing missed opportunities for widespread learning from Pacific ways of knowing, learning, and being?

The primary strategies of our *Ho`imi* IE project (*ho`imi* means “to look for better and best” in Ōlelo Hawai`i, the Hawaiian language) were:

- 1 **To enculturate our STEM curriculum in terms of place-based content and culturally sustaining, inclusive pedagogy, with the goal of increasing belonging for Hawaii-Pacific students;**
- 2 **To foster culture-based faculty-student research experiences;**
- 3 **To center family and community in students’ journeys through higher education;**
- 4 **To build institutional capacity for inclusion through multilevel engagement with individuals, affinity groups, and systems.**

### During our journey

IE outcomes at Chaminade include course redesign, experiential learning, and extracurricular programming that are culturally grounded. A *mauka-to-makai* (which literally means “mountainside to oceanside”) metacurriculum guides students through a cultural journey in parallel with their four-year degree, incorporating Indigenous science, cultural practices, and *aina*-based (or “restorative”) learning. A cadre of Hawaiian faculty serve as academic navigators, providing students with academic advocacy, life coaching, and cultural engagement. One academic navigator is the first Chaminade faculty member to be credentialed for a faculty appointment based on cultural qualifications, representing institutional-level change.

New faculty research programs incubated by *Ho`imi* look at Hawaii-Pacific community priorities (health inequity, climate change, criminal justice) using biomedical, ecological, and data analytics techniques. These provide new opportunities for student research internships and course-based research experiences, as well as providing new early-career faculty with support to develop place-based research agendas. Culture- and community-based (CCB) research and internship

programs have been developed that place students in nonprofits and leverage faculty expertise to support the missions of nongovernmental organizations. Families and support networks for students are engaged and involved through a systematic program of events across the four-year degree (welcome events, showcases of students' research work, and a culminating 'awa and *kihei* ceremony to mark graduation and the next phase of students' voyages).

Institutionally, *Ho'iimi* has fostered key conversations about inclusion and provided faculty with professional development and mentoring in culture-based pedagogy. *Ho'iimi* faculty collaborate with colleagues to add cultural dimensions to new and extant courses. *Ho'iimi* faculty have become embedded in numerous university bodies and committees, adding voices for IE in almost all ongoing initiatives. A DEI/IE task force has been convened as a central component of developing the university's new 2024–2029 Strategic Plan. In August 2023 the university announced its first DEI leadership position – a newly appointed assistant provost for inclusive excellence. We have not encountered significant internal barriers to progress. Faculty broadly see IE as an obvious extension of the university's mission, and the administration is extremely supportive and informed about DEI. Of the many challenges navigated during *Ho'iimi*, faculty bandwidth and exhaustion, COVID-related disruptions, and the severe economic precarity experienced by our students all continue to be issues.

## **Sustaining our journey beyond HHMI**

The *Ho'iimi* program has laid critical foundations for Chaminade to “walk the talk” of its inclusivity mission. Institutionalization of key positions and functions, and the leveraging of a significant grants portfolio focused on DEI issues, provide assurance that the core efforts of the HHMI award will be maintained. Perhaps even more importantly, *Ho'iimi* brokered key (and complex) conversations about the intersectionality of our university and catalyzed an increase in the sophistication of our institutional understanding of, approach to, and commitments to inclusion in the Pacific context.

## **Reflections**

**We gained a deeper understanding of the multiple marginalizations experienced by our students,** and we have moved to extend the mandate of IE far beyond Indigeneity into populations such as veterans, currently and formerly incarcerated students, and sexual and gender minorities. We continue to elevate the Hawaii-Pacific STEM voice as a global asset for confronting societal challenges and culture-based educational models as broadly applicable to promoting equity and inclusion on a national scale. Our lessons learned are numerous: The importance of relationship-based advocacy and change management has been a major theme, and the continual crosswalking of IE goals with the underlying mission and identity of the university has been critically important for buy-in from campus stakeholders.

## Grant-Derived Dissemination Products

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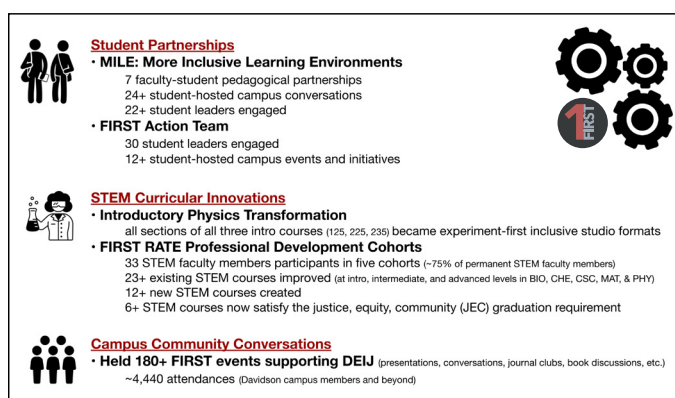
# Davidson College

## Davidson, North Carolina

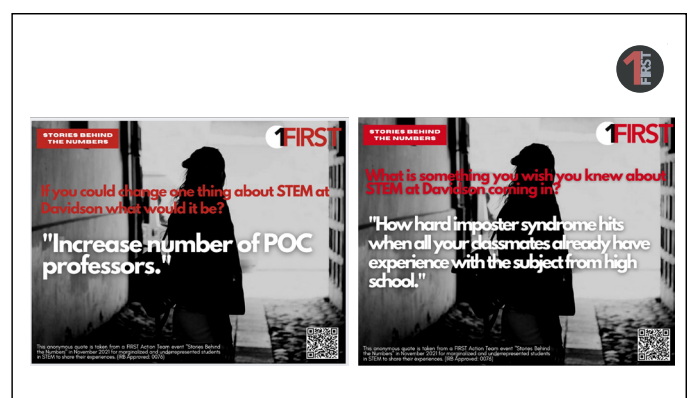
We identified two critical starting points at Davidson College for our HHMI project, which we called FIRST (Fostering Inclusivity and Respect in Science Together):

- 1 Most STEM faculty members were deeply interested in expanding capacity for inclusion, but many lacked essential time, community, experience, and/or information to develop pedagogies and curricula to serve our increasingly diverse student body.**
- 2 Many were aware of outcome disparities between marginalized students and students with white/dominant identities, yet far less familiar with the barriers our marginalized students experience pursuing STEM.**

These starting points, combined with a stance of fixing our institution (rather than our students) drove FIRST's strategies (see Figure 1). Specifically, we created FIRST RATE (Resources and Time for Experimentation) cohorts for STEM faculty members to enact inclusive teaching goals within a community of peers. We also offered a robust calendar of varied and convenient professional development opportunities (over 180 in five years). Although FIRST targeted STEM faculty members, we welcomed the full campus community and observed that particularly deep insights occurred when multiple facets of our campus community participated together. Importantly, FIRST also catalyzed two new student teams – FIRST Action Team and MILE (More Inclusive Learning Environments) – to engage undergraduates directly in facilitating more inclusive environments by elucidating barriers they faced (see Figure 2), sharing recommendations for enhancing inclusion, and acknowledging student expertise and passion.



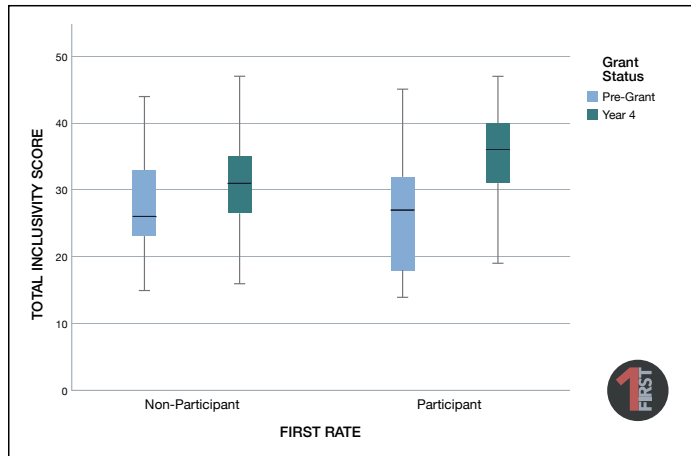
**FIGURE 1:** This table summarizes several metrics for actions and activities supported by Davidson's HHMI-funded IE project, FIRST (Fostering Inclusivity and Respect in Science Together).



**FIGURE 2:** These posters are examples from a series created by students on the 2021-22 FIRST Action Team, to share with the Davidson community anonymous experiences of students who identify as marginalized in STEM.



During our journey, we learned that bold expectations for a better future are necessary amid work that can be slow, exhausting, overdue, and challenging. Changes can and should occur at all levels (individual, departmental, divisional, institutional), from both the ground up and the top down and through actions both large and small. We learned about obstacles and supports by 1) listening, particularly to students, and inviting them as partners; 2) recognizing ineffective efforts; and 3) learning from the successes and failures of others. We also recognized that a community that values individual differences fosters freedoms that empower individuals to suggest and enact changes. Importantly, a critical mass of individuals (not necessarily a majority in numbers) can powerfully influence norms, buy-in, and momentum. As examples, faculty members shared that FIRST RATE “allowed me to think more deeply,” helped to “develop a network of like-minded colleagues,” and “increased...my ability to lead discussions of DEIJ [diversity, equity, inclusion, and justice] topics.”



**FIGURE 3:** This figure is an example from an assessment of STEM syllabi conducted by Shauntell Pinckney (at Howard) and Brent Maher (at Davidson). They first developed a rubric with which to evaluate the inclusivity of a syllabus. Their analysis revealed that STEM syllabi at Davidson scored as more inclusive in Year 4 of the HHMI funding than prior to the start of the grant. Moreover, syllabi of courses taught by STEM faculty members who had participated in one of the first three FIRST RATE cohorts showed greater gains in inclusivity over this time period than did syllabi of courses taught by faculty members who did not participate (or had not yet participated) in a FIRST RATE cohort.

These efforts established new norms. One faculty member noted, “I’ve been deeply embedded in conversation about inclusion frequently enough that it’s now become a habit of mind.” Another who was engaged in the department-wide, collaborative transformation of the introductory physics curriculum observed, “Momentum is so strong that it is almost physically impossible for us to teach the way we did before,” while a faculty member in another department remarked, “Now that I’ve seen the gains in student learning and what equitable grading looks like, I can’t imagine ever going back...if the way I assessed student work could be improved this dramatically, what else in my current practice could also be similarly improved?” Encouragingly, we also observed during the grant period that an external evaluator assessed our Year 4 STEM syllabi as more inclusive than earlier STEM syllabi (see Figure 3). Importantly, student metrics also revealed that students with identities underrepresented in STEM are increasingly majoring in STEM. Students cite positive changes in classroom climate, and MILE students were encouraged by professors who “implement our ideas or suggestions” and the fact that “we can see change happening.”

The grant provided opportunities at a critical time to generate momentum that will unquestionably sustain this

important DEIJ work well beyond the grant funding period – and far beyond STEM departments. Davidson is well positioned to continue advancing toward inclusive excellence by emphasizing that DEIJ work is a shared and ongoing priority expected of all. As an example, several members of the FIRST leadership team served on a group that updated definitions of effective and inclusive teaching that were approved by the faculty and will soon be expanded into policies that explicitly value, mentor, and evaluate teaching with new clarity, support, and guidance. Additionally, curricular innovations by FIRST RATE faculty members are highlighted as gold standards of inclusion. A VP recently commented that FIRST had facilitated “amazing changes” because faculty members talk about pedagogy now in ways that “look totally different.” Another VP described FIRST’s offerings as Davidson’s “premier” faculty development opportunities. These opportunities will continue as FIRST events transition into Davidson’s Center for Teaching and Learning (CTL).

As further evidence of sustainability, the new CTL director is now a member of the FIRST leadership team, and the critically important FIRST program analyst postbac position has transformed into a permanent CTL DEI coordinator position. With regard to student partnerships, FIRST leadership team members recently reflected that it is now nearly impossible to think about improving pedagogy and/or campus culture without meaningfully partnering with our students in ways that truly welcome their voices and value their expertise. As an example, several FIRST Action Team students serve on a DEI search committee and a strategic planning advisory committee. Moreover, Davidson has demonstrated broad and high-level institutional commitments to addressing our many persisting barriers by creating a new vice president for diversity, equity, and inclusion position.

Our thinking regarding inclusive excellence has evolved considerably over the past five years – a period including pandemics that increased the visibility of numerous inequities and enhanced the moral urgency to do the right thing in setting conditions so all humans can reach their full potential. We expect our thinking will continue to evolve as we learn and grow from both success and failures. Realizing the value of student partnerships, expertise, and input is one of our most profound reflections. This information will drive us to sustain and expand on the roles of our student action and advisory teams (MILE and FIRST Action Team) long after the grant funding has ended. Similarly, realizing the value of keeping DEI work always on the agenda is a priority. This work requires “a commitment to radically transform the traditional approaches to teaching that center privileged groups, in favor of liberatory pedagogy,” as well as “deep knowledge of historical and contemporary oppression, an activist posture, and a willingness both to be vulnerable with students and to show them in the structure and practices of your course that you are reforming and not perpetuating the status quo.”

## Grant-Derived Dissemination Products

### Publications

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### Publications In preparation

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Smith, K.G. “Teaching problematic case studies in biostatistics” (target journal is TBD).

Thurtle-Schmidt, D. “Representation in genomic datasets” (target journal is *CourseSource*).

## Presentations

Barsoum, M. "Antiracist curriculum for undergraduate physiology," Anatomy and Physiology Online Teaching and Learning Community, 2023.

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Hales, K.G. "Inclusive language frameworks and approaches in the biology classroom," American Society for Cell Biology (ASCB) annual meeting, 2020.

Hales, K.G. "Signaling inclusivity through deliberate framing of specific genetics-related course content," Auburn University Department of Biological Sciences, 2020.

Hales, K.G. "Signaling inclusivity through deliberate framing of specific genetics-related course content," ASCB Online with LSE (life sciences education) webinar series, 2020.

Hales, K.G. "Signaling inclusivity through deliberate framing of specific genetics-related course content," University of Florida Department of Biology, 2020.

Hales, K.G. "Research, teaching, and careers at primarily undergraduate institutions (PUIs)," *Drosophila* Research Conference, 2021.

Hales, K.G. "Inclusive pedagogy specific to genetics topics," University of Maryland Department of Entomology, 2021.

Gfroerer, T. "Teaching sustainable design with solar-powered Arduinos," AAPT winter meeting, 2023.  
<https://aapt-wm.secure-platform.com/a/solicitations/44/sessiongallery/1101>

Jaswal, S., Bunnell, S.L., Chung, J., Chaterjea, D., Dudle, D., Lom, B., and Stanford, S. "The being human initiative: Engaging student-faculty partners in critical analysis of education and collective action for a more inclusive campus," American Association of Colleges and Universities (AAC&U) national conference, 2023.

Lom, B., and Lherisson, E. "Catalyzing a student action team for improving inclusivity in STEM," AAC&U Transforming STEM Higher Education meeting, 2019.

Lom, B. "Reducing bias when telling developmental biology stories," Society for Developmental Biology southeast regional meeting, 2020.

Lom, B. "Making science more inclusive: Strategies at multiple scales," Duke University Cell Biology Department seminar, 2020.

Lom, B. "Building antiracist lab environments," Faculty for Undergraduate Neuroscience (FUN) Final Friday series, 2022.

Maher, B.D. "Analyzing course syllabi to understand inclusive teaching practices," North Carolina Association for Institutional Research annual conference, 2023.

Pinckney, S. "Is DE&I on the syllabus? Assessing inclusive components of STEM course syllabi," AAC&U Transforming STEM Higher Education conference, 2022.

Stutts, L.A., Wessner, D., Mamoon, N., Chillag, K., and Bullock, S. "Integrating justice, equality, and community concepts into a public health curriculum," Liberal Arts Collaborative for Digital Innovation conference, 2022.

# Delaware State University

## Dover, Delaware

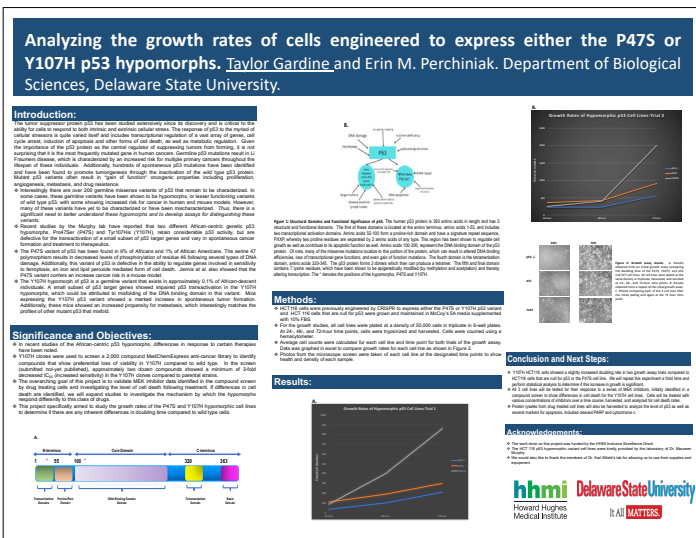
### When we began our journey

The principal goal we established at the start of our IE journey at Delaware State University (DSU) was to increase the retention and graduation rates for nontraditional students in STEM programs. In the first two years of the project, this primarily consisted of pedagogical training for STEM faculty to help them bring more active learning into the classroom, particularly in order to engage students in introductory courses, and to create online courses that met the needs of nontraditional students. Our definition of “nontraditional” applies to a broad swath of DSU students: first-generation students, Pell Grant recipients, transfer students, full-time workers, single parents, adult learners, veterans, and students with breaks in their academic careers. Over the life of the grant and due to the COVID-19 pandemic, our goals expanded to include creating professional development opportunities for all DSU faculty and instructors to help them transition their courses to an online environment and to improve the quality of teaching in that environment. More recently, our grant efforts have focused more on expanding experiential learning activities inside and outside the classroom.

### During our journey

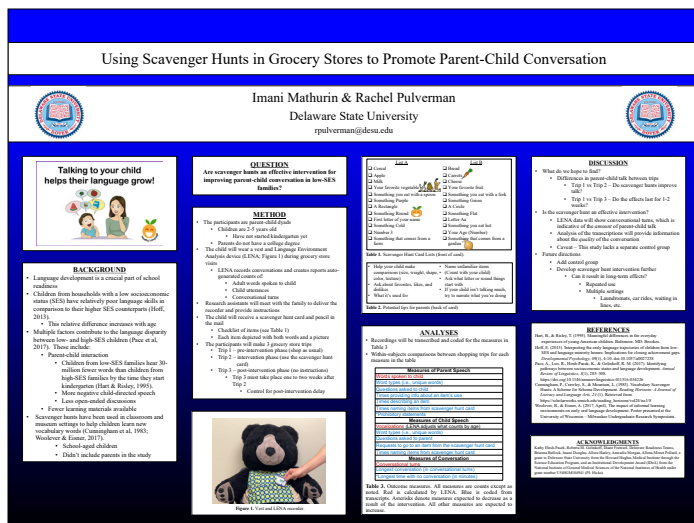
As noted above, the pandemic created a need for online delivery of courses and thus one of the goals established at the beginning of the grant – to help faculty transition courses to an online format to support the needs of nontraditional students – became an urgent university-wide necessity. Thanks to the support of the HHMI IE grant, a training course was already in development when the pandemic began, so we were able to immediately offer that training to the entire DSU community, not solely to STEM instructors. This training was developed by a team of DSU faculty who had completed courses offered by the Association of College and University Educators (ACUE) in effective teaching practices and online teaching. Between 2020 and 2022, more than half of the DSU faculty completed this training.

While the expansion of online course offerings created more scheduling flexibility for nontraditional students, the issue of retention persisted. A secondary activity developed in the final years of the grant was an opportunity for students to engage in their own laboratory-based research under the guidance of a faculty mentor. This initiative was intentionally created for first- and second-year students with the hope that active experiential learning early in their academic career would support their retention in the STEM majors. Students were paid a stipend, and mentoring faculty were offered funds for supplies. This program was particularly appealing to students because it occurred during the academic semester, required only 10 hours per week of laboratory work, and enabled students to make immediate connections between their coursework and independent research. At the end of each semester, students shared their findings in poster presentations (see Figures 1–3) and several have submitted articles to scientific publications.

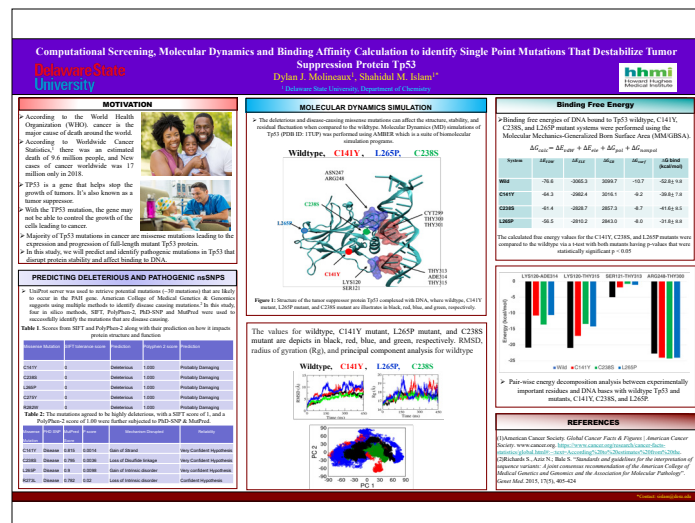


**FIGURE 1:** A student research poster about cell growth rate.

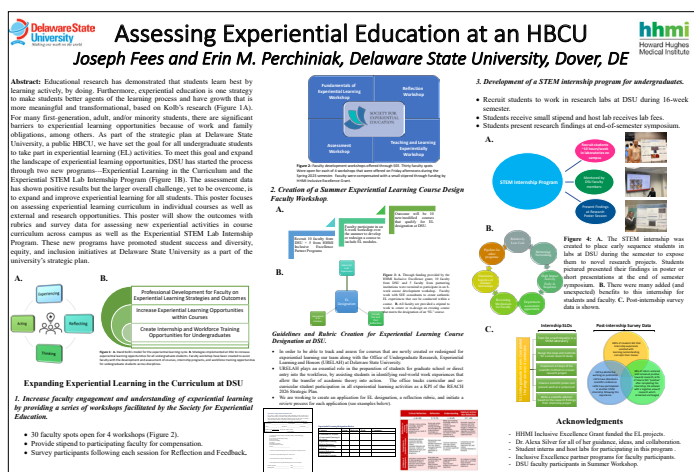




**FIGURE 2:** A student research poster about children's language development.



**FIGURE 3:** A student research poster about the tumor suppressor gene TP53.



**FIGURE 4:** A research poster about the experiential education aspects of DSU's IE program.

More recently, training has been offered to the faculty through the Society for Experiential Education, and, during summer 2023, 11 DSU faculty and four faculty from other schools in our peer implementation cluster are participating in a collaborative project to restructure their course curricula to infuse more classroom-based experiential learning activities into them.

## Sustaining our journey beyond HHMI

The professional development and experiential learning activities created through the HHMI IE grant have had a significant impact on the culture of teaching excellence at DSU (see Figure 4). Our ability to engage with more than half of the DSU faculty and instructors, not simply those in the College of Agriculture, Natural Sciences, and Technology (CAST), has created a collaborative environment where faculty from diverse colleges and departments engage in ongoing conversations regarding best teaching practices.

The student experiential learning lab project has been a great success. As of spring 2023, more than 50 students, primarily from the biology and chemistry departments but also from agriculture and psychology, have engaged in independent research and, building on those experiences, are now pursuing additional research opportunities available to upperclassmen. Faculty in CAST are now seeking additional funding sources to continue and expand the program.

## Reflections

While we initially intended to concentrate this grant on the needs of students in STEM fields, the variety of professional development opportunities offered has changed the culture at DSU to not only emphasize but also to celebrate teaching excellence. Since DSU is an HBCU committed to educating underserved populations, teaching has always been an essential component of our mission. However, prior to this grant and the upheaval of the pandemic, pedagogical training was sporadic and not widely attended. In particular, faculty expressed frustration that they were learning about pedagogical innovations but rarely had the time to implement them in the classroom. The training offered through the IE grant intentionally challenged faculty to engage in long-term projects and create new activities to implement best-teaching-practice principles. Utilizing HHMI funding, we were able to offer stipends to faculty based on their successful submission of deliverables. This financial remuneration sent an important message – that the institution is committed to teaching excellence and acknowledges that faculty have diverse responsibilities and limited time and, therefore, should be recognized for their strong commitment to improving their craft.

## Grant-Derived Dissemination Products

### Presentations

Silver, A., Fees, J., and Taylor, O. "Online Course Conversion Training at Delaware State University," American Association of Colleges and Universities annual conference, January 22, 2021.

Silver, A., Fees, J., and Taylor, O. "Faculty Training for Online Course Conversion at Delaware State University" (poster), Virginia Tech Conference on Higher Education Pedagogy, February 3–5, 2021.

Perchiniak, E., and Fees, J. "Assessing Experiential Education at an HBCU," Association for the Assessment of Learning in Higher Education" (poster), June 5-8, 2023.

Perchiniak, E. "Building an inclusive workforce pipeline at Delaware State University" (roundtable discussion), Society for Experiential Education annual conference, September 26, 2023.

### Publications

Fees, J., Silver, A., and Petrovic, T. (2021). "Planning Community-Based Faculty Trainings and Professional Development at Your Own Institution," *Academic Leader*, February 2021.

Perchiniak, E., Fees, J., and Silver, A. (2023). "Promoting Student Success and DE&I in Experiential Education at an HBCU: STEM Lab Internship Programs," *Experiential Learning and Teaching in Higher Education Journal*, November 2023.

Wilwerding, L. (2024). "Singleness Summit," *Undisciplining the Victorian Classroom* (forthcoming).

# DePauw University

## Greencastle, Indiana

### When we began our journey

Our IE journey began at DePauw University when institutional data revealed that PEER (person excluded due to ethnicity or race) students who entered the university with an interest in science and mathematics were less likely to graduate with degrees in STEM than their white counterparts. Furthermore, PEER and first-generation college students received lower grades in our introductory STEM courses than white and continuing-generation students. Finally, focus group data revealed that PEER students encountered barriers to success in their STEM courses.

DePauw's STEM faculty are predominantly white and male; PEER students don't see their own diverse identities reflected in their instructors and may perceive a subtle message that they might not belong in STEM. In addition, STEM instructors who have not invested in learning about anti-racism and inclusive pedagogies may fail to recognize structural inequities built into the educational system that likely benefited them while disadvantaging others.

To raise awareness and inspire action among our colleagues regarding systemic racism, we have facilitated faculty-staff learning communities where we discuss anti-racist practices in higher education, share struggles and successes, and devise projects to address inequities on campus. Because faculty and staff are vital to our STEM students' experiences, STEM-affiliated staff members are invited to participate in all grant activities, and we have worked to ensure equity in compensation for all participants.



Our STEM Guide Program has successfully built capacity for inclusion across our STEM departments by empowering students (ideally PEER students) to serve as academic leaders in and out of the classroom and by strengthening relationships between students and faculty, as well as among students (see Figure 1).

Additional resources for students, faculty, and staff include internal grants for community-building and support for conference and workshop attendance, hosting of visiting scholars, and development by departments/programs of projects that increase the inclusiveness of their courses, curricula, pedagogies, and spaces.

**FIGURE 1:** DePauw University's logo for its Growing Inclusive Excellence in STEM grant. The trees and their roots symbolize the individual and collective work that it takes for systemic change. The depth and breadth of the root systems show that the work isn't solely in one direction and that the different systems are interconnected.

## **During our journey**

Our chemistry and biochemistry department exemplifies successful capacity-building for inclusion. During the grant period, faculty altered their pedagogy and research practices, and the number of PEER students persisting and majoring in the discipline increased.

For example, all sections of the department's introductory courses are now taught in a "flipped" format, and STEM Guides are well integrated into the introductory and other core courses. The integration of STEM Guides into introductory organic chemistry has been accompanied by an increase in course GPA of half a letter grade and by a substantial reduction in withdrawal rates.

The chemistry and biochemistry department also established a transparent and inclusive approach to student-faculty research. To increase students' access to research opportunities, the department invites all students currently enrolled in a chemistry/biochemistry course to a lunch seminar where faculty describe their research projects. This event is followed by a second lunch resembling "speed-dating," so interested students can meet individually with faculty to learn more about their projects. Students then apply to those that interest them. This process has allowed the chemistry/biochemistry department to match 95% of student applicants and has doubled the proportion of PEER students participating in faculty-student research, with a corresponding increase in PEER students majoring in chemistry/biochemistry.

We have also built capacity among faculty and staff by facilitating an Inclusive Excellence Learning Community. All eight STEM departments have participated, reading works on inclusive teaching, white supremacy culture in STEM, and fostering belonging among students. These meetings have encouraged participants to begin to do some of the internal work necessary to dismantle white supremacy culture.

Our most popular and successful initiative has been the STEM Guide Program, in which students (ideally PEER students) who have successfully completed an introductory STEM course serve as embedded teaching assistants and mentors for a subsequent section of the course. STEM Guides attend the class at least once a week, hold "office hours" outside of class, and are paid for their time and expertise. First-time STEM Guides enroll in a practicum course to discuss best practices for peer instruction and DEI. STEM Guides help introductory STEM students understand challenging material and also serve as role models. The STEM Guide program benefits the guides themselves, as they reinforce their comprehension of the material by teaching it to others, while also building confidence and leadership skills. Over 4,800 students have had a STEM Guide; 127 guides have worked with 54 faculty sponsors in 26 unique courses across all eight STEM departments at DePauw. Our STEM Guide roster includes 74% women and 33% PEER students, exceeding the proportions of those groups in the general DePauw student population.

## **Sustaining our journey beyond HHMI**

The STEM Guide Program is the initiative most likely to be sustained by the institution. The practicum course is part of the university catalog, and the administration has extended the contract of the faculty STEM Guide coordinator. This program has become an important part of STEM culture at DePauw, with data to demonstrate its success. Our Development Office is looking for donors to endow the program once the grant funding ends.

DePauw's structures and policies have undergone some positive changes during the grant period; for example, a vice president of institutional equity has been hired, both faculty development funding and tenure/promotion now require evidence of DEI activity, and a requirement to post midterm grades for all students has been established. We believe our consistent efforts and support, in solidarity with many other voices on campus, have contributed to these changes.



## Reflections

**Despite some frustration with the slow pace of change, we have seen some progress.**

We have come to recognize that we are attempting to address centuries of white supremacy culture in higher education, so structural change will not occur overnight, or even in five years. We have been somewhat successful with grassroots efforts to engage our science and math colleagues, but it takes more to make structural changes.

It might have been helpful to have an administrator on the primary grant team to ensure more high-level, consistent attention and priority to our goals. However, given the frequent administrative changes over the grant period, including the president and the entire cabinet, even that might not have ensured that our programs would be institutionalized.

## Grant-Derived Dissemination Products

Ahmad, H., Majka, S., Davis, B., Zhu, S., Armas, A., Bello-Rosas, K., and Propsom, P. "Identifying college classroom factors to address underrepresentation in STEM," Midwestern Psychological Association annual meeting (virtual poster presentation), Chicago, Ill., April 22-24, 2021.

Dudle, D.A. "Learning communities and Being Human in STEM," Indiana College Biology Teachers' Association (poster presentation), Indianapolis, Ind., September 24, 2022.

Jaswal, S., Bunnell, S., Chatterjea, D., De Grandi, C., Dudle, D., Greenland, K., Lom, B., and Stranford, S. "The Being Human Initiative: Engaging student-faculty partners in critical analysis of education and collective action for a more inclusive campus," American Association of Colleges and Universities (AAC&U) annual meeting (poster presentation), San Francisco, Calif., January 18-20, 2023.

Poturovic, S., Guinn, E., and Hansen, J.H. "Flipped classroom design in organic chemistry course improves student performance and retention," Ohio Project Kaleidoscope (PKAL) conference (poster presentation), Dayton, Ohio, May 18, 2019.

Propsom, P., Ahmad, H., Davis, B., and Majka, S. "Listening to student voices: Focus-group research to promote inclusion," AAC&U Transforming STEM Higher Education conference (poster presentation), Chicago, Ill., November 7-9, 2019.

Roberts, J.R., and Hansen, J.H. "An embedded STEM Guide Program: Improving student performance and persistence," AAC&U Transforming STEM Higher Education conference (poster presentation), Chicago, Ill., November 7-9, 2019.

Roberts, J.R., and Propsom, P.M. "Evidence-based model for institutional change in a college STEM division," Ohio PKAL conference (poster presentation), Dayton, Ohio, May 18, 2019.

# Framingham State University

## Framingham, Massachusetts

### When we began our journey

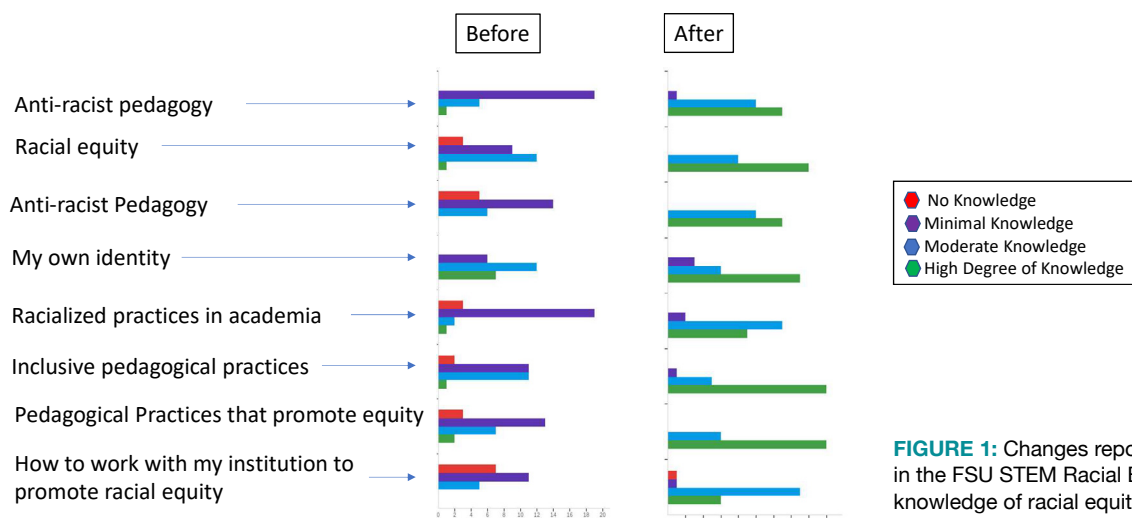
When we began our IE journey at Framingham State University (FSU), we had recently very quickly increased the racial and ethnic diversity of our undergraduate students. The critical problem we identified was that our STEM faculty were unable to provide the level of support that students of color requested in the wake of a series of hate crimes targeting Black students at FSU. The primary strategy we used to increase inclusive excellence was through intensive faculty development. Specifically, we developed the FSU STEM Racial Equity Institute, a full-time, five-week faculty development experience for which faculty were paid a stipend equivalent to the compensation they would receive for teaching a summer course through the Division of Continuing Education.

The first step in our journey was to gather a team of 20 members of the FSU community to attend the Equity Institute run by Dr. Shaun Harper at the University of Southern California's Rossier School of Education. On our team were 10 administrators (including the president, the provost, and all of the academic deans) and 10 faculty leaders (including individuals from STEM as well the social sciences). The purpose of this exercise was for key stakeholders across campus to achieve a shared mental model that would help connect and guide us in our work. This institute provided for mentored projects carried out by smaller teams from FSU. Two teams tackled projects central to the proposed grant work: the STEM Racial Equity Institute Curriculum Development Team and the Racial Equity Data Team. Including senior executive staff turned out to be highly beneficial in securing the support necessary to move this work forward. Specifically, the president was a member of the data team, and he authorized the release of the raw data needed to begin the work; access to this type of data has traditionally been impossible at FSU.

This grant has allowed us to develop an intensive faculty training model that engaged 70% of the STEM faculty at FSU. The benefits to Framingham State are twofold: First, over a relatively short period of time, a majority of STEM faculty participated in training that has increased their understanding of and comfort with discussing issues related to racial equity and anti-racism. Second, we developed a model for effective anti-racist STEM faculty development that can be applied in a modified format going forward, for the benefit of FSU as well as other institutions. Faculty who have benefited from attending the FSU STEM Racial Equity Institute have gone on to make changes in the way they operate as professionals within the university community.

70%

### Participant knowledge before & after the Institute

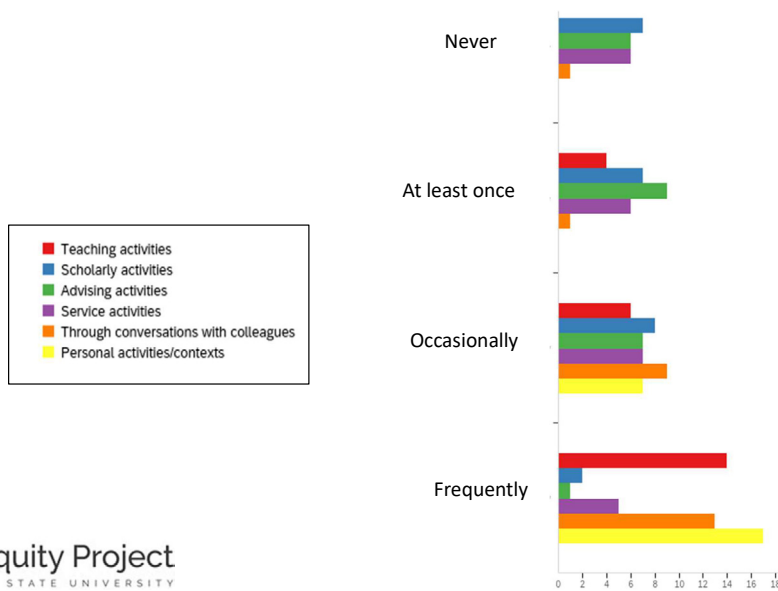


**FIGURE 1:** Changes reported by participants in the FSU STEM Racial Equity Institute in their knowledge of racial equity issues.

Some have become leaders on campus, mobilizing in a group called Faculty Against Hate. Several have pursued leadership roles in the Center for Excellence in Learning, Teaching, Scholarship, and Service (CELTSS) and have expanded equity-focused programming for all faculty on campus. Others have brought an equity lens to their service on governance committees that make impactful decisions regarding curriculum and academic policies – supporting policy changes over the past two years that are aimed at making academic success and degree attainment more accessible to all students.

When the initial award was announced, the leadership team took a very broad view of inclusive excellence – one that was so broad that it prioritized the comfort of the most privileged members of our community. With the help of the inclusive excellence program staff at HHMI, we learned to look more critically at our institution to identify which populations were facing the greatest barriers to success.

## In what contexts did the participants share their new knowledge?



**FIGURE 2:** Contexts in which participants in the FSU STEM Racial Equity Institute shared their new knowledge of racial equity issues.



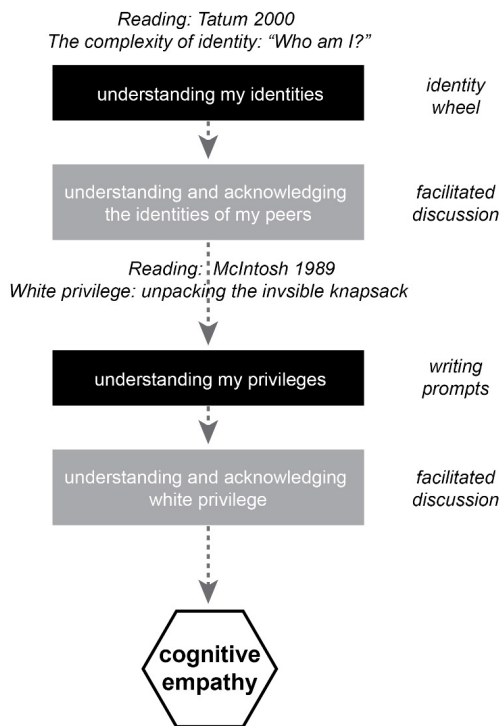
## Reflections

At FSU, it was clear that we needed to address issues related to race and ethnicity, and the negative effects that the systemic imbalance of power and privilege, favoring individuals with dominant identities, had on the outcomes of our students. We learned that doing this work – the work of transforming mindsets – is hard, and that the individuals pushing this work forward have a high turnover rate. It is important to develop a strategy for mentoring faculty leaders so that the institution does not place all of the responsibility for maintaining the momentum of equity work on one or two individuals.

# James Madison University

## Harrisonburg, Virginia

The HHMI IE grant at James Madison University (JMU) consists of three initiatives designed to improve the experience and retention of students historically underserved and poorly retained in biology/biotechnology: first-generation students, community college transfer students, and BIPOC students. Our three foci are improving transfer students' experiences as majors in our discipline; creating a physical space to meet the needs of all our majors, particularly transfer students and BIPOC students; and enabling faculty to teach more inclusively by understanding student identities and backgrounds.



**FIGURE 1:** Conceptual model for an identity-privilege workshop facilitated by biology faculty at James Madison University (K. Slekar and M.R. Parker). Participants read two short papers and engage in reflection and peer-peer discussion in a process designed to develop cognitive empathy. The workshop was inspired by the Center for Faculty Innovation at JMU and was supported by HHMI Inclusive Excellence funding.

The strategies guiding our initiatives are interlocking, with a shared aspiration: generating a self-sustaining culture of inclusion that establishes diversity and equity as nonnegotiable foundations. To improve the experience of our transfer students, we developed a transfer-student course-based research experience (tCRE) to facilitate their transition into the department, while helping them develop the skills and competencies they need for success, providing them with an opportunity to meet one another on common ground as new matriculants at JMU, and incorporating a framework of evidence-based practices to build a sense of belonging and scientific identity. To bring together all our biology/biotechnology majors while meeting the needs of our underserved students, we established the BioCommons to facilitate learning, relaxation, and community-building. By asking diverse student groups about their needs and desires for the BioCommons, we conveyed a message of care and compassion, altering their view of the faculty-student relationship. This space also provides programming and resources to draw all students together and facilitate the realization and celebration of our diversity. Our faculty-staff development initiative relayed the concepts of identity and privilege to uncover implicit bias and develop empathy. Facilitated discussions with colleagues in a safe space allowed faculty to hear and understand their peers and initiate the development of cognitive empathy, a sense of knowing how others think and feel.

Numerous grant-driven outcomes have built inclusive capacity at our institution. Assessment data reveal that tCRE participants reported higher gains in science identity and sense of belonging than their counterparts in a parallel CRE. tCRE participants also benefited from the sense of community within the cohort positively contributing to their transition into the department. Challenges include providing a broader spectrum of discipline-specific CREs throughout our curriculum and ensuring their facilitation by well-trained instructors. As such, we are developing a CRE workshop to fold tCRE-specific inclusive programming into the logistics of implementing CREs in general.

Our recently opened BioCommons has already generated outcomes indicating an increase in our inclusive capacity. In one three-week period, about 700 students used the facility, a clear indication that we are meeting student needs (Figures 2-3). Further, a BIPOC student organization, Biology Students of Color, was formed as a result of our IE work and is now a prominent entity in professional development (Figures 4). The existence of this space and its early success belies one of the challenges we faced throughout: buy-in from students and upper administration. To ensure that the space serves our students effectively, we collect feedback, through which we have determined a number of student-identified resources and programming. In addition, challenges in getting the space allocated and renovated revealed an important lesson about institutional buy-in: while a change in culture requires grass-roots efforts, involving upper administration from the outset and throughout the process is also essential, especially in the context of space, a chronically limited resource.



Our faculty-staff development has increased capacity for inclusion through an increase in awareness of inclusive behavior and a desire to use this awareness to improve students' experiences (Figures 1). Tremendous buy-in and peer-based influence has resulted from our focus on identity privilege, and nearly all our faculty and administrators have participated in the workshop. We are now poised to offer a Mobile Summer Institute to develop classes that weave inclusion and equity throughout our curriculum. The major challenge of this work related to initial buy-in; we found an effective strategy was to meet the faculty or staff member where they "live" – i.e., we match apprehensive faculty with faculty of similar ages and backgrounds to discuss inclusive concepts.



**FIGURE 2:** The JMU BioCommons is housed on the third floor of the Bioscience Building and is an integral component of the JMU biology department's RIDGE (Reaching Inclusiveness by championing Diversity, Growth and Equity) program. The atrium shown here looks out on a panoramic view of campus and contains movable chairs, couches, tables, and whiteboards to encourage both academic and social interactions. The atrium also contains a 98-inch monitor suitable for student and faculty presentations on topics of inclusion, diversity, and equity.



**FIGURE 3:** The JMU BioCommons office suite, adjacent to the BioCommons atrium, offers communal space for biology and biotechnology majors to interact; store and prepare food; and relax before, in between, and after class. The main space contains chairs, tables, and couches, as well as a 75-inch monitor for student use, while surrounding areas include a reservable study room with a monitor and whiteboards, a computer lab for peer tutoring/mentoring as well as general use, printing services for students, and an office for our BioCommons faculty champion. Also housed in this space is a dedicated office for our Biology Students of Color (BIOSOC) organization, which was directly involved in the design and outfitting of this space.



**FIGURE 4:** The JMU BioCommons Biology Students of Color (BIOSOC) office, located in the BioCommons office suite, is a dedicated space where the leadership of this organization can hold meetings, plan events, and interact with each other in a safe space. While other biology student organizations will have access to this office, depending on the BIOSOC schedule, BIOSOC students will control the nature of the space. Their first addition was to "plant" the BIOSOC tree, on which all members will place their handprint and signature as the organization moves forward.

Our grant work has positioned our institution to continue evolving toward an inclusive culture by driving institutional changes in our curriculum and community; the value added to our culture and practice is now being recognized and requested by other departments. The tCRE concept is integrated into our curriculum and is part of the advising structure for onboarding transfer students as biology/biotechnology majors. Other units have inquired about our tCREs, and we are planning a workshop to train faculty at JMU as well as other institutions. The BioCommons is now a committed space strongly supported by our upper administration; its continual evolution will ensure its role as a valued generator of inclusive community and as a center for programming and resources providing equitable opportunities for success. Our faculty-staff workshop on awareness and empathy positions us to develop effective inclusive practices, ensuring that inclusion and the embrace of diversity and equity are established throughout our curriculum. Many institutions have expressed interest in this workshop, and we plan to facilitate this programming through “train the trainer” events.

Our ideas of what effective inclusive excellence is and how to implement it have evolved dramatically, driven primarily by two lessons we learned: 1) invite input and listen with humility and 2) define your successes through rigorously assessed, readily understood data. Anticipating an inclusive experience for our students is a poor substitute for their input, and providing our students a voice allows us to learn about their needs and the barriers they face. Listening is also essential for buy-in from faculty and staff. Reticence about adopting an inclusive mindset and practices arises from various places; determining the source of any reticence through discussion in a safe space is essential for changing such mindsets. Regarding implementation, we provide administrators with comprehensible data to facilitate their advocacy for this work.

In every facet of our work, we have observed cultural shifts, especially at the interpersonal level. We’ve learned people can change regardless of age or experience, and new relationships and alliances can be forged.

## Reflections

**We’ve progressed from a mindset of prescriptive diversity and inclusion work to a stance of prevention and holistic care.** Accordingly, we have become an agent of change at JMU to improve the experience of our students and increase our capacity for inclusion.

## Grant-derived Dissemination Products

Cresawn, S., Harsh, J., Ludwig, P., Parker, R., Slekar, K., and Bloss, T. “Inclusive Excellence at James Madison University,” Big PIC meeting, Radford University, May 31, 2023.

Parker, R., Ludwig, P., Cresawn, S., Harsh, J., Slekar, K., and Bloss, T. “Inclusive Excellence at James Madison University: A Celebration” (poster), Big PIC meeting, Radford University, May 31, 2023.

Thiry, F., Granché, R., Biryukova, S., Miller, J., Edelman, T., Dooley, L., Starling, R., Sidahmed, A., Walker, H., Bendele, M., and Cresawn, S. “Exploring the Role of tRNA Genes in Mycobacteriophages,” Science Education Alliance (SEA) symposium, April 15, 2023.

Cobb, I., Shifflett, Z., Kossey, J., Fisher, R., Bowersox, W., Liffert, N., Barklow, R., Beasley, P., Biryukova, S., Blevins, G., Coose, G., Dooley, L., Edelman, T., Granché, R., Grove, A., Hauck, A., Lee, S., Martin, R., Mendez, G., Miller, J., Rostem, A., Sidahmed, A., Smith, R., Starling, R., Thiry, F., Walker, H., Winesberry, N., Bendele, M., Cresawn, S. “A Comparative Analysis of Protein and Domain Conservation within Cluster Q Genomes,” SEA Symposium, APRIL 16, 2023.

Thiry, F., Granché, R., Biryukova, S., Miller, J., Edelman, T., Dooley, L., Starling, R., Sidahmed, A., Walker, H., Bendele, M., Cresawn, S. “Exploring the Role of tRNA Genes in Mycobacteriophages,” JMU Biology Biosymposium, April 27, 2023.

Cobb, I., Shifflett, Z., Kossey, J., Fisher, R., Bowersox, W., Liffert, N., Barklow, R., Beasley, P., Biryukova, S., Blevins, G., Coose, G., Dooley, L., Edelman, T., Granché, R., Grove, A., Hauck, A., Lee, S., Martin, R., Mendez, G., Miller, J., Rostem, A., Sidahmed, A., Smith, R., Starling, R., Thiry, F., Walker, H., Winesberry, N., Bendele, M., Cresawn, S. “A Comparative Analysis of Protein and Domain Conservation within Cluster Q Genomes,” JMU Biology Biosymposium, April 28, 2023.

Bendele, M. “Elevating the Student Voice” (panel), HHMI IE 1&2 Inclusive Excellence annual meeting, October 25, 2022.

# Kalamazoo College

## Kalamazoo, Michigan

When President Eileen Wilson-Oyelaran began her 11-year tenure at Kalamazoo College in 2005, the intentional recruitment of a diverse student body began. Through her leadership, students of color, including underrepresented minorities (URMs), more than doubled (from 14% to 33%); students underrepresented in STEM tripled (from 8% to 24%); and the cohort of first-generation (FG) students grew to 17%. These changing demographics required that the community develop an understanding of diverse ways of knowing and being. Not surprisingly, students, staff, and faculty sounded the alarm about an existing marginalizing climate rooted in underlying white privilege and white cultural norms. Moves toward building institutional support for inclusion encompassed the development of the Arcus Center for Social Justice Leadership (in 2010), support for teaching innovations from a Mellon Foundation grant (in 2015), and the creation of a major in critical ethnic studies and an Intercultural Center (in 2016).

So our inclusive excellence journey began with three priorities intended to remove the following barriers:

### Barrier 1

#### Success disparities among majority and URM/FG students

While approximately 30% of the students in each class graduate with a STEM degree, our majority students (white, Asian, or non-FG) graduate at higher rates than our URM and FG students. Moreover, URM and FG students earn lower grades in STEM classes and have lower overall GPAs on average than majority students. In addition, majority students enroll in graduate programs, pursue health-related careers, and enter science-related fields at higher rates. In general, we tout the success of our STEM students' postgraduation placements, while masking the entrenched institutional barriers that impact the academic and interpersonal supports necessary for full inclusion. It appears that we've made some inroads into addressing this barrier, as the percentage of URM students graduating with a STEM degree has reached the levels of majority students (see Figure 1).

#### Strategy 1: Unmasking the hidden curriculum

**We sought to revise courses (especially at the introductory level) by implementing evidence-based inclusive pedagogies, deliberately highlighting core concepts across STEM courses, and incorporating topic relevance and career readiness into the syllabi. To this end, we restructured our Learning Commons and hired a learning specialist dedicated to enhancing academic support.**

Student Groups	2019	2020	2021	2022	2023
All	51%	53% (+2)	61% (+10)	55% (+4)	58% (+7)
Women	53%	56% (+3)	59% (+6)	58% (+5)	59% (+6)
URG	38%	36% (-2)	58% (+20)	40% (+2)	57% (+19)

**FIGURE 1:** This table shows the percentage of all students, of students who identify as women, and of students from underrepresented groups (URG) who graduated within five years of taking introductory courses in biology or chemistry during their first year at Kalamazoo. The percentage values are relative to the total number of students in each category. The values in 2019 were used as the starting point, and the numbers in parentheses indicate the percentage changes from that point. While the percentages of all students and of women students remained relatively constant during the five years of our inclusive excellence work, the data for URG students show an increase in retention and hence in STEM degree completion.

Percentage of students who enrolled in introductory biology or chemistry courses in their first year who completed a STEM BA degree within five years.

## Barrier 2

### Systemic biases embedded in our culture that hinder student success

Historically, Kalamazoo College educated white students from middle- or upper-class families. Although some inroads have been made in diversifying the campus, we are still a majority white institution. Because of this history and demographic profile, our culture includes unconscious biases and microaggressive behaviors that impede the learning and growth of our non-white students.

#### Strategy 2: Infusing anti-racism/cultural competence education into all facets of the college

**We sought to make difficult discussions the ethos of the college, develop a shared language in relation to racial and cultural differences, and build a community with mutual respect. To this end, we were instrumental in highlighting the importance of continued anti-racism trainings (through Eliminating Racism and Creating/Celebrating Equity [ERACCE] and Justice at Work) for all on campus.**

## Barrier 3

### Buy-in/compliance from faculty

Historically, the academy rewards certain deeply embedded behaviors (e.g., the “sage on the stage” classroom model and the journal publication scholarship model). These models can be limiting and thus prevent innovations by well-meaning faculty who deviate from the norm, embrace community-based scholarship and non-traditional measures of impact, and/or create inclusive teaching and learning environments.

#### Strategy 3: Revising hiring, tenure, and promotion guidelines

**With input from the faculty personnel committee and the provost, and after extensive conversations with all academic departments, the guidelines for hiring, tenuring, and promoting faculty have been revised (and will be implemented in 2023-24). What “counts” toward these goals will soon include nontraditional pedagogical models (e.g., field and exploration work), an expanded definition of professional engagement, and an accounting of the invisible service of mentoring URM/FG students.**

While the lofty goals of our initial proposal felt doable in five years, we quickly discovered that change takes time and patience, requires collaboration, and must include the whole community. As we endeavored to do the work, we rolled with the punches, zigzagged when we needed to, and worked on instituting programming that the community indicated they needed/wanted. For example, even though the COVID-19 pandemic put a halt to activities such as the in-person ERACCE workshops we’d introduced in 2014, we were able to continue anti-racism trainings through the Justice at Work program (a virtual class with online individual trainings and group



discussion sessions). Unlike ERACCE, which supports only up to 40 people per session, Justice at Work is available to everyone on campus – administrators, faculty, and staff. Several community-building events were established following Justice at Work trainings, such as our annual K'Arival and summer Traveling Breakfasts hosted by different departments on campus.

At the moment, it feels like the wind is at our backs. The K-community is demonstrating strength as we use our voices collectively to influence policies on campus. The creation of a justice, equity, diversity, and inclusion (JEDI) standing committee of the faculty is one demonstration of how we will be able to continue to advocate for and advance toward a more inclusive community. Our work will continue these next two years as we begin discussions and planning for the creation of a Diversity, Equity, Accessibility, and Inclusion (DEAI) Office on campus. When conducting listening tours with several campus stakeholders, JEDI heard a common theme: the need for a DEAI Office. The president and provost were presented with a memo suggesting that a task force be put together to investigate practices at other institutions and help us create an office suited to our campus needs – this will happen during the 2023-24 academic year.

**Our biggest takeaway is that this work is collaborative and requires community and time. In particular, strategies needed to effect changes in barrier 1 (how faculty adjust their teaching) have been especially difficult. Although K-faculty, especially those in STEM fields, are interested in students' success and well-being (and Figure 1 suggests that our efforts have had some impact), STEM faculty report that their high teaching and advising loads prevent them from researching new inclusive teaching tools and do not allow for the incorporation of new tools into existing courses.**

# Kennesaw State University

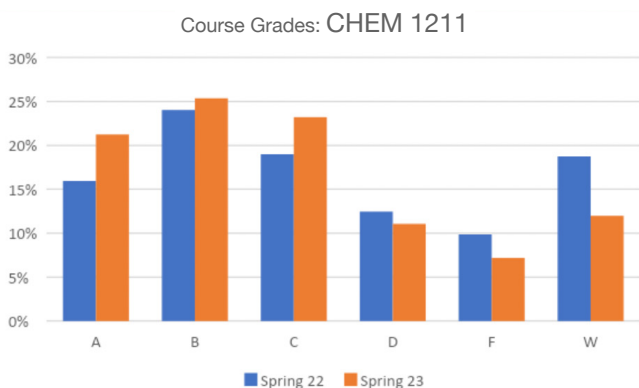
## Kennesaw, Georgia

Kennesaw State University (KSU) sought out the HHMI Inclusive Excellence Initiative because our location in metro Atlanta and our regional service footprint have led to our growing student population becoming increasingly diverse. Students from traditionally underserved backgrounds, primarily African American and Hispanic communities, composed over 35% of our STEM degree-seekers when entering KSU but were experiencing our introductory science and mathematics courses differently than, at the time, our majority white students were; African American and Hispanic students were unsuccessful at higher rates (38% and 12% higher, respectively), despite having similar high school GPAs and SAT scores. These differentials were an indicator of our challenge, signaling a culture in our STEM programs that resulted in lower rates of STEM graduation for students from traditionally underserved communities, seeing as they left STEM majors at higher rates than white students.

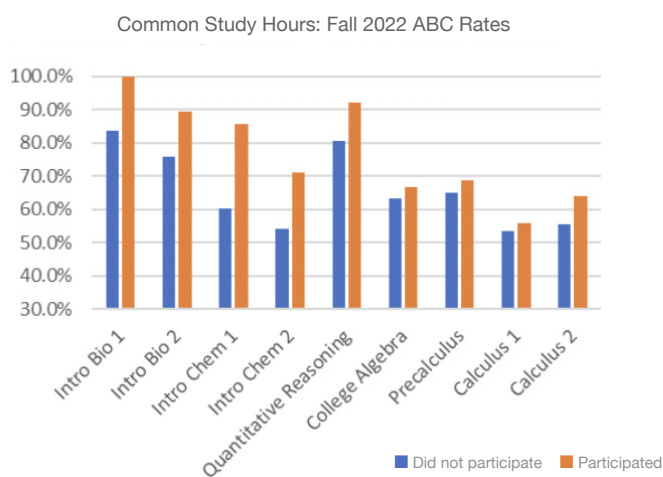
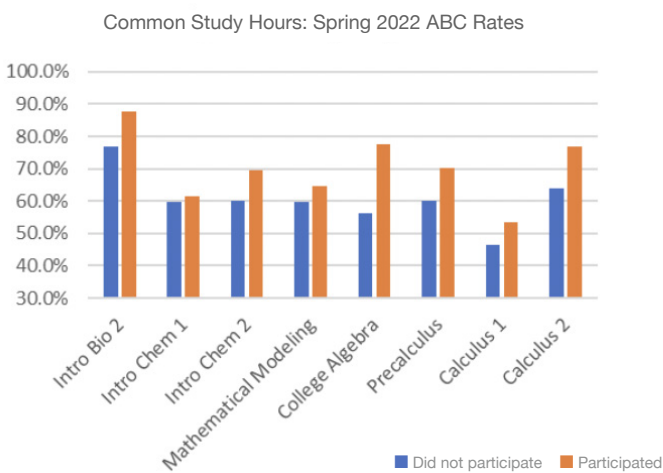
Addressing the culture behind these concerns meant tackling three goals: building a supportive, inclusive culture for students; reducing student challenges in classes; and making degrees more flexible. To achieve these goals we took the following steps:

- 1 Built faculty, staff, and student training programs** – including workshops by experts on bias, stereotypes, inclusive teaching, active learning, and high-impact practices – and organized faculty learning communities (FLCs) around these topics. We learned about building an inclusive community and worked on its implementation across the college.
- 2 Redesigned curricula to better support students.** Our first-year science courses now include evidence-based active learning techniques. We created a transition seminar course that focused on sense of belonging, metacognition, and quantitative reasoning. We redesigned introductory math pathways. We redesigned degree programs.
- 3 Built supportive environments** for transitioning into KSU's STEM programs. With learning assistants, supplemental instructors, common study hours, and summer bridge programs, students were able to access help.
- 4 We embraced policy governance** to expand our hiring criteria and attract diverse faculty and staff, to support faculty working to improve inclusion in promotion and tenure, and to include students in the governing structures.

An early outcome that transformed our project was incorporating students as collaborators rather than as subjects. The first time we brought students to the table to discuss what they needed, it became clear that some key changes were necessary. This was an important transition and stands as a core transformation that will endure as we continue. We also found that expanding the knowledge of our faculty was not enough to elicit change. Showing them data about student outcomes and bringing in experts to give talks – the traditional ways academics approach our work – would not motivate people to transform curricula; inertia is strong in humans and in any systems created by humans. So we needed to set up structures where faculty could work with material in supported ways, test ideas, get things wrong, and talk with each other. The FLCs did some of the most important work in expanding our inclusive culture. Faculty were able to discuss the difficult aspects of a course and disagree about potential solutions. They were able to work on curriculum across sections and help every student engage with the material. New courses were born, transformed, and built into degrees; degrees were transformed to be more flexible; and faculty found the time and support to change their thinking about our students. The FLCs have done more to produce an enduring mark on our faculty culture than any of our other strategies and will endure.



**FIGURE 1:** This chart shows the grade distribution (A–F) and withdrawals (W) for students taking introductory chemistry for STEM majors (CHEM 1211) before the implementation of student supports and curricular modifications (in spring 2022) and after their implementation (in spring 2023).



**FIGURE 2:** This chart shows the success rates of students who participated in common study hours, versus those who chose not to participate, across all of the multisection, introductory STEM courses engaged in the program during the 2022 calendar year.

Finally, a key outcome of our work resulted from a hurdle we faced. We had significant leadership turnover during our transformation – from the chairs of the STEM departments (only one chair who started this project is still a chair), to the dean of the college (the College of Science and Mathematics has seen four deans since we started the project), to the provost (four have led KSU since the start of the project), to the president (three have graced the main office). The early parts of our work were very dependent on the direction of leadership, and we needed to continue our transformation despite this leadership churn. The FLCs were vital in that respect, as we were able to develop faculty interest that carried across administrators. In addition, we were able to transform bylaws, change the way we train search committees, and build new faculty evaluation tools for promotion and tenure. These were key aspects of our IE work that transcended individual administrators and will continue to support our transformation as we move forward.

One of these transformations included a faculty member who went through an FLC on our introductory chemistry course (CHEM 1211). One of the leadership transitions included this faculty member being elevated to the interim chair role for the department, and their leadership encouraged engaged faculty and ensured that everyone implemented key course interventions. This resulted in increased success rates for all students in CHEM 1211 (see Figure 1). Another important transformation was thinking about all the sections of a given course and the ways instructors could collaborate to support students in those spaces. Expanding the support structures for faculty allowed us to create common study hours, where faculty teaching a given course were available in a common room that students from any section were invited to. This simple transformation of time already committed by faculty (their office hours) helped students feel more comfortable asking for help, and the students who took advantage of the opportunity were more successful in the class (see Figure 2). The expansive nature of our work with policy then allowed this support structure to extend to all introductory STEM courses.

In the end, the successes we have found at KSU are not really about the individual strategies. Our successes came from learning that there is no single strategy to building inclusion. What it requires is talking with people about the challenges people face. In the end, we have found that transforming an institution to be more inclusive will need to be different depending on the cultures people find themselves in – and to find out what those are, you need to listen. That was our greatest finding and will continue to support our transformation long after the life of the HHMI Inclusive Excellence program ends.

## Reflections

**Our successes came from learning that there is no single strategy to building inclusion.** What it requires is talking with people about the challenges people face. In the end, we have found that transforming an institution to be more inclusive will need to be different depending on the cultures people find themselves in – and to find out what those are, you need to listen.

### Grant-Derived Dissemination Products

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# Kenyon College

## Gambier, Ohio

Kenyon College's Natural Science Division was well positioned to build capacity for inclusion when the HHMI Inclusive Excellence Initiative was announced. Institutional data had recently identified a critical problem – new majority students were not persisting as robustly in the sciences as were all students studying in the division. A survey designed to reveal students' perceptions of belongingness correlated with the persistence data. Although small-scale, student-centered programming had demonstrated positive outcomes, and an increasing number of science faculty members were actively working toward a more inclusive division, we realized that effecting lasting change would require both a commitment from and collaboration with the college administration, who also had been seeking ways to improve the campus climate.

In response to HHMI's call for proposals, a core team of scientists and high-level administrators developed a strategy not only to improve inclusion and belonging in the science division, but also to build institutional capacity for all students. Our plan was structured as two complementary threads:

- 1 Changing college-wide institutional structures, such as tenure/promotion requirements, to emphasize inclusive excellence and**
- 2 Creating faculty-generated programming that both inspires and helps science faculty to become more aware of their own behaviors and interactions that could potentially promote or impede a sense of belonging and equality in and out of the classroom – with the larger aim of serving as a model for other college divisions.**

Early in the grant period, we held a two-day priming retreat for members of the Natural Science Division, facilitated by Partnership for Undergraduate Life Sciences Education (PULSE) Ambassadors, to develop a shared vision of what a more inclusive science division would look like and to identify institutional structures inhibiting our capacity for inclusion. A series of action groups subsequently convened to study the most stifling structural barriers and to create and implement a plan to lower those barriers. Significant, enduring outcomes include the following:

- Adoption of revisions to Kenyon's criteria for evaluation. All faculty members under review must now substantiate how they are cultivating an inclusive learning community in their teaching, scholarship, and service roles.
- Revision of the college mission statement through an inclusive campus-wide process, and its subsequent adoption by the Kenyon board of trustees, to better reflect our core values, including diversity, equity, and inclusion.
- Modification of the structure of our shared governance system to include action committees (modeled on the Science Division's HHMI IE action groups), as well as creation of a new faculty development committee, which partners with the Center for Innovative Pedagogy and the Office for Sponsored Faculty Projects to award internal grants for teaching (much as our HHMI IE Course Innovation Grant program does) and for individual faculty research.
- Development of two guides about best practices: 1) supporting and retaining underrepresented faculty and 2) cultivating diverse candidate pools. Ideas from both continue to influence the evolution of policies and activities across campus.

The Kenyon faculty's overwhelming affirmative vote to adopt new inclusive tenure and promotion criteria is perhaps the single biggest policy change catalyzed by the HHMI IE grant. That, along with the college's new mission statement and new shared governance structures, as well as the direct products of the action groups themselves, will all continue to promote a community that is primed to foreground conversations about how our policies and structures impact our capacity for inclusion.

Primary outcomes from the second thread of our HHMI IE plan, which focused on effecting changes in personal behaviors and interactions among members of our community, include the following:

- The IE project that has had the broadest and deepest college-wide impact has been the Kenyon Equity Institutes (KEIs). Inclusion is not an insular phenomenon, and folks across our professional educational community, from upper administrators to faculty from all divisions to staff at every level, were invited to take part in this annual five-day institute facilitated by the Inclusion, Diversity, Equity, Access, Leadership (IDEAL) Center at the Science Museum of Minnesota. The program is a master class in learning to create inclusive spaces for difficult conversations while illuminating systems of oppression that operate all around us. Each institute is limited to 24 individuals, and the cohorts that emerge from this intensive training have coalesced and now make up a rich and active network that spans traditionally siloed parts of the college. Kenyon's HHMI grant funded the first five KEIs, which enrolled more than half of the faculty in the science division and about a third of our professional educational community. The college itself will fund KEIs beginning in August 2024.
- During the IE grant period, more than a dozen Course Innovation Grants (CIGs) were awarded. Many of the piloted innovations focused on introductory and intermediate classes in biology, chemistry, and physics. Since the conclusion of the grant, faculty have continued to explore how to catalyze, implement, and evolve ideas engendered by the CIGs, which now touch nearly every student in the science division.
- Kenyon's Natural Sciences Faculty Reading Group was, at the outset of our HHMI IE effort, already gathering several times a semester. It has not only continued but expanded its program of reading and discussing current literature on inclusive science education and exploring new pedagogies and mentoring approaches. Our support included lunches, small stipends for the group's faculty organizers, and facilitation of pedagogical changes via CIGs and other means.

Our thinking about IE has evolved throughout the grant period. The first fundamental shifts were really about mindset. We decided to capitalize on our successes with existing programs that had direct impact on students to develop initiatives that had the potential to change the culture of the college itself. Early in the grant program, we discovered that we needed to recognize that students' sense of inclusion on a small college campus reflects the sum of their experiences and not only those that occur in the science division. We also realized that to sustain our efforts and their impact would require that we broaden our focus to the entire college community. The continued interest in IE by community members from all corners of the college, their participation in policy changes that now impact the whole college, and the adaptation of our shared governance system will be critical to ensuring Kenyon's continued evolution toward a more inclusive institution of higher learning.

# Lawrence Technological University

## Southfield, Michigan

### When we began our journey

The face of higher education is changing, with the majority of college students now considered “nontraditional.” In our project, nontraditional students were defined as commuter students; part-time students; students who work full-time; and/or students who have significant nonacademic commitments, such as childcare. Nontraditional students often graduate at lower rates than so-called “traditional” students. A lack of access to high-impact practices like undergraduate research, which improve graduation rates and interest in STEM careers, is a contributing factor in this disparity.

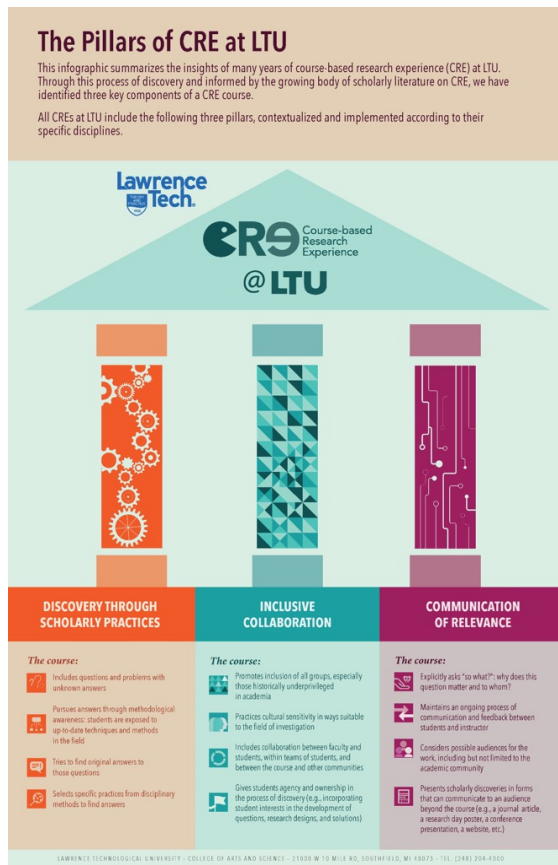
The majority of undergraduate students at Lawrence Technological University (LTU) fit this definition of “nontraditional.” The development and implementation of course-based research experiences (CREs) was the primary strategy we utilized to build LTU’s capacity for inclusive excellence. CREs remove barriers that prevent nontraditional students from participating in undergraduate research, such as self-selection and awareness. CREs also eliminate the additional time required to participate in cocurricular research experiences. Our CRE intervention was a large-scale, multidisciplinary effort within the College of Arts and Sciences (CoAS). Our three departments – humanities, social sciences, and communication; mathematics and computer science; and natural sciences – impact every LTU undergraduate through our core curriculum and majors.

### During our journey

We have developed and implemented CREs in more than 50 courses to date, generating enthusiasm for research on campus and an enhanced interest in student success. Most CRE courses reside within CoAS; however, our outreach to the broader campus community has resulted in CREs also being implemented in our Colleges of Engineering and of Business and Information Technology. Our intervention has involved more than 35 faculty across diverse disciplines and ranks, including not only tenure-track and tenured faculty, but also non-tenure-track and adjunct faculty.

Our ultimate goal was to bring about a systemic change in the pedagogical vision of our institution. We have succeeded in creating an inclusive community that will enable us to continue to enhance LTU’s capacity for inclusive excellence. Moreover, the “three pillars of CRE” framework developed during the grant project provides an inclusive scaffold for the development of future CREs in disciplines beyond science (see Figure 1).

To help faculty create, implement, and refine CRE modules, we developed a “CRE student researcher award” program. Awardees worked closely with faculty to create and test CRE modules and followed up on promising discoveries. The goal was to advance CRE outcomes and support the dissemination of research. This initiative provided stipends to CRE student researchers and engaged more than 50 undergraduates in a total of 46 projects over a five-year period.



**FIGURE 1:** The three pillars of CRE at LTU illustrate the general principles and practices shared by IE-CRE faculty at LTU.



**FIGURE 2:** Home page of the IE-CRE website: <https://www.inclusivity-cre.org/>.

Beyond the CREs, we engaged the broader campus community in a series of what we called Idea Factory seminars, with external speakers and journal clubs related to DEI in higher education. The addition of these initiatives to the original proposal significantly added to our inclusive-excellence-minded outcomes and reflected a realization that engaging faculty in professional development activities beyond CREs is critical to our mission.

Throughout our journey, the most significant obstacle we encountered was multiple changes in upper administration, including a new president, provost, and CoAS dean. It was challenging to repeatedly explain the significance of our efforts to new personnel in positions of power. We worked to overcome this challenge by consistently explaining and promoting the impact of our efforts to key individuals at LTU.

## Sustaining our journey beyond HHMI

All members of our HHMI IE leadership team have a strong desire to be ongoing agents of institutional change. This grant project has given us the knowledge, experience, and inspiration to continue to advocate for a campus that embraces and promotes the success of all students.

Notably, a high percentage (83%) of CRE community members have expressed an intention to continue using CREs as a pedagogical model, even after the grant's financial incentives end. This speaks to the strength of our community of practice and their passion for our inclusive approach to teaching and learning.

The following additional measures will help ensure the continued pursuit of inclusive excellence at LTU:

- **Institutional support:** We have procured strong support from Dr. Patrick Nelson, interim dean of CoAS. Funding from the Dean's Office will ensure the continuation of our DEI speaker series and journal clubs. Furthermore, we have successfully advocated for our existing Quest cocurricular experiential learning program to provide funding to pay undergraduate student stipends to support their involvement in research projects.
- **DEI-focused grant-writing:** All members of the HHMI IE leadership team are actively engaged in writing DEI-focused proposals to procure funds to support future initiatives related to inclusive excellence. Recent examples include a pending National Science Foundation (NSF) Scholarships in STEM proposal (by Timmons, Bhattacharya, and collaborators) and a pending NSF Improving Undergraduate STEM Education proposal (by Delogu and collaborators).
- **Student success, equity, and inclusion committee:** A new campus-wide student success, equity, and inclusion committee composed of faculty and staff has been created to advocate for policy changes and to provide enhanced support and programming for LTU students. This committee is preparing a report to advocate for institutional change.



**FIGURE 4 (TOP):** CRE-LTU logo used in presentations and documents. **(BOTTOM):** CRE-LTU logo used on the CRELTU website: <https://www.inclusivity-cre.org>



**FIGURE 3:** Illustration used on bottles, magnets, and stickers for the 2020 LTU-CRE marketing campaign.

## Reflections

At the beginning of the project, we mainly focused on CRE as an inclusive pedagogical model. Over the years since then, we have amplified and diversified our program, which now organically integrates CRE with ancillary initiatives (a lecture series, a journal club, and the CRE research awards). What we have accomplished is admirable; however, we recognize that much work remains to be done. While diversity is our strength, unity is our power. Initiating conversations with key campus offices will help us advance our mission beyond CoAS. Continuing our DEI-focused seminars and journal clubs will help us include faculty who are not using CRE pedagogy but have an interest in student success.

Support from the upper administration is important to move toward a more inclusive campus culture. As leaders of DEI-focused initiatives, we must advocate for our places at the tables where decisions are made. The creation of a community of like-minded faculty who are interested in having these discussions and transforming our pedagogical model was a very positive outcome of this project.

## Grant-Derived Dissemination Products

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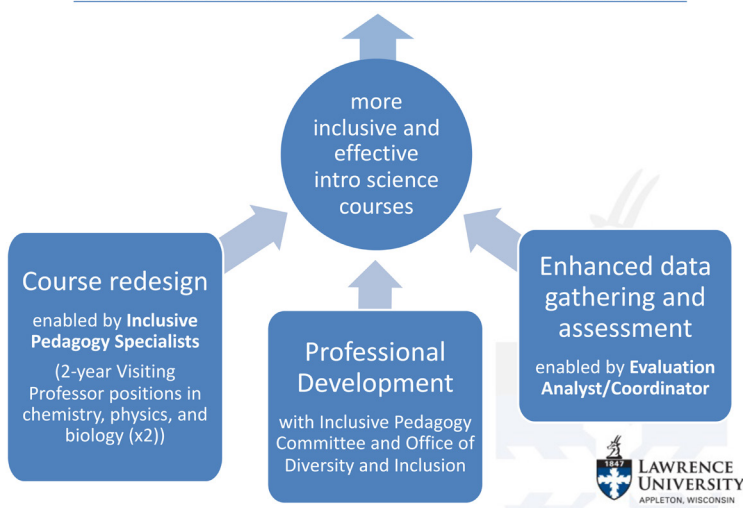
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# Lawrence University

## Appleton, Wisconsin

In our inclusive excellence program at Lawrence University (LU) of Wisconsin, we have worked to address the structural barriers to success faced by our underserved students – particularly first-generation and minoritized students – in the natural sciences. We seek a natural science community that unreservedly welcomes, fully embraces, thoughtfully engages, and effectively teaches all students of all identities, from their very first class through to graduation. With broad commitment from our faculty, staff, and administration, we at Lawrence have worked to place inclusive excellence at the root of our curricula, our mindsets, and our shared mission (see Figure 1).

### Goal: a more inclusive and effective science division



**FIGURE 1 (LEFT):** As part of our work to create a more inclusive and effective science division, we will redesign our introductory science courses in biology, chemistry, and physics. This work was supported by Inclusive Pedagogy Specialists, widespread professional development for faculty and staff, and enhanced data gathering and assessment resources.

**FIGURE 2 (ABOVE):** Lawrence's new Science Learning Commons has enabled the adoption of active learning pedagogies in large introductory courses across our natural science curricula.

The main intervention point for our grant program has been the redesign of our introductory courses in biology, chemistry, and physics. We seek to better serve and include all our students and to prepare them for further success in our natural science curricula. This course redesign work has involved the following strategies:

- Professional development for faculty in inclusive pedagogies and practices, in collaboration with other campus stakeholders, such as our inclusive pedagogy committee, our Center for Teaching Excellence, our instructional technology staff, and our Office of Diversity, Equity, and Inclusion.
- Departmental groups, enabled by inclusive pedagogy specialists, that engage in extended reflection on their journeys as teachers and scientists, their assumptions concerning their students, and their goals for their courses.
- Development of a course redesign framework and a rubric and workshop for inclusive syllabus design.
- Grant-funded data-gathering, including disaggregated grade data and a Sense of Social and Academic Fit survey, by our Office of Institutional Research.
- Consultation with external collaborators at the Higher Education Data Sharing (HEDS) consortium about our students' experiences in our courses and about best practices in pedagogy.
- The LU-funded remodeling of an underutilized lecture hall into a Science Learning Commons (see Figure 2) that is more conducive to small-group work and technology-enabled hands-on activities.



The results of this work include redesigned introductory courses in biology, chemistry, and physics. Highlights of this work include the following:

- Our **biologists**, with student input and assistance, have worked to bring more attention in their courses to scientists from PEER (persons excluded due to ethnicity or race) backgrounds. Their reflections on their curriculum have also led to the splitting of one introductory course into two, to better manage student workload and to provide alternate entry points into the major.
- Our **chemists** have engaged with the chemical education literature to reach consensus on the content and ordering of their introductory courses. By building in short, consistent pre-lecture assignments, they have worked to give better guidance to their students in how to utilize texts in preparing for class.
- Our **physicists**, using the Student-Centered Active Learning Environment for Undergraduate Programs (SCALE-UP) model as a starting point, have integrated lectures, small-group work, and laboratory exercises into the biweekly three-hour class sessions. The courses that have resulted from this collaboration foreground the development of problem-solving methods and the contributions of PEER scientists, particularly women. These efforts led to a National Science Foundation-funded grant, titled “Retrieval Practice Scaffolded Argumentation to Facilitate Problem Solving on Structured and Semi-Structured Tasks in Introductory Undergraduate Physics,” to continue this work with colleagues from Purdue University and Jackson State University.

Our grant work has positioned us to continue to seek inclusive excellence in our introductory courses and beyond. Science faculty have adopted more reflective and collaborative practices in our shared courses. Our work has spurred conversations within and among departments about our experiences in our courses and about how we might serve our students better. These conversations have led to wider adoption of practices such as Transparency in Learning and Teaching (TILT) framework concepts, more inclusive syllabi, and more effective peer observation of teaching (in conjunction with our Center for Teaching Excellence).

With help from our Office of Institutional Research, student surveys and disaggregated grade-data dashboards have been developed to inform further course development work. We can now track grades in our courses among first-generation students, minoritized students, and Pell Grant awardees, and we are using that data to track our progress toward our goal of eliminating the opportunity gaps faced by these student populations.

Student voice has also been elevated as we seek continuous improvement. Students have been directly involved in course redesign and developing new modules, videos, and materials. They have also contributed indirectly by engaging with surveys and HEDS-led focus groups, which have generated a much clearer picture of the barriers to success our students face. In addition, our redesigned courses all utilize student peer leaders as teaching assistants and tutors, both in and out of the classroom. In our first biology course, this takes the form of credit-bearing Biology Learning Teams that seek to develop both problem-solving strategies and interpersonal skills.

By engaging with student feedback, grade data, and evaluator reports, we also now better understand the challenges our natural science students face with math preparation and math anxiety. We see how these barriers to success are impacting our students across our natural science curricula, and we will continue to work with our mathematics department and our Center for Academic Success to develop new ways to support students struggling with quantitative skill development. We are also working with our director of advising to help develop more equitable and effective advising practices, particularly for incoming students.

In seeking to build our capacity for inclusive excellence, we have found it crucial to create time and space for reflection and for collaboration. Our continued progress will rely on many stakeholders – administrators, faculty, staff, and students – sharing their experiences, listening to each other, and working together to create a more effective and more inclusive natural science division at Lawrence.

# Grant-Derived Dissemination Products

## Publications

Del Toro, I., Dickson, K., Hakes, A.S., and Newman, S.L. (2022). "Early undergraduate biostatistics and data science introduction using R, R Studio, and the Tidyverse," *The American Biology Teacher*, 84(3), 124-129. <https://doi.org/10.1525/abt.2022.84.3.124>

McKinley, K., and Dunnagan, S. (2021). "The role of institutional research in advancing diversity, equity, and inclusion efforts," *New Directions for Institutional Research*, 2021, 71-91. <https://doi.org/10.1002/ir.20353>

## Presentations

Debbert, S.L. "Course Redesign for Inclusive Excellence: A Framework for Engagement," 27th Biennial Conference on Chemical Education, West Lafayette, Ind., 2022.

Debbert, S.L. "Course Redesign for Inclusive Excellence," Associated Colleges of the Midwest Retention and Success Workshop (virtual), 2022. [https://youtu.be/Nayap2Otd\\_M?t=4307](https://youtu.be/Nayap2Otd_M?t=4307)

Debbert, S.L. "Course Redesign for Inclusive Excellence: A Framework for Engagement," invited talk for Davidson College faculty (virtual), 2020.

Fleshman, A.M., Donohoue, D.L., and Doughty, R.D. "Mathematical Practices in Chemistry: A supplemental course to support mathematics preparation for general chemistry," 27th Biennial Conference on Chemical Education, West Lafayette, Ind., 2022.

Kinzie, J., Silberstein, S., Palmer, D., McKinley, K., and Nicholas, J. "Data for Decision-Making: Inclusion and Engagement with Cultural Diversity," Association for Institutional Research Forum (virtual), 2021.

McKinley, K., Kinzie, J., and Drake, B.M. "How to Utilize Data to Become a Better Change Agent: A Case Study on First-Year Experience (FYE)," Association for Institutional Research Forum, Cleveland, Ohio, 2023.

McKinley, K. and Dunnagan, S. "Assessing and Enhancing the Student Experience with Data," Higher Education Data Sharing Consortium (virtual webinar), 2021.

McKinley, K., and Dunnagan, S. "Assessing and Enhancing the Student Experience with Data," Sharing Best Practices among Wisconsin Association of Independent Colleges and Universities Members: A Persistence and Completion Series (virtual webinar), 2020.

McKinley, K., Brenner, V., Johnson, A., Anderbryne, E., and Oman, J. "Data in the Age of COVID-19," Association for Institutional Research in the Upper Midwest (virtual conference), 2020.

McKinley, K., Dahlenberg, D., Jamison, T., and Palcisco, A. "Making Networking Work for You!" Higher Education Data Sharing annual conference, Asheville, N.C., 2019.

Miller, B., McKinley, K., and Peters, E. "We Are All In This Together: Successful Collaborations with Institutional Research," Association of American Colleges and Universities (virtual annual meeting), 2021.

Theisen, R.M., and Rex, J. "Create a More Inclusive Syllabus Workshop," What Works in Diversity, Equity, and Inclusion – conference sponsored by Kenyon College, Ohio Wesleyan University, the Ohio Five Collaborative Grants Program, and Kenyon's Anti-Racism Resource Fund (virtual), 2022.

# Mercy University

## Dobbs Ferry, New York

### When we began our journey

At the onset of our HHMI IE grant in 2018, the critical problem we faced at Mercy University (formerly Mercy College) was high attrition from the biology major, particularly for Black and Latin American students. This equity gap spurred two main strategies: 1) the Inclusive Excellence Fellows Academy – professional development in high-impact inclusive teaching for part-time science faculty, who teach the majority of gateway science courses, in which rates of DFW (a grade of D or F or a withdrawal from a course) are higher than average, and 2) DEI data analytics – the building of a data infrastructure to make effective use of data to close equity gaps.

### During our journey

IE outcomes that have enabled our capacity for inclusion are:

- 1 The development of equity index dashboards and an institutional process for planning action steps to address our equity gaps;
- 2 Inclusive-teaching training modules developed through the lens of the IE Fellows Academy, in collaboration with the Center for Teaching and Learning;
- 3 The Learners-As-Partners program, which formally integrated student voices into curriculum development, faculty committee work, and the development of a Mercy model of inclusive teaching practices; and
- 4 Codevelopment of faculty senate DEI strategic priorities to build capacity for inclusion across the college and to integrate IE work into the existing college infrastructure.



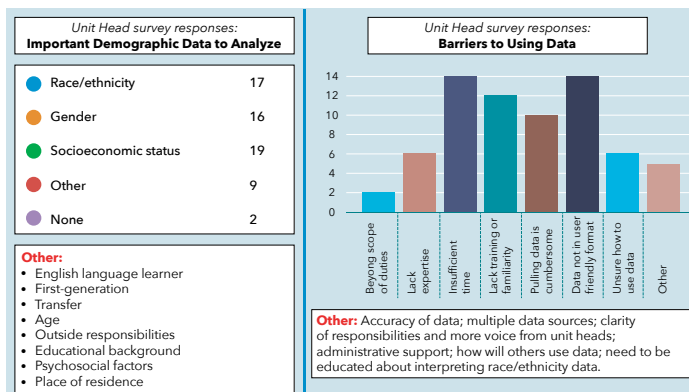
**FIGURE 1:** Six inclusive pedagogy modules are in the final stages of development. These modules were created through a collaboration between Mercy’s Center for Teaching and Learning, HHMI IE instructional designer, HHMI IE faculty fellows and IE core leadership team. The modules focus on the Mercy model of inclusive teaching and include evidence-based practices shown to be effective at Mercy. Mercy faculty and student voices are infused throughout, in addition to reflective exercises that complement the content.



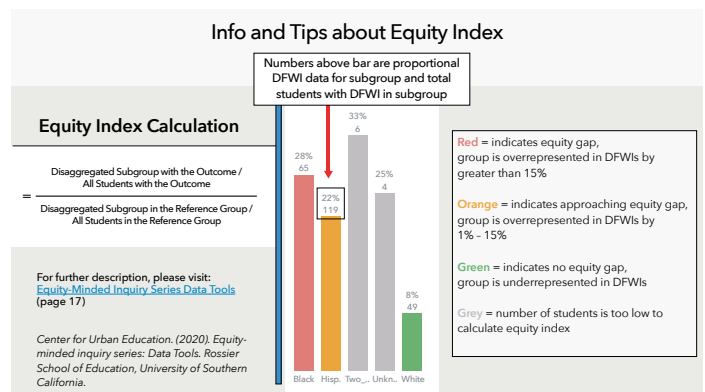
The early focus of Mercy's HHMI IE work centered on logistics and the implementation of IE initiatives. With a constant eye on capacity-building from the onset, key stakeholders from across the college were brought into the fold of the IE work, but the momentum to coordinate IE activities across the institution often faltered. In retrospect, we realize we didn't fully appreciate the breadth of stakeholders, the need for relationship-building across units, and the need to integrate IE work into existing formal processes. To overcome these barriers, we examined our institutional structure more carefully, brought in a more diverse set of voices from academic and nonacademic units, and better aligned our work with existing initiatives across the college. In turn, the IE team strengthened partnerships across the college, allowing for more robust integration and coordination of IE work across college departments and committees. Some key examples include 1) endorsement of IE work by the faculty senate and incorporation of faculty senate committees into IE work; 2) development of cross-disciplinary faculty working groups to advance DEI data analytics and action planning, in collaboration with Institutional Research, the Provost's Office, the Office of Educational Assessment, and the director of academic engagement, equity, and inclusion; 3) expansion of the Inclusive Excellence Fellows Academy beyond science faculty to include full- and part-time faculty from all disciplines, with more robust integration of the Center for Teaching and Learning and a formal role for the IE fellows in shaping inclusive-teaching training modules; 4) incorporation of aspects of IE work into the college's strategic plan; and 5) support for staff positions in the Center for Teaching and Learning and in Institutional Research, with the goal of producing sustainable DEI tools (e.g., DEI data dashboards and inclusive teaching modules) to support capacity for inclusive excellence beyond the lifetime of these positions.

## Sustaining our journey beyond HHMI

The grant has placed Mercy University in a strong position to advance institutional inclusive excellence. The HHMI IE initiative elevated the recognition of DEI work and its importance in student success. The grant sponsored several town halls focused on the campus and classroom climate for faculty and students, facilitating meaningful dialogue across the college and spurring relevant action steps. Several institutional practices have been created and advanced through the HHMI IE initiative, namely 1) the practice of monitoring course performance equity gaps across academic programs, with associated planning guides to address those gaps; 2) training modules in inclusive teaching practices for faculty; 3) the sponsorship of DEI strategic priorities by the faculty senate and oversight by HHMI IE core leadership, and 4) the incorporation of student



**FIGURE 2:** To build institutional buy-in for analysis of DEI data and development of equity plans, academic unit heads were surveyed and participated in focus groups led by the HHMI IE core leadership team to determine their interest in analyzing different types of demographic data (as shown in the left panel above) and barriers to effective use of the data (as shown in the right panel).



**FIGURE 3:** In response to the academic unit head survey and focus groups, the DEI Data Ambassadors initiative was developed through the HHMI IE grant. Tableau dashboards that were already being developed by Institutional Research were enhanced with equity-index flags that had been developed in collaboration with the DEI Data Ambassador faculty and the HHMI IE data analyst. A guide to accessing and using the data was developed for academic unit heads (as shown in the snapshot above), and each academic program was asked to complete discussion prompt responses aimed at facilitating dialogue around the DEI data and the development of action plans. Resources were made available to aid faculty in developing next steps.

voices into key curriculum initiatives. To address the barriers of buy-in and coordination across key stakeholders at the college, the grant has laid the groundwork for relationship-building across academic and nonacademic units and has played a key role in advancing DEI policy and practice in the college.

## Reflections

**The inclusive excellence work at Mercy commenced with a clear but narrow focus – to 1) train science faculty to incorporate inclusive and high-impact practices and 2) develop data analysis tools to close equity gaps.** Understanding how to effectively weave these practices into the fabric of the institution posed greater challenges than we initially realized. As the nuts and bolts of the work progressed, so did our realization that true institutional change requires both meaningful partnership-building across the institution and disruption of existing practices and norms.

Our grant work initially focused on faculty and data but did not encompass a role for students, who had been overlooked as key stakeholders in setting institutional norms. Accordingly, a formal consulting role for students was subsequently built into the grant and has begun to shape the norms of the college – formally recognizing student voices in establishing institutional practices.

Faculty professional development (PD) was also reimagined during the course of the grant, upon our realization that the initial PD model would reach only a small number of faculty and hence a small number of students. The latest cohorts of IE faculty fellows now undergo professional development with the goal that the fellows will, in turn, codevelop training modules in inclusive teaching for new faculty. Additionally, IE faculty fellows have identified simple cross-disciplinary inclusive practices that will be embedded within our learning management system so they can be easily carried out by all instructors, regardless of their individual PD experiences.

The DEI data analytics initiative evolved to encompass not only the creation of DEI data and modeling tools but the development of an institutional process for making effective use of the data to close equity gaps. This led to an institutional effort to incorporate DEI data assessment and action planning into the annual assessment work of academic programs, with support from key stakeholders in both academic and nonacademic units.

## Grant-Derived Dissemination Products

### Publications

Herrera, J., Haskew-Layton, R.E., Narayanan, M., Porras-Alfaro, A., Jumpponen, A., Chung, Y.A., and Rudgers, J.A. (2020). "[Improving Instructional Fitness Requires Change](#)," *BioScience*, Oct 7;70(11):1027-1035. doi: 10.1093/biosci/biaa111 eCollection 2020 Nov.

### Presentations

Haskew-Layton, R.E. "Using Data to Promote Equity in STEM Education," American Society for Microbiology Microbe, Washington, D.C., June 2022.

Haskew-Layton, R.E., Hartwell, E., Waddington, S., Narayanan, M., and Herrera, J. "Using Data to Reduce Barriers to Inclusive Excellence at a Hispanic Serving Institute" (poster), Gordon Research Conference: Undergraduate Biology Education Research, Bates College, Lewiston, Maine, June 2019.

# Mount Mary University

## Milwaukee, Wisconsin

### When we began our journey

Mount Mary University (MMU), serves women at the undergraduate level and men and women at the graduate level. At the beginning of our journey, close to 50% of MMU students majoring in STEM fields at the undergraduate level were from an underrepresented demographic. Although MMU had invested in student supports and was achieving better outcomes for students underrepresented in STEM than similar institutions in Wisconsin, we still faced a discrepancy in six-year graduation rates between underrepresented students and white students. This discrepancy in outcomes was the critical problem that we were trying to address through institutional transformation.

### During our journey

During this journey, which included multiple workshops and book clubs for faculty and staff, including upper administration, the main obstacles were 1) the realization that inclusive excellence is a change in mindset and 2) the work it takes to internalize the concept of privilege. It is not an easy journey to understand the complexity of how race, gender, socioeconomic status, and other identities affect the uphill or downhill course or the outright blocks in life's pathways. Asking the question "But what about my struggles?" seems to be a natural step on this journey. Essential supports to making progress include allowing the space, time, and conversations for people to learn, understand, and internalize that each of our singular world experiences are just that – singular. It is important to provide an environment where we can learn to not extrapolate from our own perspectives and experiences, but to listen to others' experiences and build our own humility.

### Sustaining our journey beyond HHMI

The HHMI project positioned our institution to continue to advance toward inclusive excellence in many ways. One significant way that directly affects sustaining this effort is that as more members of the MMU community engage with inclusive excellence learning and work, more members of search committees can learn and follow practices – with a deeper understanding – aimed at hiring talent that adds to the university instead of searching for a given fit. In addition, more faculty and staff coming to MMU have experience with work directly in inclusive practices and can speak to those during their interview process, and that is valued. For those who appear less far along in their journey toward inclusive excellence practices, the workshops and book clubs provide a way for MMU to continue to offer growth.

We still have a long way to go — that growth and learning are a never-ending part of the life journey toward inclusive excellence — and that working toward inclusive excellence is far-reaching, touching all elements of the MMU experience.

## Reflections

**During this project, George Floyd was murdered**, which created a saltation in the evolution of our recognition of the urgency of changing mindsets and growing toward inclusive excellence and of the importance of the HHMI project. Since the project began, MMU also became designated as a Hispanic Serving Institution (HSI), and because of the successful workshops and book clubs organized by the HHMI project, we were able, for example, to quickly implement training strategies on what the HSI designation means and how we can improve ourselves to better serve multilingual students.

The significance of being #1 in Wisconsin and #2 in the Midwest for social mobility is our proudest achievement. Even so, through the HHMI project, we came to understand these crucial lessons: that we still have a long way to go – that growth and learning are a never-ending part of the life journey toward inclusive excellence – and that working toward inclusive excellence is far-reaching, touching all elements of the MMU experience.

# Norfolk State University

## Norfolk, Virginia

From the outset, the (NSU) focused on two fundamental objectives:

- 1 **Increasing student engagement in science;**
- 2 **Improving the institutional environment for inclusive pedagogy.**

As we began our project, we found that opportunities for undergraduate research were limited and that biology students were not actively engaged in their course-based research experiences. They did not view themselves as scientists, and even the students who completed biology degrees were not pursuing STEM careers. It seemed they were not aware of the career options provided by a biology degree.



**Photo 1:** Our student-engagement work centered on a collaboration with a non-profit called the Elizabeth River Project (ERP). We incorporated a novel course-based undergraduate research format that enabled students to undertake projects whose outcomes would directly inform the ongoing restoration of our local waterway. Here students are collecting water samples from ERP's floating classroom called the Learning Barge.

As a historically black college/university (HBCU), Norfolk State of course espouses a commitment to diversity, equity, and inclusion. Yet as we began our IE work, we found that the university did not recognize the need for faculty to employ inclusive pedagogy and did not support faculty members in doing so. Collaboration, communication, and interdisciplinary activities between departments were lacking, and faculty members were more likely to compete with one another than to collaborate. Student support services existed in siloes not connected to our academic program. In addition, as a department, we had a strong core of faculty members with research backgrounds in environmental science, but they were not connected with other universities or with organizations working to improve environmental awareness in the region.

The primary strategy we used initially to build a culture of inclusion within our department was the introduction of collaborative, community-oriented, course-based undergraduate research experiences (C3UREs). We teamed up with a local nonprofit, the Elizabeth River Project (ERP) to provide students with authentic research opportunities in environmental science. (See photos 1–3 for examples of the activities involved in these research opportunities.) We collaborated as a project team to create C3UREs in several required courses, so that students would experience authentic research throughout all four years of the biology curriculum. Our initial aspiration was limited to our department because we did not feel that change at the institutional level was achievable.

As we worked to implement C3UREs within the department, however, we recognized that development of a culture of IE requires support at the student, faculty, and administrative levels. We were successful in developing biology C3UREs, and talking about that process helped us introduce IE to the broader NSU community. We brought the Mobile Summer Institute (MoSI) on Scientific Teaching to campus and intentionally included faculty from other departments. As a result, we created an interdisciplinary faculty learning community (FLC), although keeping the FLC activities going has proven challenging. Our project team has developed workshops on inclusive syllabi and student-centered teaching methods and is planning to offer workshops on developing CUREs to faculty in other departments.





**Photo 2:** Our team worked with ERP's educational staff on the Learning Barge to develop a curriculum appropriate for college students who have had limited experience on field trips and limited access to the river. We also "flipped the script", creating opportunities for NSU students to teach the educators, by bringing dissection scopes to the floating classroom, giving ERP educators a rare chance to see river organisms in greater detail. Here, ERP educators show NSU students common organisms living in the Elizabeth River, such as sea squirts, spider crabs, mummichog fish and toadfish.



**Photo 3:** Our team collaborated with local organizations to directly address questions about the health of our rivers. Here a student works with a community member to investigate the presence of microplastics in oysters collected from a local waterway.

Through our efforts thus far, we have improved communication between our department and various support units – including the career center, marketing and communications, the student success center, and facilities – aimed at broadening environmental awareness as part of our campus landscaping and grounds management. We have been working closely with our Student Success Center to improve academic advising, and a new position for a professional advisor focused on biology has been approved. We have also developed a collaboration with the College of Liberal Arts as part of a new environmental justice initiative.

These improvements have collectively required us to take initiatives and raise questions about accepted ways of doing – or not doing – things on campus. Our progress was greatly supported with the arrival of a new president in the summer of 2019, as our project was moving into its second year. We have now been successful in getting conversations and activities started and in seeing them taken up by other individuals and departments on campus.

As we enter the final year of our grant-funded activities, we feel NSU is better positioned to continue developing a culture of IE. Our HHMI-funded project has led to new collaborations with the Virginia Institute of Marine Science; the University of California-Santa Cruz; Old Dominion University; and the University of Virginia. We have secured additional grant funding from the National Science Foundation, the Virginia Sea Grant Program (which is underwritten by NOAA), Virginia Natural Gas, and the National Fish and Wildlife Foundation. Our collaboration with the ERP in the community has continued to grow. Our faculty have received training they will continue to build on, and we are collaborating with our Center for Teaching and Learning to continue offering that training to faculty in other departments. The lines of communication between units of the university are now more open, which will enable us to continue the conversation about eliminating remaining barriers to a campus culture of IE. We have been invited into the conversation around university efforts to improve students' connection to career pathways via classroom and cocurricular activities because the HHMI grant raised our department's profile.

Our initial aspirations for the IE project were limited, as a result of experiences with previous university administrations. Yet despite the expected and unexpected hurdles we encountered, we have had a much more far-reaching impact than we'd expected. As a result of this grant, members of our project team have stepped up and made a difference. We have found that our most effective strategy has been leading by example: Making presentations about our activities has created a framework that allowed other faculty and administrators to join and/or support efforts to develop a culture of IE on campus. To help ensure this work is sustained and rewarded, we have updated the faculty evaluation criteria in biology to recognize inclusive teaching, with the hope that this model will be taken up by other departments. Members of our project team have gotten involved in the Faculty Senate, in efforts to reform the general education curriculum, and in the Quality Enhancement Plan that is part of the university's ongoing accreditation activities. Together with a supportive new administration, our campus community is working to put equity, inclusion, and justice into practice.

# North Carolina State University Raleigh

## Raleigh, North Carolina

In developing the North Carolina State University at Raleigh (NC State) IE program – Inclusive Excellence at NC State (IE@NC) – we took to heart the challenge of institutional transformation as presented at the HHMI Inclusive Excellence kickoff meeting, knowing that five years would be just the start of our IE efforts. The pandemic shutdown and the murder of George Floyd dramatically changed the broader context within which we were working, leading to adjustments in our programmatic priorities. Over the course of five years, IE@NC has fostered a growing community engaged in the pursuit of inclusive excellence in higher education and has created opportunities to work together across boundaries of all sorts. Some of our work is summarized below.



### Professional development

IE@NC's programmatic efforts focused primarily on professional development for faculty and administrative staff whose work directly impacts students, including staff in admissions, recruitment, academic policies and procedures, instructional design, and curricular development. Several types of professional development opportunities related to inclusive excellence were made available. More than 500 individuals devoted over 2,200 hours of their time to personal and professional growth through the opportunities provided by IE@NC. Participation by upper-level administration was limited, but those who engaged also actively supported participation by members of their units.

Participants told us what was most valuable to them as a result of their participation in these offerings, revealing three themes: community, stories, and frameworks. For faculty and administrative staff participants, learning and community existed in a symbiotic relationship: learning together enabled the discovery and development of community, while at the same time the collective purpose that was felt in that community facilitated learning and well-being. As a result, we continue to create opportunities for conversation, collaboration, and community. Notably, this interrelationship of community and learning is something that our faculty hope to achieve through their inclusive teaching efforts; it also relates directly to the effort to replace a culture of competition with one of collaboration across all aspects of higher education.

The power of hearing and sharing stories was strongly felt by many participants. Stories from peers and stories from students were extremely impactful: enlightening, humanizing, and, in some cases, validating. Participants from marginalized groups felt both validated and empowered through hearing the stories of their colleagues and students. Individuals who were more dominantly positioned (e.g., financially secure, able-bodied, white, and male) reported the largest awakenings from these shared stories. As a result, we are further exploring the power of stories in STEM education at NC State as a way to 1) build community, 2) foster learning through narrative (in and outside of traditional classrooms), and 3) enhance students' sense of belonging by empowering them to bring their authentic selves to their STEM courses and their research.

Participants also highlighted the importance of learning various frameworks for thinking about inclusive excellence from different perspectives. Especially transformative for participants was shifting from perspectives that focus on the individual (e.g., racist) to perspectives that focus on the systemic (e.g., racism) and understanding that racism, sexism, ableism, etc. are all part of a system of oppression with a long history. Many participants appreciated opportunities to use these frameworks to examine our own institution, units, and classrooms and to envision how they might be changed. Participants reported a heightened sense of motivation to take action and a greater sense of the importance of what they could accomplish in their own realms of influence.

## Curricular development

IE@NC's efforts also included curricular development, both as part of our programming and as a result of our professional development efforts with faculty, most of whom have implemented and continue to implement changes consistent with inclusive teaching, universal design for learning, and pedagogies of care. Changes to courses include content as well as culture – more and more of our life science courses are incorporating topics related to the interface of science and society, and students are responding with great interest and appreciation.

Many of our faculty are also engaged in critically examining curricular requirements, identifying arbitrary barriers, and proposing changes to increase flexibility and enable students to take ownership of their pathway through college. Faculty also are working across traditional disciplinary and departmental boundaries in a way not common at NC State, including in conversations about how to fundamentally change our introductory science courses and our general education program. And one of our student-focused programs (not described here) has led us to develop a proposal to create a cross-disciplinary opportunity for undergraduate and graduate students to bring their authentic selves to their STEM research.

In addition, IE@NC was critically important in creating [Wicked Problems, Wolfpack Solutions](#), which introduces all incoming students to the importance of interdisciplinarity and the value of general education, while also inviting students to see themselves as part of our diverse community of scholars, working together to solve “wicked” problems. Each Wicked Problem offering has addressed a different challenge, with at least 20% of the content addressing social equity issues. This is a collaborative effort involving staff and faculty from across all colleges at NC State and is free to students – over 2,500 have completed a Wicked Problems, Wolfpack Solutions course.

## Institutional development

Currently, we are shifting our focus to more targeted advocacy to achieve specific institutional changes. There are clear challenges, including sociopolitical influences and a continued emphasis on a compliance mindset toward decision-making in many administrative offices.

There are encouraging signs, too, including our modest contributions to the university's strategic plan and new values statement (which now includes community, inclusion, and collaboration); an administrative commitment to sustain some IE@NC initiatives (not all described here); and a new emphasis on interdisciplinarity. Also promising is a recent invitation to join a new university implementation team tasked with [proposing revisions to academic policies from an equity mindset](#) and with student well-being in mind.

Change at the institutional level requires patience and persistence. Will our efforts result in recruiting and retaining a more diverse student body and faculty? Will we be able to change more policies and procedures to enhance NC State's capacity for inclusive excellence? Will our efforts help push change across the broader landscape of higher education in the U.S.? Stay tuned.

# Northeastern University

## Boston, Massachusetts

When we began our journey, systemic barriers existed between the Northeastern University (NU) College of Science community and nontraditional students, particularly students in NU's access programs. One result was low rates of declaration of science majors by students in the access programs. Another was that, while students from underrepresented groups who entered as science majors were graduating from the university at about the same rate as majority students, attrition to nonscience majors was higher for underrepresented students.



**FIGURE 1:** Teaching Circle participants – Professors Veronica Godoy-Carter (rear), Dessy Raytcheva (center), and Missy McElligott (foreground).

Our strategies to address these problems were twofold. First, we worked to build bridges between the College of Science community and the students in the access programs. Second, we worked to raise awareness among College of Science faculty about inclusive teaching practices and to facilitate implementation of evidence-based changes. We organized workshops and Teaching Circles to promote more welcoming and inclusive teaching. Often these were interactive learning sessions led by facilitators trained in our Northeastern University Skills and Capacity for Inclusion (NU-SCI) program – for example, on topics such as stereotype threat. We also held lively sessions centered around a book or a guest presenter. The Teaching Circles always enabled much-needed conversations among faculty about what worked well, and what didn't work, to increase student engagement and active learning. The Teaching Circles were not about telling faculty what to do, but rather about stimulating their consideration of what inclusive practices would work best for each individual professor, based on their class format and personal style.

We also aimed to build capacity for inclusion within existing NU programs. For example, our Foundation Year provides one year of college-preparatory and college-level courses for students from local public schools who did not get good college preparatory coursework in high school. Students who do well in Foundation Year courses receive a scholarship to continue at Northeastern. Most Foundation Year students are BIPOC and come from lower-income households. Traditionally, it was rare for any Foundation Year student who remained at NU to declare a science major.

Therefore one focus of NU-SCI was outreach to Foundation Year students. In the early years of our project, we hosted lunches for Foundation Year students with College of Science faculty, PhD students, and undergraduate researchers. Unfortunately, the pandemic stopped these luncheon meetings, which had been successful and well attended. We attempted virtual meetings but they did not work well. We had to change our focus and turned to advocating for changes in the Foundation Year program. We are pleased that Foundation Year has now been revamped so that the students in it have the option to take chemistry and biology courses as part of their preparatory curriculum. The structure of the program has also changed so that most of the students now remain at Northeastern.



Our work with faculty has brought the concept of inclusive teaching into the fabric of the College of Science. Information about inclusive teaching intentions is now sought from candidates for faculty positions. It is also brought up in teaching peer reviews and is a component of the review process for merit raises and for promotions. The teaching assistants in the chemistry and chemical biology department are being taught to incorporate metacognition, based on books by Dr. Saundra McGuire, into their instructional practices. Most of the College of Science faculty who teach introductory science courses have participated in our Teaching Circles and are active advocates of interactive, inclusive classrooms.

In order to sustain these efforts, we are in the process of transitioning the Teaching Circles into department-based activities. The first departmental events were facilitated by NU-SCI. Each department in the College of Science has a DEI committee and we have approached these committees to continue the work of promoting inclusive and welcoming classrooms, through continued workshops and Teaching Circles.

**We are also continuing our work to improve the science curriculum for Foundation Year students. Discussions are ongoing with the Foundation Year faculty and the chemistry department to provide more problem-solving experience for Foundation Year students.**

We gained many insights over the course of these efforts. We learned, for example, that the concept of inclusive classrooms involves a major shift in thinking about teaching. A large number of current College of Science faculty who have participated in NU-SCI activities have reported shifts in their thinking and in the ways they teach. We are also seeing new faculty enter the university far more aware of the need for, and cognizant of, effective strategies to achieve a welcoming classroom. That said, significant advances in diversity require firm commitments from the administration. We are pleased to see actions by our leadership at the college level and higher that are fostering positive changes to promote diversity and inclusion. Dean Hazel Sive became leader of the College of Science in 2020. She instituted a new hiring program for tenure-track faculty called INVEST, a field-open search each year for multiple tenure-track positions across the college. This has proven to be a significant step toward achieving better faculty diversity within our college. The president committed in 2020 to increase diversity across the university and, for the past two years, our incoming classes have had higher representation of Black, Hispanic, and Indigenous students. A key feature of Northeastern's success has been the commitment of people and resources to DEI from the ground up – from, for example, designated departmental and college DEI committees, a new associate dean for equity and inclusion, and a new senior vice provost and chief inclusion officer. With this investment and commitment, our inclusive excellence program has had the synergy needed for success and we look forward to seeing the continuation of the work we have started.



# Oberlin College

## Oberlin, Ohio

Oberlin College's IE project was designed to shift the culture across STEM at Oberlin to:

- 1 Increase participation with and implementation of equitable and inclusive practices beyond early adopters, who were often siloed in departments;**
- 2 Move away from practices based on a student-deficit model;**
- 3 Decrease the distance between our stated values of equity and inclusion and the lived experiences of students in STEM who are persons excluded due to ethnicity or race (PEERs).**

Our initial design aimed for a highly emergent process, but as the project progressed we found it necessary to provide greater guidance and structures to increase stakeholders' understanding of the barriers to PEERs' full participation in STEM, leading to more-informed emergent strategies.

We sought to build stronger relationships within and across STEM departments; deepen faculty and staff knowledge of the IE literature and best practices; and increase PEER students' sense of belonging in STEM. We designed faculty-focused efforts in two phases. The first included approximately 10 campus-wide learning communities for faculty and staff over the first two years of the grant. Groups self-organized to read literature, discuss the campus context, and develop action plans. The Faculty Rewards and Recognition group and the Pedagogy group had particular impact, including revising tenure and promotion forms to include IE activities and hosting two offerings by Yale University's Summer Institutes on Scientific Teaching for Oberlin and Kenyon faculty. To increase PEER students' sense of belonging in STEM, we established the position of STEM fellow, filled by a recent Oberlin STEM graduate. This provided a near-peer role model and expanded the amount and type of support available for PEER students in STEM.



This phase was followed by Departmental Action and Reflection Teams (DARTs), composed of at least four faculty or sometimes an entire department. DART members received course release, with their classes covered in most cases by visiting faculty paid through the grant. Each DART spent an academic year on work guided by a syllabus that included IE literature, quantitative and qualitative data about institutional and departmental contexts, and structures to support discussion and the creation of a DEI-focused vision statement. Each DART used its vision statement to design department-wide DEI-focused strategies. To prepare faculty and provide foundational knowledge about pervasive systems of oppression and their instantiation in STEM and higher education, the grant supported two five-day equity institutes led by the Inclusion, Diversity, Equity, Access, Leadership (IDEAL) Center from the Science Museum of Minnesota. Eight STEM departments went through the DART process over three academic years. Each year, we refined the syllabus to include more creative problem-solving and to respond to feedback from previous DARTs. We also moved from periodic check-ins with the DARTs by members of the leadership team to having a faculty member external to the department serve as facilitator. This aligns with established departmental-change models.

Recognizing the need to center student voices in the DART process, we created the Student Leadership Committee (SLC) in Year 3. This group, led and mentored by the STEM fellow, held interviews and listening sessions to understand the experiences of students in departments planning upcoming DARTs. A summary of themes from the interviews was included in the DART readings. In Year 5, the goals of this group transitioned to providing more support for community-building among PEER students across STEM.

As DART work progressed, we saw the need for a structure to support IE initiatives beyond individual departments. In response, and in collaboration with Oberlin's teaching center, we created a STEM DEI working group, a community of faculty guided by shared values and vision for equity- and inclusion-focused institutional change in STEM. One effort was the launch of a searchable pedagogy repository for faculty to share and search for pedagogical structures and course materials. Working group members received a stipend through the grant for their efforts.

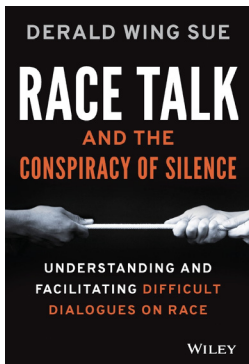
The leadership team's understanding of IE evolved throughout the project, with a shared reading of the book *Race Talk and the Conspiracy of Silence* in Year 3 proving particularly influential. The murder of George Floyd, the shifting national conversation that followed, and the pandemic also brought inequity issues into sharp relief and heightened the commitment of Oberlin's STEM faculty to address these challenges.

As we look to the future, we are confident the work of the past six years will be sustained at Oberlin in multiple ways. At the institutional level, DEI efforts are now recorded on faculty tenure and promotion forms. The STEM DEI working group and other programming efforts increased interactions among faculty across departments and across campus, creating a stronger network for support and exchange of ideas. The working group will become an ad hoc faculty committee in 2023-24 and a formal committee in 2024-25, the latter a change that will allow faculty to receive service credit for this DEI work.

At the departmental level, DARTs have significantly shifted our culture and practices, including adoption of more-equitable methods of communication in faculty meetings and consideration of DEI in all aspects of departmental work. Other changes include department-wide shifts in pedagogy and/or the sequencing of introductory courses, with the aim of increasing student access and success; a decline in barriers to research participation; and an expansion of initiatives to increase students' sense of belonging, through design of physical spaces and programming. At the individual faculty level, there is a notable increase in faculty members' understanding of the barriers to participation in STEM by PEER students, as well as knowledge and actionable curiosity about pedagogical approaches and structures to support students.

At the student level, in fall 2023 the STEM fellow position will transition to a coordinator position and from a 10-month to a 12-month appointment, with funding from the college to continue this support for PEER students. The SLC's community-building work will extend beyond the grant as well, under the acronym BRANCHES (Bridging Resources and Access to Nurture Community through Holistic Engagement in STEM), also with college support.

One of the most crucial lessons we learned is that the combination of faculty release time, training and guidance from experts such as those from the IDEAL Center, and a centering of student voices and sense of belonging strengthened our institutional change beyond what any of these strategies alone would have accomplished.



# Oregon State University

## Corvallis, Oregon

When we began our journey, the critical problem we faced was to transform the way STEM courses are taught at Oregon State University (OSU), Lane Community College (LCC), and Linn Benton Community College (LBCC) in order to improve student learning experiences and outcomes – specifically for economically disadvantaged, first-generation, and underrepresented minority (URM) students. We addressed this challenge by creating five annual cohorts of teaching faculty who were selected as IE fellows; they were introduced to inclusive teaching practices via an initial workshop and then supported in a yearlong action plan to create change in their sphere of influence through peer-support, mentoring, a community of practice, and opportunities to exhibit their work.

One of the intended outcomes of our IE@OSU program was to improve student belonging and success while building a sustained IE community within and across the IE fellow cohorts and between OSU, LCC, and LBCC. To date, we have trained 64 fellows, and 17 more fellows started their yearlong fellowship in the summer of 2023. Each fellow enacts their own action plan to fit their unique context; by this time next year, we will have had 81 different action plans actively improving student success on our campuses. Using data from a belonging survey that our fellows ask their students to complete, we have found that, overall, students feel a sense of belonging in the classrooms of the IE@OSU fellows and that their sense of belonging does not appear to vary by demographic characteristics.



Beyond the IE@OSU community, our three-times-a-year public events have spurred excitement for action (i.e., a recent event motivated faculty to advocate for changes in the disability access policy at OSU) and fostered recognition of our program more broadly on campus. Yet we had hoped to have 100 fellows by now, and we attribute this shortfall to factors (like the COVID shutdown and related fatigue) that were out of our control. So to recruit more community college (CC) faculty, we solicited feedback from prior CC fellows to tailor materials to their needs, hosted listening sessions with faculty, and engaged more deeply with the community colleges' leadership. And to better knit the prior and current fellows, we have invited prior fellows to join the IE@OSU leadership team, host workshops, and serve as project mentors.

We find that IE@OSU serves OSU, LCC, and LBCC's faculty, staff, and students well. For example, OSU made changes demonstrating support for diversity, equity, and inclusion initiatives in its general education reform and its promotion and tenure policies. In addition, IE@OSU not only gives fellows the opportunity to grow as educators, but also allows them to demonstrate their commitment to diversity, equity, inclusion, and accessibility (DEIA) within their spheres of influence.

Our faculty fellows are each expected to design and implement an action plan, using the ideas and practices they learned during our Inclusive Excellence Academy. These action plans ask fellows to "create change within their sphere of influence" and include efforts to revise curriculum, incorporate equity and justice concepts into course content, host departmental workshops on equity, and so on. Since the majority of our fellows are contingent instructional faculty, if OSU's environment was hostile to our work, we could not ask fellows to enact action plans like this without jeopardizing their employment. Although fellows occasionally mention that they experience skepticism from colleagues, all of the heads and chairs of our fellows' departments have expressed their support for our program and for the work the fellows do. The recent Diversity Action Plan announced by the College of Science spells out DEIA-related requirements as part of the promotion and tenure process, and we hope that our fellows' work will also be valued in terms of their professional advancement in the future.

We have ample allies in units across campus, including in the College of Science leadership, Office of Institutional Diversity, and Center for Teaching and Learning. The project team has intentionally sought out partnerships with key stakeholders at these units and invited many of them to serve on our advisory board. We see potential pathways to institutionalize our inclusive excellence work, particularly in partnership with the Center for Teaching and Learning, which has committed to continue featuring the ideas of our program, even if the fellowship structure itself might not continue. Moving forward, we recognize a need to ensure that our program maintains its recognition on campus as the institution navigates various leadership transitions. In fact, one important task for IE@OSU going forward will be to position the program within the many DEIA initiatives and programs at OSU and to ensure that its specific characteristic of blending inclusive pedagogy with evidence-based instructional practices is well understood.

Finally, OSU has partnered with LCC and LBCC on a promising National Science Foundation Improving Undergraduate Science Education (NSF-IUSE) proposal that would allow us to deepen our research on faculty members' efforts to improve the IE aspects of their educational practices, while better adjusting the program to meet the community colleges' needs.

While we entered this project primarily focused on faculty classroom teaching practices, we realized that faculty mindset and positionality were crucial to truly enacting sustained change that benefits students (see Figure 1). In response, we shifted the fellowship to spend more time engaged in this important work with our fellows. We also recognized that the perspectives of the faculty at our partner community colleges are important and impact our relationships with one another, given that we share students across the three institutions but differ enormously in our institutional contexts. Furthermore, the institutional context for doing IE work improved tremendously within OSU, making it less necessary to advocate with leadership at any level to execute basic ideas, but making it more urgent to understand how our program fits into the many other efforts to support student success and DEIA. Lastly, while there was stability among the faculty, even the contingent faculty, involved in IE@OSU, the leadership at all three institutions changed, creating a need to reintroduce ourselves more than we had anticipated.

## INCLUSIVE EXCELLENCE @ OSU

**OUR MISSION:** to make inclusive excellence intrinsic to excellence in STEM pedagogy at OSU

### THE PROGRAM AT A GLANCE

#### THE HOWARD HUGHES MEDICAL INSTITUTE

- OSU is one of 57 institutions to receive a \$1 million, 5-year grant from HHMI
- In partnership: the STEM Research Center, the College of Science, and the Office of Undergraduate Education

#### IE@OSU FELLOWS

- 5 annual cohorts of about 20 STEM faculty from OSU, Linn-Benton, and Lane Community Colleges
- To date (Year 2 of 5), we have reached 36 fellows across 11+ departments at OSU and the community colleges

#### LEARNING IN COMMUNITY

- Quarterly Peer Learning Community help strengthen bonds within the IE community
- Faculty Food and Fun events create opportunities for fellows to connect with the broader OSU community

### THE FELLOWSHIP EXPERIENCE

#### INCLUSIVE EXCELLENCE ACADEMY

- IE@OSU fellows participate in an intensive academy that challenges them to incorporate equity and justice into their mindsets as educators, and introduces them to social justice pedagogy

#### ACTION PLANS

- Each fellow creates and implements an action plan to create change within their sphere of influence
- Action plans are broad in scope, and have the **ultimate goal** of making STEM teaching and learning more equitable, just, and inclusive

#### COVID-19 ADJUSTMENTS

- Remote Academy held over Fall-term, rather than a 1-week in-person event during the summer
- Synchronous and asynchronous engagement with enrolled fellows

### OUR THEORY OF CHANGE

#### INSPIRING STEM FACULTY

##### MOVE MINDSETS

- Generate a sense of responsibility and agency over social justice in the classroom
- Reflect on identity and power

##### SHIFT PRACTICES

- Marry inclusive excellence to STEM pedagogy and instruction
- Enable faculty to generate pedagogical tools in an experimental and reflective way

##### PROMOTE STUDENT SUCCESS

- Increased sense of belonging in the STEM classroom and at their institutions
- Improved academic metrics

#### INSTITUTIONAL TRANSFORMATION

##### ΔHEARTS

- Inclusive pedagogy is normalized, rewarded & actively encouraged by departments

##### ΔMINDS

- IE@OSU becomes a part of OSU's broader inclusion strategies
- Effective practices are disseminated

##### IE IS CHAMPIONED

- Faculty and administrators act as champions for IE
- Students expect inclusive pedagogy in their classrooms

##### IE@OSU IS SUSTAINED AT OSU

- IE@OSU lives on beyond grant period
- Students' classroom experiences are mutually supported by their institutional experiences
- Inclusive practices are intrinsic to STEM pedagogy

**FIGURE 1:** Overview of the IE@OSU program and our theory of change.

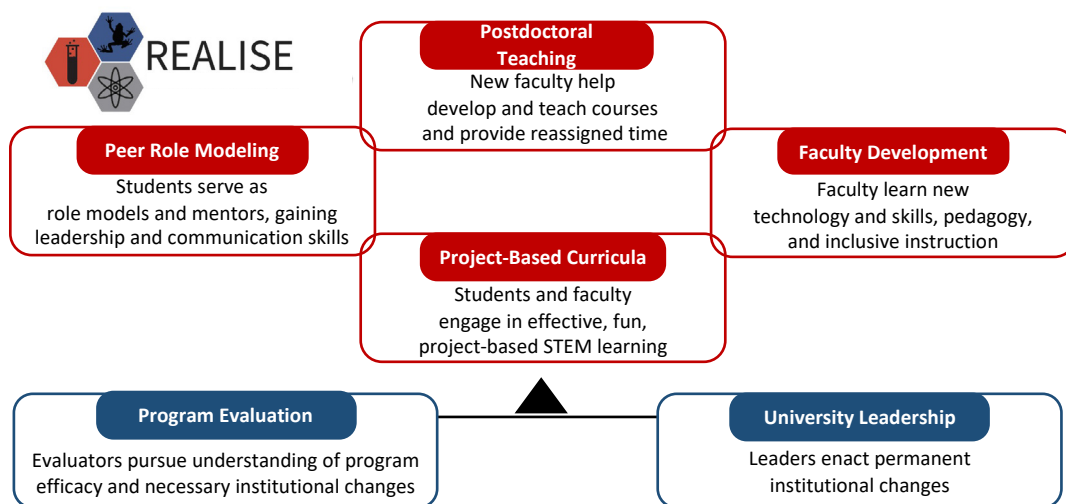
## Reflections

Our best advice is to engage in mindset/positionality work as a leadership team, provide opportunities for enacting or experimenting with real change, and strengthen authentic partnerships and relationships with engaged institutions to keep the focus on supporting students.

# Radford University

## Radford, Virginia

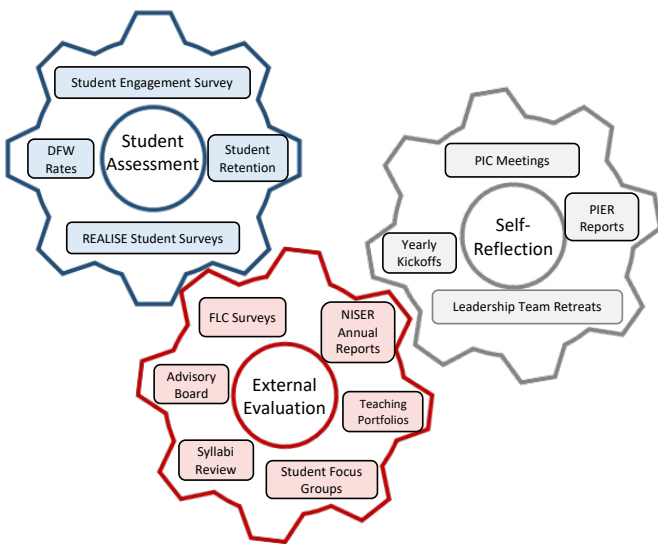
As is the case nationwide, too many STEM students leave Radford University within their first year of college. Instead of blaming this attrition on the students, we transformed our uninspiring entry-level science curriculum and the cold social environment that greeted our students. Our REALising Inclusive Science Excellence (REALISE) program aimed to redesign the biology, chemistry, and physics curricula and provide a welcoming environment where students support each other and faculty communicate their belief that all students can succeed. Through inclusive pedagogy and a student-centered approach, we sought to alter the environments within which our students live and learn. Our three primary strategies for effecting change were investing in faculty professional development, focusing on student social supports, and utilizing our leadership team to advance cultural and structural change across the institution (see Figure 1).



**FIGURE 1:** Overview of the REALISE program's structure.





Within the three focal departments, more than 75% of full-time faculty engaged in six faculty learning communities (FLCs) to learn and implement inclusive pedagogy strategies (e.g., disrupting microaggressions and implicit biases, engaging in project-based learning, raising cultural awareness, undertaking backward course design). REALISE postdoctoral fellows, hired in each department, provided reassigned time for full-time faculty and also participated in the FLCs and REALISE leadership. Importantly, the FLC training encouraged self-reflection and promoted adoption of a student-asset mindset. Assessment of the FLCs indicated that faculty now have more awareness of diversity and equity issues within their classrooms, which altered their teaching methods and approaches more toward building relationships with their students. Two workshops led by project-based learning (PBL) experts from Worcester Polytechnic Institute helped faculty build specific classroom projects. Now, revised syllabi communicate care for our students, faculty learn together through reading groups, and PBL is gaining traction in our STEM curriculum (several of our FLC and PBL outcomes are published). In the three departments during 2019, the rates at which students received grades of D or F or withdrew (DFW rates) from courses with REALISE-trained faculty were 12% lower than DFW rates in courses taught by non-FLC faculty. While the pandemic disrupted our progress, 2022 DFW rates in the required 100- and 200-level courses were 10% lower than in the years prior to the pandemic.





**FIGURE 2:** Evaluation and assessment for REALISE.

To overcome the barrier of faculty buy-in, the REALISE team championed tracking inclusive pedagogy on the university-wide faculty annual reporting system and worked with the new dean to require the use of inclusive pedagogical practices to earn tenure and promotion at the college level. Partnerships with the Center for Innovative Teaching and Learning (CITL), as well as with non-STEM faculty with specific expertise (i.e., team-based learning or cultural awareness), were critical to the success of the REALISE FLCs. In parallel, faculty development offerings were shifting to embrace inclusive pedagogy; this is changing how faculty think, act, and invest their resources. Utilizing an external advisory board of experts in PBL and inclusive pedagogy, working with the National Institute of Science Education and Research (NISER) as an external evaluator, and creating opportunities for leadership team reflection were critical to continually reevaluating our efforts toward advancement of IE (see Figure 2).

Program Goal	Event/ Initiative	Description
<b>STRENGTHEN SCIENCE IDENTITY</b>  	Imposter Syndrome Seminar	Dr. Devin Swiner spoke about her scientific journey as a woman of color and shared definitions of types of imposter syndrome, the different ways it can present, and how to overcome it. <b>(10-50 students per event)</b>
	Diversity in STEM Series	Diverse groups of career scientists met with students as a virtual panel and in-person roundtables to discuss their experiences in STEM and answer questions. <b>(10-30 students per event)</b>
	Artis Student Panel	Third- and fourth-year students from each STEM major answered questions about study habits, school-life balance, overcoming barriers, and other facets of their experience at Radford University. <b>(30-40 students per event)</b>
	Classroom Visits	Faculty hosted REALISE PRMs in their classes to talk to new students about their college experience and answer questions. Some visits were general Q&As, while others were focused on a specific topic, like undergraduate research. <b>(5-15 visits per semester)</b>
<b>BUILD STEM COMMUNITY</b>    	Tie-Dye	Students spend time with REALISE PRMs and other peers while tie-dyeing a REALISE T-shirt or mask. <b>(40-70 students per event)</b>
	Fresh Fruit Fridays (FFF)	Every Friday morning free coffee, breakfast, and snacks are shared to help combat food insecurity on our campus. REALISE PRMs interact with students throughout the event to help build connections. Faculty also host office hours during the event. This event was extremely popular and spread to other colleges/units on campus until there was a similar event for every day of the week. <b>(30-100 students per event)</b>
	Paint & Plant	Students meet REALISE PRMs and other peers while painting terracotta pots. The REALISE Students collaborated with Plant Club so students could also pick out a plant to take home. <b>(30-50 students per event)</b>
	STEM Club Fair	REALISE Students invited all STEM-based student clubs to participate in a college-specific club fair. Students could meet members from each club and participate in a club-related activity. For example, the REALISE PRMs helped students make science and motivational buttons. <b>(10-50 students per event)</b>
<b>AMPLIFY STUDENT VOICE</b>  	Student Surveys	REALISE Students distributed online surveys about classroom comfort and office hours accessibility. The students then analyzed the data and created informative visuals for faculty.
	Fresh Fruit Friday Polls	A different poll question was written on a whiteboard during FFF each week. These questions often revolved around students' well-being and ideas for future REALISE events.

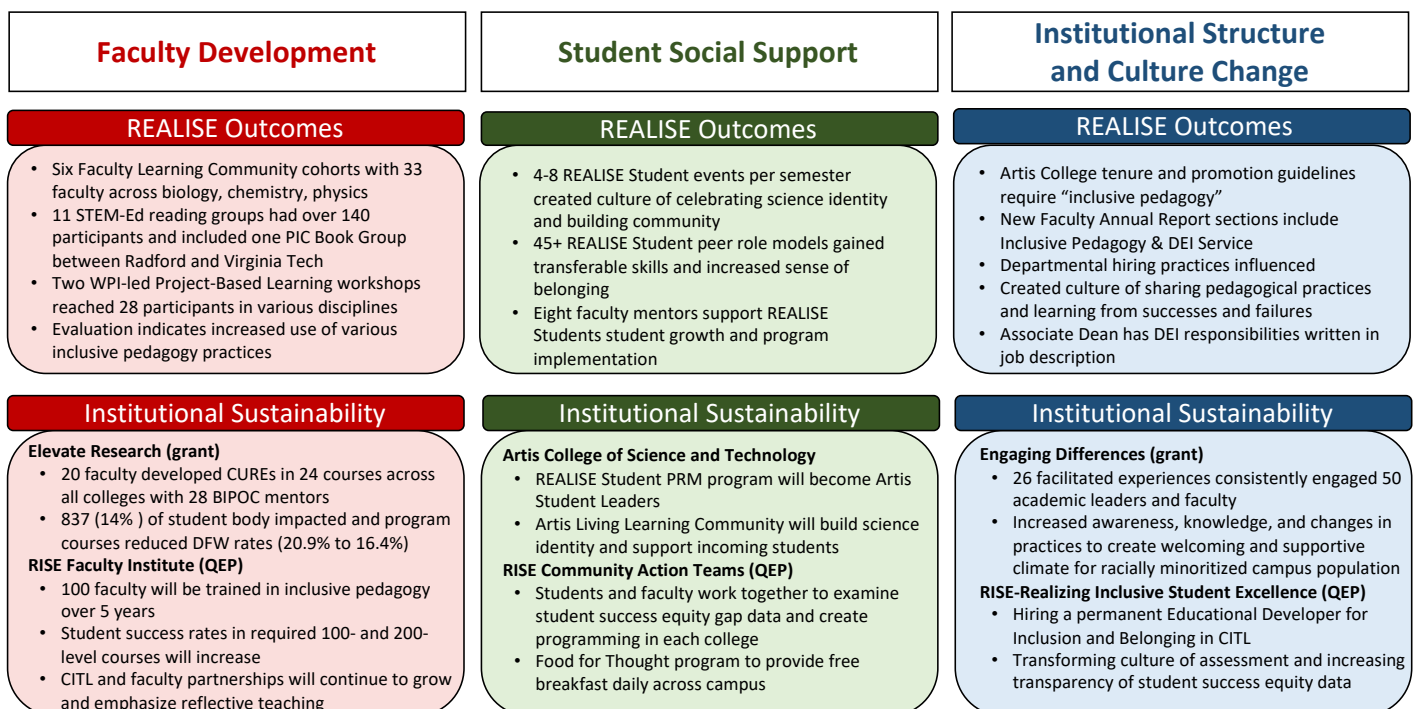
Student social support was provided by what we called REALISE Students, peer role models (PRMs) whose goals were strengthening science identity, building STEM community, and amplifying student voices (see Figure 3). With close faculty mentorship, PRMs were trained to handle difficult conversations and create inclusive communities. One of our signature events, Fresh Fruit Fridays, catalyzed the creation of a network of free breakfast events each day of the week across campus. The REALISE Students flourished during the grant and elected to become a student club at the end of the funding period. However, this transition was not successful; we learned that compensation for student time is imperative for running an extensive PRM program. Currently, we are exploring utilization of work-study positions and other special funds to revive and continue the PRM program.

**FIGURE 3:** REALISE Peer Role Model events and engagement.

The presence of REALISE created additional opportunities to advance cultural and structural change across the institution (see Figure 4). REALISE catalyzed two other grant programs: Engaging Differences, funded by our HHMI Faculty Forums on Race grant, and Elevate Research, funded by the Jessie Ball duPont Fund. Engaging Differences aimed to increase awareness, knowledge, and changes in practices by program participants – faculty and institutional leadership – that resulted in specific actions leading to a more welcoming and supportive climate for our racially minoritized campus populations. The Elevate Research program aimed to increase and diversify the number of students participating in research and creative inquiry, to close equity gaps in retention and graduation rates, to support faculty who develop course-based undergraduate research experiences (CUREs), and to increase BIPOC classroom leadership. Finally, REALISE faculty development and student social support will be scaled up via our five-year institutional quality enhancement plan called RISE (Realizing Inclusive Student Excellence). The RISE program uses a data-driven approach and aims to increase student success in required 100- and 200- level courses, as well as to increase student academic success and sense of belonging in college. The hiring of an educational developer for inclusion and belonging, a new permanent CITL staff member, through the RISE program was an important win in terms of our ability to institutionalize inclusive excellence.

We have been intentional, strategic, and opportunistic in our efforts to alter the environments within which our students live and learn – attending to culture, structure, and the political landscape. Our REALISE leadership team included individuals at the provost and dean levels, both junior and senior faculty, and the program's postdoctoral fellows. This positionally diverse group gave us access to different institutional levers, resources, and spheres of influence to keep advancing our work; this was critical, given administrative turnover. We incentivized people and activities, aligned with our partners' priorities and supported their initiatives for mutual gain, leveraged the strategic plan, and made connections across the university. Our thinking evolved over time as institutional leadership and personnel shifts created opportunities to advance some strategies and limited advancement (or even access) in other areas.

We learned several crucial lessons about building institutional capacity for IE. First and foremost, this work is hard and requires significant emotional labor. As progress is made, pushback increases. As such, taking care of one another as humans is always important – and becomes



**FIGURE 4:** Highlights of REALISE outcomes and the institutional sustainability of faculty development, student social support, and institutional structure and culture change.

increasingly so as the work advances. Second, seeding change in multiple institutional locations and using different levers to advance the work helps the project maintain forward momentum when environments shift – and they will. Third, keep the end goal in mind and remain flexible in your approach and priorities.

## Grant-Derived Dissemination Products

### Publications

Wojdak, J., Phelps-Durr, T., Gough, L., Atuobi, T., DeBoy, C., Moss, P., Sible, J., and Mouchrek, N. (2020). "Learning Together: Four Institutions' Collective Approach to Building Sustained Inclusive Excellence Programs in STEM" in *Transforming Institutions: Accelerating systemic change in higher education* (book). <http://openbooks.library.umass.edu/ascnti2020/chapter/wojdak-et-al/>

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Lau, J.K., Paterniti, M., and Stefaniak, K.R. (2019). "Crossing floors: Developing an interdisciplinary CURE between an environmental toxicology course and an analytical chemistry course," *Journal of Chemical Education*, 96: 2432-2440. DOI: 10.1021/acs.jchemed.9b00289

Kennedy, S.A., Balija, A.M., Bibeau, C., Fuhrer, T.J., Huston, L.A., Jackson, M.S., Lane, K.T., Lau, J.K., Liss, S., Monceaux, C.J., Stefaniak, K.R., and Phelps-Durr, T. (2020). "Faculty Professional Development on Inclusive Pedagogy Yields Chemistry Curriculum Transformation, Equity Awareness, and Community," *Journal of Chemical Education*, 99: 291-300. DOI: 10.1021/acs.jchemed.1c00414

Lau, J., Mekolichick, J., Raimer, A., and Kennedy, S. (publication anticipated in 2023). "Assessing changes in student engagement using a mixed-methods approach" in *Fostering Communities of Transformation in STEM Higher Education: A Multi-institutional Collection of DEI Initiatives* (book).

Raimer, A., Stefaniak, K., and Liss, S. (publication anticipated in 2023). "Creating impactful moments: Using peer-role models to build community and sense of belonging in STEM" in *Fostering Communities of Transformation in STEM Higher Education: A Multi-institutional Collection of DEI Initiatives* (book).

Mekolichick, J. (publication anticipated in 2023). "Institutionally advancing inclusive excellence: Leading from the middle in times of transition" in *Fostering Communities of Transformation in STEM Higher Education: A Multi-institutional Collection of DEI Initiatives* (book).

DeBoy, C., Gough, L., Kennedy, S., Raimer, A., and Sible, J. (publication anticipated in 2023). "From the soul: Learning and leading together toward inclusive excellence" in *Fostering Communities of Transformation in STEM Higher Education: A Multi-institutional Collection of DEI Initiatives* (book).

Huston, S., Herman, R., Liss, S., and Taylor, B. (publication anticipated in 2023). "Community, curriculum, and CUREs: Transformations in the physics department at Radford University" in *Fostering Communities of Transformation in STEM Higher Education: A Multi-institutional Collection of DEI Initiatives* (book).

### Presentations and posters

Phelps-Durr, T.L., Mekolichick, J., Rogers, J.O., Wojdak, J.M., and Kennedy, S.A. "Year 1 progress on HHMI Inclusive Excellence at Radford University," HHMI IE Peer Implementation Cluster (PIC) meeting, Trinity Washington University, Washington, D.C., May 2018.

Phelps-Durr, T., Rogers, J.O., Kennedy, S., Mekolichick, J., and Wojdak, J. "Realising Inclusive Science Excellence (REALISE) at Radford University," Council on Undergraduate Research (CUR) biennial conference, Arlington, Va., July 1-3, 2018.

Taylor, B.E. (presenter) and coauthors Phelps-Durr, T., Rogers, J.O., Mekolichick, J., Herman, R.B., Huston, S.M., Freed, M.S., Anderson, J.R., Small, C.J., Sheehy, R.R., Redmond, S.B., and Wojdak, J.M. "Adding Undergraduate Research in a Backwards-Designed Curriculum," CUR biennial conference, Arlington, Va., July 1-3, 2018.

Rogers, J., Phelps-Durr, T., Mekolichick, J., Wojdak, J., and Kennedy, S. "Achieving Inclusive Excellence by Embedding Project-based Learning into First-year Courses," American Association of Colleges and Universities (AAC&U) Transforming STEM Higher Education conference, Atlanta, Ga., November 8-10, 2018.

Kennedy, S., and Curtis, A. "Using the lens of inclusive excellence to redesign and assess the general chemistry laboratory experience," American Chemical Society (ACS) national meeting, Orlando, Fla., April 2019.

Curtis, A., Kennedy, S., and Mekolichick, J. "Assessment of Students' Sense of Belonging, Science Identity, and Self-Efficacy to Measure the Effects of Inclusive Excellence Initiatives," HHMI PIC meeting, Blacksburg, Va., June 6, 2019.

Stefaniak, K.R., Lau, J.K., Herman, R.B., and Phelps-Durr, T.L., "Creating Inclusive Classrooms through Project-based Learning," Teaching and Learning conference, Elon University, Elon, N.C., August 15, 2019.

Kennedy, S.A., and Winfrey, M. "Curricular reform in light of inclusive pedagogy: Faculty development and student support," ACS national meeting, San Diego, Calif., August 2019.

Taylor, B.E., Herman, R.B., Liss, S., Rutkowski, T.C., Jaronski, W.S., Huston, S.M., Freed, M.S., and Watts, L.T., "Radford University – Physics Year 3 Update and Successes," CUR Transformations Project, Rice University, Houston, Tex., October 5, 2019.

Mekolichick, J., and Kennedy, S. "Institutional change toward inclusive excellence: Case study & conversation," AAC&U, Chicago, Ill., November 7-9, 2019.

Firebaugh, A., Phelps-Durr, T.L., and Mekolichick, J., Kennedy, S.A., Herman, R.B., Rutkowski, T.C., and Jackson, M.S. "STEM Peer Role Models Build Strong, Sustainable STEM Communities," AAC&U Transforming STEM Higher Education, Chicago, Ill., November 7-9, 2019.

Rutkowski, T.C., and Herman, R.B., "Project-Based Learning in Physics – Seeing the Physicist Within," AAC&U Transforming STEM Higher Education, Chicago, Ill., November 7-9, 2019.

Mekolichick, J., Jones, S.B., Penven, J., Lovelace, L.S., and Corey, D. "Leveraging Resources, Building Alliances, and Creating Capacity for Change," AAC&U Diversity, Equity, and Student Success, New Orleans, La., canceled due to COVID but scheduled for March 19-21, 2020.

Kennedy, S., and Winfrey, M. "Inclusive pedagogy toolkit for chemistry curriculum delivery," ACS national meeting (virtual), August 2020.

Raimer, A.C., Jackson, M.S., Lau, J. "REALising Inclusive Science Excellence (REALISE): Changing the Ways in which Students Perceive Their Science Identity and Sense of Belonging," AAC&U (virtual), November 4-6, 2021.

Kennedy, S., and Elkins, K. "Challenges and Successes on the Road to Inclusive Excellence in Chemistry," ACS national meeting, March 22, 2022.

Raimer, A.C. "Building STEM Identity and Community through Peer Mentoring," Luce Colloquium on Inclusive Excellence (virtual), April 21-22, 2022.

Foltz, S., \*McLaughlin, J., Mekolichick, J., Monceau, C., Raimer, A., \*Richard, G. (\*student presenters). "Reflection on Radford's REALISE Program," HHMI IE PIC meeting, Towson, Md., June 2, 2022.

Raimer, A.C., and Kennedy, S.A. "REALising Inclusive Science Excellence (REALISE) Student Peer Mentoring: Building Community, Identity, and Belonging within STEM," AAC&U, Arlington, Va., November 3-5, 2022.

DeBoy, C.A., Gough, L., Raimer, A.C., Sible, J.C., and Kennedy, S.A. "Sustaining Inclusive Excellence through Communities of Practice", AAC&U, Arlington, Va., November 3-5, 2022.

Fox, J., Herman, R., Kennedy, S., Lau, J., Mekolichick, J., and Raimer, A. "REALISE Project Successes and Challenges," HHMI IE PIC meeting-Big PIC, Radford, Va., June 1, 2023.

Stefaniak, K., Kennedy, S., and Raimer, A. "REALISE Student peer mentoring: Building community, identity, and belonging within STEM," ACS meeting, March 2023.

## Grants

Mekolichick, J., Wirgau, J., Keith, H., Hill, B., and White, P. \$102,000 from the Jessie Ball duPont Fund for the Elevate Research Program ("The Retention-Based Practice of Course-Based Undergraduate Research Using Student Research Mentors on Black, Indigenous, and People of Color Students"), 2020.

Mekolichick, J., Jones, S., and Keith, H. \$25,000 from the HHMI Faculty and Staff Forums on Diversity and Inclusion Initiative for the "Radford University Engaging Differences Program," 2019.

Kennedy, S., and Elkins, K. (of Towson University). a \$6,500 Innovative Project Grant for Divisional Enhancement from the ACS Committee on Divisional Activities for "Inclusive Excellence in Chemical Education" (to host symposia at national ACS meetings), 2019.

# Rochester Institute of Technology

## Rochester, New York

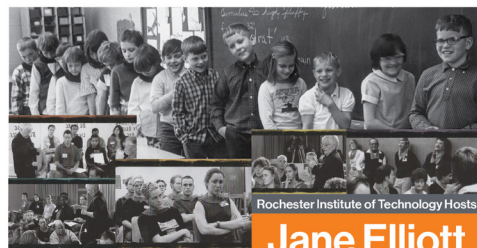
As is the case at many STEM institutes, the entrenched culture at the Rochester Institute of Technology (RIT) College of Science was one in which people avoided difficult conversations and institutional inertia inhibited significant change. Over the previous decade, however, there had been a palpable shift in the college climate, reflecting a need for more programming in the DEI space and a desire to do better by our faculty, staff, and students.

RIT's HHMI IE leadership team set out to change the college culture, starting with engaging and educating our faculty – and, later, staff (see Figure 1). Our three-pronged approach targeted change in the areas of research mentoring, teaching, and nurturing a sense of community. Faculty cohorts participated in year-long, biweekly workshops to discuss inclusive teaching and

	Description	Target Audience
Curricular Innovations	Inclusive Mentoring workshop series for faculty; Inclusive Teaching Practice workshop series for faculty	College of Science faculty
Student Research Summer	Inclusive Excellence Student Research Fellowship program (2017–2023, annual), including professional development and social activities for students	College of Science students with nontraditional or marginalized backgrounds
Faculty Development and Cohort Programs	Inclusive Mentoring workshop series for faculty; Inclusive Teaching Practice workshop series for faculty; single workshops on inclusive practices for faculty and staff, with sessions on allyship, power dynamics (invited external educator), etc.; Diversity Theatre programming (workshops and demonstrations)	College of Science faculty, staff, and students
Interdisciplinary Programs	All programming was across college units and departments	College of Science faculty, staff, and students
Community Outreach	Annual speaker events on campus (Jane Elliott, Rick Guidotti, George M. Johnson, and Adam Rutherford)	All RIT community and the greater Rochester community
Community-Building	Created department liaisons (under the Dean's Office) to implement community events; organized tabling at student community events (e.g., LGBTQ+ STEM Day, Racial Reconciliation Together RIT event, etc.); supported re-creation of a student group for students of color (COS ALANA); supported COS LISC (LGTBQ+ student group); sponsored film screening of <i>Forgotten Genius</i> for Black Heritage Month	College of Science faculty, staff, and students
Policies and College Practices	Developed a College of Science Strategic Plan for Diversity, Equity, and Inclusion; added a DEI section to faculty annual reviews; added a DEI value statement to university-wide tenure and promotion policies; advocated for the addition of a gender-neutral bathroom in the College of Science; developed a universal search criteria rating form (SCRF) for faculty searches; updated bias training for faculty searches; instituted department-wide training for faculty searches	College of Science faculty and administration; RIT faculty

**FIGURE 1:** These were the institutional strategies we employed during our IE journey.





Rochester Institute of Technology Hosts  
**Jane Elliott**

internationally acclaimed anti-racism activist, feminist, and educator

Tuesday, November 6, 2018  
1:30pm – 4:30pm

Keynote Address: Power, Perception, and Prejudice  
Webb Auditorium (James E. Booth, Room 1350)  
1:30pm – 3:30pm

Reception and Photo Opportunity:  
University Gallery (Vignelli Center for Design Studies)  
3:30pm – 4:30pm



In partnership with:

- AALANA Faculty Advisory Council
- Chester F. Carlson Center for Imaging Science
- College of Science Dean's Office
- Department of English
- Division of Diversity and Inclusion
- Division of Enrollment Management
- Division of Academic Affairs
- Howard Hughes Medical Institute Inclusive Excellence
- Integrating Metacognition Practices and Research to Ensure Success (IMPRES)
- Q Center
- School of Physics and Astronomy
- School of Chemistry and Materials Science
- Thomas H. Geonell School of Life Sciences
- Women and Gender Studies Program

Register by: November 1, 2018  
at: [www.rit.edu/diversity/JaneElliott](http://www.rit.edu/diversity/JaneElliott)

Free Event



**FIGURE 2:** We invited high-profile speakers to campus to present on topics related to inclusive excellence. The first speaker was Jane Elliott, the inventor of the “blue eyes/brown eyes” exercise. Inspired by the assassination of Martin Luther King Jr. in 1968, Elliott demonstrated the effects of racism with her elementary schoolchildren in Iowa, and she has been an anti-racism activist ever since.

mentoring practices. Community events brought together faculty, staff, and students to learn about critical DEI topics such as bias, microaggressions, racism, gender and sexuality, the need to increase accessibility, and the need to dismantle power dynamics. Nationally renowned experts and artists, including Jane Elliott, Rick Guidotti, George M. Johnson, and Adam Rutherford were brought to campus to present their work and inspire our community (see Figure 2).

A unique aspect of our programming was the active participation of faculty, staff, and students in immersive experiences known as Playback Theatre, in which participants watch as actors dramatize audience members’ personal narratives, with the goal of reflecting on those situations and gaining a better perspective on how others experience racism, bias, exclusion, and harassment (see Figure 3).

We tried to address the age-old problem of “getting credit” for DEI efforts, ensuring that contributions toward creating an inclusive culture would be a recognized priority alongside teaching and research responsibilities (see Figure 4). We advocated for new language in tenure and promotion policies to emphasize the institute’s commitment to fostering a respectful, supportive, accessible, and inclusive RIT community. And we added a section to the College of Science’s self-appraisal forms to allow faculty and staff to describe specific contributions they’d made to DEI initiatives. Both of these changes allowed our faculty and staff to demonstrate their commitment to inclusion and see their efforts acknowledged by leadership. Further efforts are underway to update college policies to encourage more inclusive language and practices. All of these changes were made with the goal of sustaining the initial progress of our IE project and of supporting our continued efforts to improve our culture. Currently, there is an institute-wide push to incorporate/adapt some of our college’s practices, and recent conversations in the Faculty Senate recognized the need for real acknowledgement of efforts in the DEI sphere.



**FIGURE 3:** A unique aspect of the RIT IE Program was the inclusion of Playback Theatre to facilitate difficult conversations. We held workshops open to the entire community based on exploring aspects of diversity and identity. In these sessions, actors would improvisationally dramatize personal experiences suggested by the audience.

Featured Inclusive Excellence Faculty  
Research Mentor

**Dr. Moumita Das**  
School of Physics and Astronomy

“We only get one shot at life. If it’s your dream to study, research, or build something, pursue it and don’t let anything hold you back.”

hhmai | Howard Hughes Medical Institute  
Inclusive Excellence | RIT | College of Science | CASTLE

**FIGURE 4:** The RIT IE program enrolled cohorts of faculty into year-long learning communities based on inclusive teaching and/or mentoring. We held professional photoshoots and made attractive posters for the participants as a perk for joining.

# 90

Our initial proposal aimed to engage 90 faculty participants in the program's activities. Over the five years of the project, we not only exceeded that goal but engaged even more staff and students in our initiatives. The diversity of our IE cohorts increased over time, making the conversations and experiences richer and more dynamic. Although the COVID pandemic brought new challenges to our leadership team, the changing political climate and the Black Lives Matter movement brought a new sense of energy and urgency, which helped drive participation in our IE programs.

Despite our efforts, challenges remain. College leadership was generally supportive of our work and were willing to promote and publicize our programming, but they rarely used their political capital to drive participation. While there was sustained engagement from a large number of faculty members, an equally large portion remains unengaged. We have also noticed pushback from faculty and staff regarding activities that require a higher investment – either a greater time commitment or more uncomfortable conversations.

To conclude, we are enthusiastic about the current position of the College of Science at RIT, as we continue to advance toward greater equity and inclusion. Our dean has moved the IE program manager position into the Dean's Office, established a new leadership position (director of DEI in the College of Science), and committed to financially support DEI programming – ensuring that the groundwork laid by our IE program will continue to grow and flourish long past the end of our HHMI grant.

## Reflections

The IE initiative provided an important opportunity for conversation, community engagement, and interpersonal connections, which were much needed after the lengthy period of isolation and restrictions came to an end.

## Grant-Derived Dissemination Products

### Publications

Michel, L.V. (2022). "All alone in a crowd," *ASBMB (American Society for Biochemistry and Molecular Biology) Today*, 21(4):59-60. <https://www.asbmb.org/asbmb-today/careers/081122/all-alone-in-a-crowd>

Michel, L.V., and Forsythe, D. (2022). "If I don't, who will?" *ASBMB Today*, 21(3):52-54. <https://www.asbmb.org/asbmb-today/opinions/031022/if-i-don-t-who-will>

Wyatt, B.N., Magalhães, R.M., Michel, L.V., and Newman, D.L. (2021). "Development of a Faculty Learning Community to Foster Inclusive Research Mentoring," *Journal of Faculty Development*, 35(2):44-49.

Magalhães, R.M., and Hane, E. (2020). "Building Inclusive Classroom Practices: A curriculum for faculty learning communities based on metacognition," *Journal of Faculty Development*, 34: 125–132.

### Presentations

Michel, L.V. "An inclusive workshop series for faculty mentoring nontraditional undergraduate research students," American Chemical Society (ACS) national meeting (virtual), 2021.

Forsythe D., Newman, D.L., Franklin, S.V., Michel, L.V., and Hane, E.N. "How Committing to Social Justice Impacts the Pedagogy and Practices of STEM Classrooms" (roundtable), Society for the Advancement of Biology Education Research (SABER), Minneapolis, Minn., 2022.

Hane, E., and Magalhães, R. "Building inclusive classroom practices: A curriculum based on metacognition," Life Discovery Conference, Ecological Society of America, Estes Park, Colo., 2021.

DaCosta, T., Connelly, J., Magalhães, R., and Hane, E. "Playback Theatre for STEM community building during physical distancing and demonstrations," American Association of Colleges and Universities (AAC&U) Project Kaleidoscope (PKAL) Massachusetts regional chapter meeting (virtual), 2021.

Magalhães, R.M., Wyatt, B., Newman, D.L., and Franklin, S. "Challenges and Keys to Successfully Implementing Inclusive Teaching" (poster), AAC&U Transforming STEM Higher Education conference (virtual), 2020.

Magalhães, R.M., Newman, D.L., and Franklin, S. "How inclusion is communicated (or not) through the course syllabus" (poster), AAC&U Transforming STEM Higher Education conference (virtual), 2020.

Hane, E., and Magalhães, R. "Building inclusive classroom practices: A curriculum based on metacognition," AAC&U STEM Education annual meeting (virtual), 2020.

DaCosta, T., Connelly, J., Magalhães, R., and Hane, E. "Building an inclusive STEM community through Playback Theatre," AAC&U STEM Education annual meeting (virtual), 2020.

Wyatt, B., Magalhães, R.M., Newman, D., Franklin, S. "Motivational factors and barriers to faculty engaging in inclusive mentoring practices," SABER West, Irvine, Calif., 2020.

Wyatt, B.N., Magalhães, R.M., Newman, D.L., and Franklin, S. "Motivational Factors and Barriers to Faculty Engaging in Inclusive Mentoring Practices," Association of College and University Biology Educators (ACUBE), Syracuse, N.Y., 2019

Magalhães, R.M., Newman, D.L., and Franklin, S. "How Inclusion is Communicated (or not) through the Course Syllabus," ACUBE, Syracuse, N.Y., 2019.

Magalhães, R.M., Wyatt, B., Newman, D.L., and Franklin, S. "We Talk the Talk, but Do We Walk the Walk? What Factors Keep Faculty from Implementing Inclusive Teaching and What are the Keys to Success?" (poster), Gordon Research Conference on Undergraduate Biology Education Research, Lewiston, Maine, 2019.

Michel, L.V., Newman, D.L., Magalhães, R.M., and Wyatt, B.N. "Developing an Inclusive Workshop Series for Faculty Mentoring Diverse Research Students" (poster), American Society of Biochemistry and Molecular Biology conference, Orlando, Fla., 2019.

Newman, D.L., Connelly, J., Hane, E., Michel, L.V., DaCosta, T.C., Magalhães, R.M., Wyatt, B., and Franklin, S.V. "Fostering Inclusivity and Equity: A Three-Strand Approach for Research, Classroom, and Community" (poster), AAC&U PKAL Transforming STEM Higher Education conference, Atlanta, Ga., 2018.

Magalhães, R.M., Newman, D.L., Hane, E.N., Michel, L.V., Connelly, J., and Franklin, S.V. "Inclusive Excellence: A Three-Pronged Approach to Increasing Diversity and Retention in Science," (poster), SABER annual meeting, Minneapolis, Minn., 2018.

# Roosevelt University

## Chicago, Illinois

### **When we began our journey**

Although Roosevelt University was founded with a mission of social justice and inclusion, we always strive to improve the effectiveness of our outreach, the inclusiveness of our campus atmosphere, and the cultural awareness and sensitivity of our faculty and staff. Data from 2017 (before the grant began) from our science department showed that persons excluded due to ethnicity and race (PEERs) and first-generation and women students were not being retained or graduating at the same rates as their majority classmates. This critical problem was the basis of our grant application. We initially felt that increasing student services through improved advising, tutoring, peer-mentoring, and early alerts would provide wrap-around services that our marginalized students needed to be successful. We also aimed to increase cultural competency for our faculty and staff. Primarily, we provided strategies to enhance faculty awareness, understanding, and ownership of issues of inclusion and equity in STEM disciplines. Such strategies included assessments of implicit bias and workshops on pedagogy. Seminars and speakers addressing anti-racism, bystander awareness, and inclusive classrooms were also provided to most personnel within the institution.

When we started our journey, our overall goal was to shift the culture for STEM inclusiveness as well as to vigorously disseminate information about IE to all faculty at the university. We strove to facilitate the embedding of IE across disciplines so that the concept would become a habit that is implemented and practiced consistently across the university.

### **During our journey**

Progress toward our IE outcomes can be identified throughout STEM majors and the university. One of the most transformative outcomes has been the success of the Science Peer Advisors (SPA) program. This program matches current STEM majors with mentees who need support in areas outside of tutoring. Beyond simply building mentor-mentee relationships, we have been able to provide dedicated space on campus for such interactions. Because many of our students are commuters, having a dedicated space to meet up with their peers has provided these students with a greater sense of belonging as well as with a safe space to discuss personal issues and other impacts on their educational experiences. The success of the SPA program allowed us to advocate for a resource center for STEM majors and the ability to convert a former underutilized storage area into an inviting area for them.

We have worked to increase cultural competencies and inclusive classrooms and to decrease a deficient-student perception among faculty and staff. We have been able to institutionalize statements on inclusivity in syllabi. We have observed a number of faculty working to incorporate voices from people of color, women, and the LGBTQA community into their classroom activities. Our work has helped faculty meet students where they are instead of labeling students as deficient. However, we also acknowledge that some faculty adapt much easier than others to



these shifts in thinking. A major barrier that we continue to work to overcome is the engagement of faculty labeled as “worst” offenders, especially those from the advantaged majority. We have been able to engage these individuals to some degree through mandatory assignments (such as completion of implicit bias tests), membership on working groups, and participation in discussions during faculty meetings – but we know these steps are not enough. We also see the same issues in the university community as a whole. Many of those who could benefit from IE initiatives are not as open to embracing changes or constructively dissecting their own misconceptions and actions as they might be.

## Sustaining our journey beyond HHMI

Evidence suggests that the grant has helped to position the university to continue to advance toward IE. The grant funding allowed the STEM disciplines to bring in speakers and workshops to the entire university community. These speakers and workshops helped others across the university identify their own barriers to IE and push for additional resources to help their areas address IE issues. As a result, the university funded additional resources for the community by hosting speakers and workshops beyond the ones we offered. Our push for IE has also influenced an increase in the number of committees in the various colleges that specifically address diversity, inclusion, equity, and justice. In addition, chief diversity officers were appointed in 2021 to convene a university-wide diversity, equity, and inclusion committee. Work from this committee will be used to guide the university’s diversity, equity, and inclusion initiatives – a key element in our new strategic plan, which begins in 2024.

We have also seen our call for more inclusive spaces for STEM majors be realized with the opening of the STEM Center in 2022. This dedicated STEM space houses offices for our McNair, Student Support Services (SSS) STEM, and Hispanic-Serving Institution (HSI) STEM programs. The space provides areas for faculty office hours, student study groups, tutoring, mentoring, and workshops, as well as areas for students to just gather with their friends. Our SPA model has been duplicated in other areas of the university, and we are very optimistic that SPA will continue to be funded through the operating budget of the university when our HHMI funding is depleted.

Significant obstacles and barriers still exist, but we now have a much stronger and wider voice throughout the university. Our program director is now a co-dean of the College of Science, Health, and Pharmacy, and members of our leadership committee hold appointments in the Provost’s Office. We know that just having a place in the rooms where discussions begin regarding student support and the university environment will be useful in continuing the IE journey.

## Reflections

**Institutional change to reflect IE must involve continuous effort from multiple stakeholders to be successful.** Work in IE is dynamic, and best practices are always evolving, so there is no time to pat yourself on the back for a job well done. One crucial lesson we learned is to always ensure that student voices are in the room – and to listen to them. Institutions respond positively to initiatives that directly benefit students and address issues that students have already identified as barriers. In addition, it is advantageous to have advocates at all levels and components of the institution. This work cannot be done in a silo and be effective.

## Grant-Derived Dissemination Products

Ndangalasi, H.J., Martínez-Garza, C., Harjo, T.C.A., Pedigo, C.A., Wilson, R.J., and Cordeiro, N.J. (2021). “Seedling recruitment under isolated trees in a tea plantation provides a template for forest restoration in eastern Africa,” *PLoS One*, 16(5), e0250859.



# San Francisco State University

## San Francisco, California

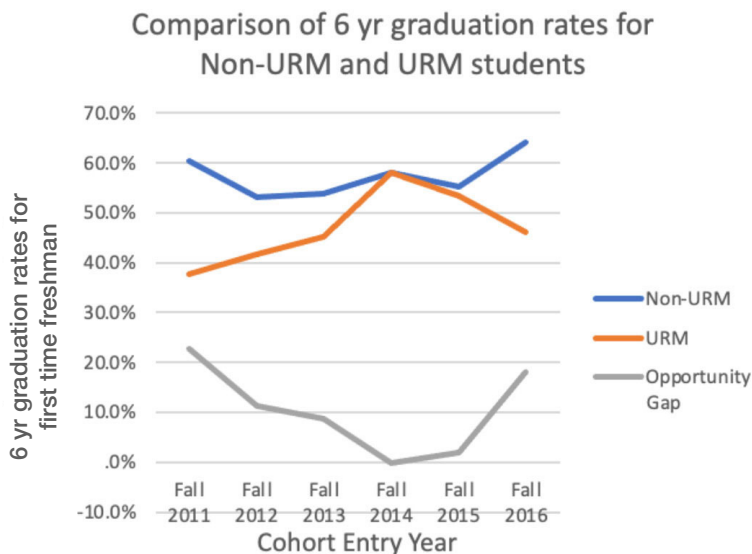
### When our journey began

Our IE project started in 2017, as part of the Biology FEST (Faculty Empowering Students in Transformations), which was connected with a previous HHMI award. We proposed projects that had been developed under the auspices of this earlier HHMI effort and focused on the following main goals:

- To engage and empower persons excluded due to ethnicity or race (PEERs) as leaders in departmental transformation efforts.
- To expand faculty capacity to implement inclusive scientific teaching practices.
- To increase the visibility of successful PEERs who serve as learning assistants in biology courses.
- To develop and integrate curricular materials on the importance of diversity in science into courses.
- To increase the retention and graduation of more PEERs in biology.

These goals were to be accomplished by the development of two service learning courses: Peer Assistants for Learning Science (PALS) and Learners Engaged in Advocating for Diversity in Science (LEADS).

Our vision for these courses was that they would foster the development of partnerships between faculty and students, with a focus on the development of inclusive curriculum that demonstrates the contributions and importance of diversity in science and the expansion of the active learning techniques and strategies that had been taught to faculty during the previous Biology FEST effort.



**FIGURE 1:** Six-year graduation rates for first-time freshman PEERs (orange line = underrepresented minority [URM] students) and non-PEERs (blue line = non-URM students) in the biology department. With our first HHMI award (BioFEST), we implemented IE strategies in our introductory biology courses and trained about 85% of our faculty in active learning strategies. Based on these changes in our department, we saw a closing of the opportunity gap (gray line), with graduation rates for URM students equaling those for non-URM students.

These efforts were led by Dr. Kimberly Tanner, project director of our HHMI IE Project, a professor of biology and principal investigator of the Science Education Partnership and Assessment Laboratory (SEPAL); Kai “Laura” Burrus, a professor and chair of the biology department; and Blake Riggs, a professor and associate chair of biology.

### During our journey

We knew from our previous [HHMI project, BioFEST](#), that about 85% of our faculty were trained in active learning strategies to promote DEI in the classroom, and this led directly to our HHMI IE1 goals to develop student-faculty partnerships and to expand diversity in the curriculum. An important outcome was the closing of our equity gap in graduation rates between 2013 and 2015 (see Figure 1). However, due to the pandemic, we saw a climb in the equity gap and are currently at the same level as before we received the HHMI award. Continuing our effort to close the equity gap was our primary goal under our IE1 award.

There were several obstacles we encountered in developing these courses for IE1. First was getting buy-in from our department to create the service learning courses. Several faculty had been skeptical of DEI initiatives and unwilling to address issues of inequity in science. We focused our efforts on institutionalizing our service learning courses by having them count toward upper-division graduation requirements for majors. Through discussions with faculty, and the provision of evidence-based arguments involving our HHMI efforts, we were able to convince a majority of faculty to approve these courses as upper-division electives that count toward graduation for majors. Additionally, these courses were approved by our University Curriculum Approval and Review Committee and are now four-unit courses that go by the designations [Biol 654 PALS](#) and [Biol 644 LEADS](#).

Initially, due to the funding provided by HHMI, we were able to recruit faculty to join our partnership efforts by providing a stipend for their participation. However, a challenge arose when we tried to maintain faculty participation in these efforts without offering a stipend. In our assessment efforts, we found that faculty struggled with implementing Scientist Spotlights within their curriculum (a goal of Biol 644 LEADS). Either these spotlights were not implemented correctly, through not having students reflect on the metacognitive questions, or they felt overwhelmed by the number of Scientist Spotlights used in their curriculum. These challenges caused several faculty to back out of participating in both courses. In addition, we experienced challenges in teaching and staffing both courses every semester, mainly due to faculty departures from our department involving issues related to the pandemic. Based on this, we combined content from both courses and now offer Biol 654 PALS every semester.

Another challenge has been a change in the leadership of the HHMI IE team. The initial project director, Kimberly Tanner, was offered an amazing career opportunity as a rotating program officer in science education at the National Science Foundation (NSF). As an NSF program officer, Dr. Tanner was unable to continue as HHMI IE project director, so another member of the HHMI grant's leadership team, Blake Riggs, stepped in and became the project director. This change in leadership involved a learning curve in the assessment and implementation of the IE projects and in the development of a research question on the PALS effort.



## Sustaining our journey beyond HHMI

The efforts we have made through HHMI BioFEST and IE have brought inclusive strategies and approaches in teaching to our department. Importantly, through these efforts, we briefly closed our equity gap (see Figure 1). The institutionalization of our PALS initiative through the creation of the Biol 654 upper-division elective guarantees that our IE efforts will outlive the grant funding. Our PALS student-faculty partners are established, and we have recently created new partnerships in chemistry, thereby expanding our IE efforts beyond just one department. Based on our past success with HHMI BioFest and the Scientific Teaching Institute, we know that our efforts can address the barriers that PEERs face within our college.

In addition, since the change in leadership of our HHMI IE team, Dr. Tanner and the SEPAL laboratory have continued to work with the HHMI IE project and have led the effort to create the [Scientist Spotlights website](#) and to disseminate the spotlights as educational materials. Funding from National Institutes of Health Science Education Partnership Award (Project No. R25GM129823-01) was used to develop the website. Currently, the HHMI leadership team is working with the SEPAL laboratory to assess the effectiveness of PALS and to develop research questions in preparation for publication.



**FIGURE 2:** Testimonials from PALS and LEADS students.

## Reflections

**Originally, we believed that faculty committed to DEI strategies and practices would be the answer to changing the culture of our department.** We thought that such a change would then be reflected in the classroom and that we would see strong gains in PEER student success. Over time, we saw that there were some gains and positive outcomes for our PEERs, but this has not been due strictly to faculty efforts; changing a department/college culture requires multiple approaches, including efforts by students and peer mentoring. Training our PALS students in DEI approaches resulted in gains for our undergraduates, but also for the PALS (see Figure 2). Additionally, promoting more community effort between all of our programs and projects really helped our students and faculty get through hard times (e.g., BioSLAM). Moving forward, our department leadership has extended DEI efforts in our department meetings and in rewriting our retention, tenure, and promotion policies. The important lesson that we learned is to keep fighting, keep pushing, keep the focus on DEI. We understand that we cannot change everyone's minds regarding the deep-rooted inequity that exists in science, but we can work to promote greater equity through all of my efforts.

## Grant-Derived Dissemination Products

Ovid, D., Abrams, L., Carlson, T., Dieter, M., Flores, P., Frischer, D., Goolish, J., Bernt, M.L., Lancaster, A., Lipski, C., Luna, J.V., Luong, L.M.C., Mullin, M., Newman, M.J., Quintero, C., Reis, J., Robinson, F., Ross, A.J., Simon, H., Souza, G., Taylor, J., Ward, K.E., White, Y.L., Witkop, E., Yang, C., Zenilman, A., Zhang, E., Schinske, J.N., and Tanner, K.D. (2023). "Scientist Spotlights in Secondary Schools: Student Shifts in Multiple Measures Related to Science Identity After Receiving Written Assignments," *CBE – Life Sciences Education*, 20(2), ar22, 1–22.  
<https://www.lifescied.org/doi/10.1187/cbe.16-01-0002>

Aranda, M.L., Diaz, M., Mena, L.G., Ortiz, J.I., Rivera-Nolan, C., Sanchez, D.C., Sanchez, M.J., Upchurch, A.M., Williams, C.S., Boorstin, S.N., Cardoso, L.M., Dominguez, M., Elias, S., Lopez, E.E., Ramirez, R.E., Romero, P.J., Tigress, F.N., Wilson, J.A., Winstead, R., Cantley, J.T., Chen, J.C., Fuse, M., Goldman, M.A., Govindan, B., Ingmire, P., Knight, J.D., Pasion, S.G., Pennings, P.S., Sehgal, R.N.M., de Vera, P.T., Kelley, L., Schinske, J.N., Riggs, B., Burrus, L.W., and Tanner, K.D. (2021). "Student-Authored Scientist Spotlights: Investigating the Impacts of Engaging Undergraduates as Developers of Inclusive Curriculum through a Service-Learning Course." *CBE – Life Sciences Education*, 20(4), ar55, 1–17.  
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Burrus, L.W., Parangan-Smith, A., Riggs, B., and Samayoa, C.A. "Rapid Response to Racism in STEM," (Jan 5, 2021).  
<https://www.insidehighered.com/advice/2021/01/06/teaching-science-through-social-justice-and-racially-inclusive-lens-opinion>



# Stony Brook University

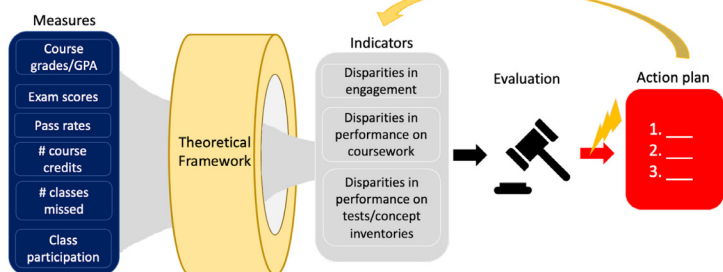
## Stony Brook, New York

### When we began our journey

Stony Brook University's IE ambitions began in 2017, with a data-driven strategy for achieving institutional change. We began our work of deeply documenting and studying our institution by leveraging new data sources (e.g., psychosocial indicators, learning management system patterns), new methods (e.g., predictive analytics, Bayesian analysis, machine learning, data mining, clinical interviews), and new tools and approaches (e.g., course restructuring, undergraduate participation in reform, teaching assistant [TA] apps) in order to robustly identify and understand the ways in which programs foster or inhibit student success. Specifically, our project focused on institutional barriers in chemistry, mathematics, and biology. Faculty learning communities served as a context for course-based and department-based change. By using evidence to uncover and dismantle barriers, we sought to establish long-term institutional baselines of progress and leverage these data to better understand why change succeeds, fails, or is not sustained.

### During our journey

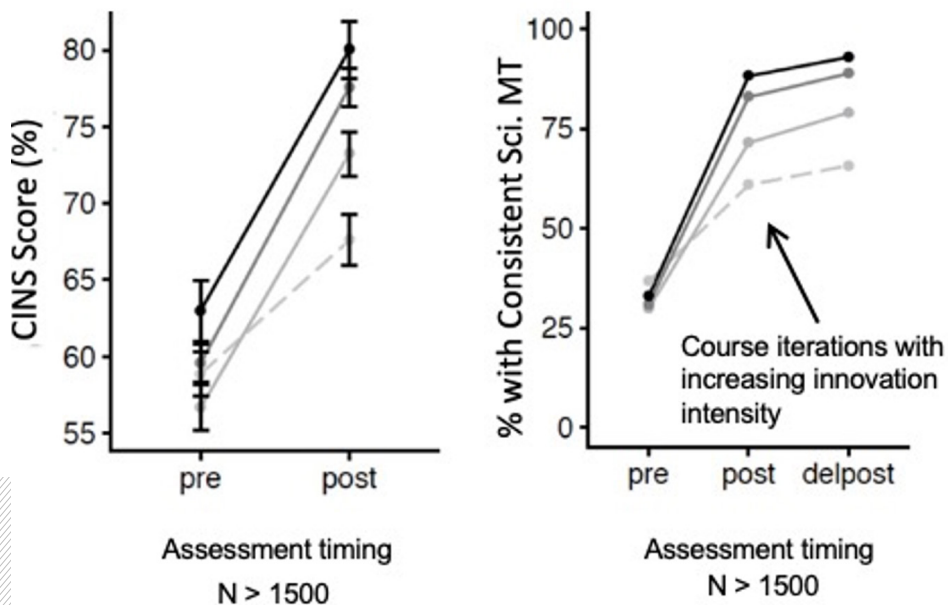
Leveraging newly developed DEI theoretical frameworks with aligned data sources (see Figure 1), we have restructured several of the large, gateway courses in the life sciences. No longer are they large, impersonal, isolating, and unsupportive lectures, but instead they are small, collaborative, and inclusive learning environments supported by undergraduate teaching assistants trained in equity-based professional development (see Figure 2). We have found that many of the structural changes we've made within courses have enhanced underrepresented minority and first-generation students' sense of belonging, have reduced initial opportunity gaps, and have led to substantially improved course outcomes (e.g., see Figure 3). Teaching assistants (see Figure 4) trained with equity and diversity materials co developed with psychology now reach thousands of students each year. New predictive models are being used to structure collaborative groups to minimize hoarding of student resources and to maximize equitable allocation of resources. Multiple faculty, as a result of their participation in faculty learning communities, have used our core reform model to restructure their upper-division courses. New course pathways aligned with students' prior preparation now meet students where they are at, in order to foster more successful mathematics outcomes. All of these reforms are now institutionalized and will continue to build capacity for inclusion beyond the funding from HHMI. Much of this work broke fundamental obstacles relating to how to restructure a system without hiring new personnel. The HHMI support was focused on infrastructure (e.g., cost-effective models, tools, and resources) that could support faculty in the future.



**FIGURE 1:** This new model was used to integrate theory and data. Educational debt – what students are owed by society due to injustice – is the theoretical framework through which we make sense of measures and indicators. The indicators focus (and are used to evaluate) the action plan for reform.



**FIGURE 2:** No more lecture halls for gateway biology: collaborative learning in a class of 600.



**FIGURE 3:** Learning outcomes in gateway biology substantially improved over four years. The earliest year is indicated by the dashed line, subsequent years by increasingly dark gray lines, and the most recent year in black. The left panel shows learning gains measured using an independently validated multiple-choice instrument (CINS). The right panel shows learning gains measured using student-written explanations and measures of the percentages of students who used a consistent normative scientific model across problem types using the validated ACORNS instrument.



**FIGURE 4:** Undergraduate teaching assistants, prepared using DEI materials from psychology, support the collaborative learning groups that replaced large lecture halls (see Figure 2).

## Sustaining our journey beyond HHMI

One of the most important outcomes has been the development and instantiation of a new DEI framework that unites thinking, data, and action – that is, a perspective that links theory relating to the concept of “educational debt” (what students are owed by society due to injustice) to the data-driven mindset we brought to the project. This perspective leverages data to quantify our impact, which in turn focuses our attention on where we need to make more effort. The tools we developed – including undergraduate TA development, course restructuring models, data analytics, and digital apps – facilitate change without additional resources. In other words, an equity infrastructure now exists; future faculty will be able to see success in action, rather than needing to imagine it, and will have access to a set of scaffolds to make change less effortful.



## Reflections

Two major struggles characterized the project. The first and greatest struggle – which took five years to overcome – was trying to integrate the data-driven, analytics-aligned model we brought to the project with our evolving theoretical perspectives relating to inequality in higher education. This alignment process was greatly facilitated by the National Research Council publication *Indicators for Monitoring Undergraduate Education* (2018). Recently, we have been working to integrate these perspectives with the university accreditation process, and in so doing provide an integrated reform effort. The second struggle was the continuous turnover of administrators. After several years, we realized that bottom-up, within-unit change allowed for more effective and efficient outcomes, because the systems were very stable in terms of personnel. Repeated efforts to leverage administrative support were not successful, and adopting a bottom-up strategy allowed the project to make more progress.

## Grant-Derived Dissemination Products

### Publications

Bertolini, R., Finch, S.J., and Nehm, R.H. (2021). "Testing the Impact of Novel Assessment Sources and Machine Learning Methods on Predictive Outcome Modeling in Undergraduate Biology," *J Sci Educ Technol*. <https://doi.org/10.1007/s10956-020-09888-8>

Shah, L., Fatima, A., Syed, A., and Glasser, E. (2021). "Investigating the Impact of Assessment Practices on the Performance of Students Perceived to Be at Risk of Failure in Second-Semester General Chemistry," *Journal of Chemistry Education*. <https://doi.org/10.1021/acs.jchemed.0c01463>

Nehm, R.H., Sbeglia, G.C., and Finch, S. (2022). "Is active learning enough? The contributions of misconception-focused instruction and active learning dosage on student learning of evolution," *BioScience*, pages 1105–1117, November 2022. <https://doi.org/10.1093/biosci/biac073>

Bertolini, R., Finch, S.J., and Nehm, R.H. (2023). "An application of Bayesian inference to examine student retention and attrition in the STEM classroom," *Front. Educ.* 8:1073829. doi: 10.3389/educ.2023.1073829

### Presentations

Sbeglia, G.C., Nehm, R.H. "A mixed-methods study of the importance of family-level variables to evolution-related perspectives and careers in Black undergraduates" (peer-reviewed paper), National Association of Research in Science Teaching international conference, April 2022.

Sbeglia, G.C., Nehm, R.H. "Does evolution coursework mitigate, maintain, or exacerbate educational debt? Equity implications for the evolutionary sciences" (peer-reviewed paper), National Association of Research in Science Teaching international conference, April 2023.

# Syracuse University

## Syracuse, New York

### At the beginning of our journey

## CHANcE

Our project, Collaborative High-impact Activities in Natural Sciences Education (CHANcE), was designed to create an inclusive environment for students from groups historically marginalized in STEM. We focused on supporting instructors (tenure-track and tenured faculty, teaching faculty, and course coordinators) so they could integrate active learning and inclusive pedagogies into their courses. We employed aspects of Wieman's Science Education Initiative (SEI) on a smaller scale, concentrating primarily on introductory courses in two departments and later adding a mathematics course. When we started, very few conversations were occurring about teaching in the biology or chemistry departments. There was only one discipline-based education researcher (DBER), and faculty generally were not encouraged to include mention of teaching in annual mentoring meetings or CV updates.

#### CELEBRATING OUR ACCOMPLISHMENTS

TUESDAY, JUNE 6, 12:30-6:30 PM

12:30-1:30 Luncheon

1:30-1:45 Official Welcome  
Dr. George Langford  
Professor Emeritus, Biology

Greetings  
Patrika Soochan, M.S., HHMI

1:45-3:45 Keynote Workshop  
Dr. Kimberly Tanner  
Professor of Biology, Director of SEPAL,  
San Francisco State University

Engaging Students, Promoting Learning  
and Making Undergraduate Science  
Classrooms Fair and Inclusive:  
Cross-Disciplinary Tools, Insights, and  
Strategies to Promote Student Success

3:45-4:00 Break

4:00-4:45 Whitman Room 103  
Platform Presentations  
Dr. Jon French, Moderator

Breaking Barriers:  
Applying Inclusive Teaching Practices to  
the STEM Learning Environment

4:45-5:15 Reception

5:15-6:30 Recognition Dinner

Unless otherwise noted, all events will take place in the Plauen Grand Hall

CHANcE

Inclusive Excellence in STEM  
PLAUN GRAND HALL



**FIGURE 1:** The program for Syracuse University's culminating workshop.

We created a team of education specialists by hiring postdoctoral DBERs and partnering closely with staff at the Center for Teaching and Learning Excellence (CTLE). We used a two-pronged approach. First, each semester we offered a two-day professional development workshop highlighting the importance of and strategies for implementing active learning and inclusive pedagogies in STEM courses. Seven of the 10 workshops featured external speakers. Biology and chemistry faculty received \$500 stipends for attending. Second, we invited faculty to apply for \$5,000 course transformation grants. Faculty submitted proposals, conducted the design phase in consultation with the DBER and the education specialist, implemented the transformation for one semester, and reported on it; many grant recipients also participated in ongoing communities of practice (COPs) with faculty peers.

### During our journey

The CHANcE Project has led to the transformation of 23 courses by 22 faculty members with 27 course transformation grants. CHANcE demonstrates that small to medium course-level changes lead to meaningful results. Faculty report that the funding offered both an incentive and accountability for implementing new teaching strategies. The inclusive excellence in STEM work continued throughout the pandemic, with online consultations, workshops, and science teaching. Some of the course transformations pertained directly to online teaching, both synchronous and asynchronous. The COPs have provided space for faculty to explore together what COVID-related changes to maintain or adapt.



**FIGURE 2:** Syracuse faculty panelists Heather Coleman and Moira McDermott addressing the question "How has changing your teaching changed you as an instructor?"



**FIGURE 3:** Syracuse faculty participating in a workshop led by Kimberly Tanner.



**FIGURE 4:** George Langford, Syracuse's principal investigator, introducing the keynote speaker.

Each semester, biology and chemistry faculty were encouraged to apply for a course transformation grant. The request for proposals provided guidance on using backward design and practical resources (e.g., Tanner, 2013; Dolan and Collins, 2015) to prepare a successful proposal. Faculty were asked to include in their proposals new or revised course learning goals, active learning, inclusive strategies to achieve their goals, specific changes they hoped to achieve in student learning, and the kinds of support they sought from the project team. Central to course transformation was the availability of ongoing consultation with the postdoctoral scholar and CTLE education specialist. They provided guidance throughout the entire process of developing the proposals, designing and implementing the transformation, assessing the changes, and writing the final report. Grantees used this opportunity to varying degrees.

Course transformations can be grouped into these categories:

- Small-scale, in-class, active-learning practices
- More complex in-class assignments
- Structural changes to course design
- Practices that highlight diversity among scientists
- Newly developed and redesigned lab courses
- Scholarship of teaching and learning

In spring 2021, we initiated the COPs to help sustain the course transformation process with instructor peer mentoring. COP participation involved biweekly journaling and monthly meetings of three to five peers, facilitated by CHANcE leaders. We provided a reflection guide tied directly to active learning and inclusive pedagogies. Sessions were structured to maximize sharing and listening. Participation was voluntary, and those who engaged for the entire semester received a stipend of \$500.

Faculty report having implemented specific strategies they learned at our semiannual professional development workshops. The overarching principles of diversity, equity, and inclusion, as well as high-impact practices, have provided faculty with concepts and values that expand their understanding of their own identities and their capacity to teach students from diverse backgrounds. The workshops have both inspired and equipped faculty.

We faced staff turnover during the grant, and we were able to stabilize and advance the work because of our strong connection with the CTLE, whose director championed the CHANcE Project.

## **Sustaining our journey beyond HHMI**

During Years 3 and 4, we looked ahead to sustainability in two ways. First, we extended the grant to faculty teaching introductory calculus, a course requirement for all biology and chemistry majors. We thus began engaging a broader group of STEM faculty.

Second, we created phase two course grants for instructors who wanted to deepen their phase one transformations and/or conduct scholarship related to teaching and learning. We have awarded 27 course transformation grants to 23 faculty (22 in phase one and five in phase two).

The Office of Research has taken the lead on no-cost extension of existing CHANcE initiatives, as well as on funding their future expansion across STEM departments – first within the arts and sciences and then in engineering. This commitment includes the hiring of multiple DBERs.



## Reflections

We have learned that a smaller-scale version of the SEI was both feasible and beneficial at Syracuse University. We developed a proof of concept whereby a team from the CTLE and the College of Arts and Sciences effectively supported a critical mass of faculty in transforming courses to promote learning and a sense of belonging among diverse students. This project reached more than 1,000 students annually over five years.



**FIGURE 5:** Syracuse faculty presenting and discussing course transformation posters.

We have watched a culture develop where faculty approach each other across departments for ideas to continue implementing evidence-based changes. Faculty also talk about their teaching and ways in which they are implementing inclusive excellence, and they report that the HHMI funding provided motivation, guidance, and accountability. The DBER consultation helped them rework learning objectives, assignments, and assessments, thereby increasing clarity and reducing time spent on explaining course procedures. COPs have helped faculty extend

their original transformations and regularly engage in conversations about the experiences and challenges faced by all students. One faculty member, who has emerged as a strong peer leader, captured these lessons from the work and words of faculty colleagues at the final CHANcE Project event: “Course transformation is not a one-time effort. Teaching in an inclusive and engaging manner takes a lot of effort, and running an inclusive learning environment is an incredibly rewarding experience.”

## Grant-Derived Dissemination Products

### Publications

Chu, Chun, Jessica L. Dewey, and Weiwei Zheng. “An Inorganic Chemistry Laboratory Technique Course using Scaffolded, Inquiry-Based Laboratories and Project-Based Learning.” *Journal of chemical education* 100, no. 9 (2023): 3500-3508.

Humphrey, E., and Wiles, J.R. (2021). “Lessons Learned through Listening to Biology Students during a Transition to Online Learning in the Wake of the COVID-19 Pandemic,” *Ecology & Evolution*. DOI: <https://doi.org/10.1002/ece3.7303>

Maxwell, M.C., and Wiles, J.R. (2022). “Cyber Peer Led Team Learning (cPLTL) Supports Marginalized Groups, Including Women, in Science, Technology, Engineering, and Mathematics (STEM),” *Bioscene: Journal of College Biology Teaching* 48(1), 10-16.

Maxwell, M.C., Maisva, T., and Wiles, J.R. (in press). “Building Confidence in Scientific Competence: Impacts of an Introduction to Primary Literature Course on Undergraduate Students’ Science Identity and Interest in Research,” *Bioscene: Journal of College Biology Teaching*.



Maxwell, M.C., Snyder, J.J., Dunk, R.D.P., Sloane, J.D., Cannon, I., and Wiles, J.R. (2023). "Peer Led Team Learning in an Undergraduate Biology Course: Impacts on Recruitment, Retention, and Imposter Phenomenon," *BMC Research Notes* 16(73). <https://doi.org/10.1186/s13104-023-06338-7>

Schmid, K.M., and Wiles, J.R. (2022). "Call her a scientist: The role of mentors in faculty lab based undergraduate biology research experiences and outcomes for student science identity," *American Biology Teacher* 84(5), 263-268. <https://doi.org/10.1525/abt.2022.84.5.273>

Schmid, K.M., Dunk, R.D.P., and Wiles, J.R. (2021). "Early exposure to primary literature and interactions with scientists influences novice students' views on the nature of science," *Journal of College Science Teaching* 50(6), 40-47.

Schmid, K.M., Hall, S.E., and Wiles, J.R. (in press). "Different approaches for engaging undergraduates in research: Differential impacts on students' self-efficacy, science research skills, and future goals," *Bioscene: Journal of College Biology Teaching*.

Sloane, J.D., Dunk, R.D.P., Snyder, J.J., Winterton, C.I., Schmid, K.M., and Wiles, J.R. (2021). "Peer-Led Team Learning is Associated with an Increased Retention Rate for STEM Majors from Marginalized Groups," *Proceedings of the National Association of Biology Teachers 2021 Biology Education Research Symposium*. [https://nabt.org/files/galleries/Sloane\\_et\\_al\\_Wiles\\_NABT\\_Symposium\\_2021.pdf](https://nabt.org/files/galleries/Sloane_et_al_Wiles_NABT_Symposium_2021.pdf)

## Presentations

Bonomo, G., Kerwood, D., and Willingham-McLain, L. "Investigating the Impact of Inclusive Pedagogies on Student Outcomes in the General Chemistry Laboratory: Preliminary Implementation and Data Collection," American Chemical Society (ACS) northeast regional meeting, Boston, Mass., June 16, 2023.

Dewey, J.L., Diede, M.K., Willingham-McLain, L., Wiles, J.R., Tillotson, J., Ruhlandt, K., and Langford, G.M. "Initiating and Sustaining Course Transformations in Biology and Chemistry," Society for the Advancement of Biology Education Research, Minneapolis, Minn., July 2022.

Diede, M.K., Dewey, J., and Willingham-McLain, L. "Imagining the Connections: Co-Creating Faculty Communities of Practice" (roundtable), POD Network, Seattle, Wash., November 2022.

Langford, G.M. (convener), Diede, M., Wiles, J.R., Phillips, R., Wentz-Hunter, K., Thakral, C., and Stieff, M. "STEM Education Reform: Lessons Learned from a Peer Implementation Cluster," American Association of Colleges and Universities (AAC&U) Transforming STEM Higher Education conference, Chicago, Ill., 2019.

Langford, G.M. (convener), Willingham-McLain, L.K., McLvain, V., French, J., Zheng, W., and Diede, M.K. "How to Transform Courses in Biology and Chemistry to Include High Impact Practices: Proof of Concept," 13th Annual Understanding Interventions Conference, July 10, 2021.

1. French, J. "Developing and Implementing a Learning Assistant Program for Introductory General Chemistry."
2. McLvain, V. "Redesigning Anatomy and Physiology using a Hyflex Model."
3. Zheng, W. "Project-based Learning in a New Inorganic Laboratory Course."

Maisva, T., Maxwell, M.C., and Wiles, J.R. "Impacts of an Introduction to Primary Literature Course on First-year Undergraduate Biology Students' Science Identity and Interest in Research," Professional Development Conference of the National Association of Biology Teachers, Indianapolis, Ind., 2022.

Maisva, T., Maxwell, M.C., and Wiles, J.R. "An Introduction to Primary Literature Course for First-year Undergraduate Biology Students: Impacts on Science Identity and Interest in Research," Association of College and University Biology Educators (ACUBE) annual meeting, University of Portland, Portland, Ore., 2022.

Maxwell, M.C., and Wiles, J.R. "Cyber Peer Led Team Learning (cPLTL) Supports Women in Science, Engineering, Technology, and Mathematics (STEM)," ACUBE annual meeting (virtual), 2021.

Maxwell, M.C., and Wiles, J.R. "Exploring the impact of Peer Led Team learning on the science identity of undergraduate biology students," National Association of Biology Teachers professional development conference, Indianapolis, Ind., 2022.

Maxwell, M.C., and Wiles, J.R. "Bolstering self-recognition as a science person: Impacts of Peer-Led Team Learning on introductory biology students' science identity," accepted for presentation at the Society for the Advancement of Biology Education Research annual meeting, Minneapolis, Minn., July 2023.

Maxwell, M.C., and Wiles, J.R. "Cyber Peer Led Team Learning (cPLTL) Supports Women in Science, Engineering, Technology, and Mathematics (STEM)," National Association for Research in Science Teaching annual international conference, Vancouver, British Columbia, Canada, March 27-30, 2022.

Maxwell, M.C., and Wiles, J.R. "Peer Led Team Learning in Introductory Biology Courses: Impacts on Undergraduate Student Science Identity," ACUBE annual meeting, University of Portland, Portland, Ore., 2022.

Maxwell, M.C., Maisva, T., and Wiles, J.R. "Introduction to primary literature course: Impacts on undergraduate students' science identity and interest in research," accepted for presentation at the National Association for Research in Science Teaching annual international conference, Chicago, Ill., 2023.

Peters, S., and French, J. "Using a weekly written problem set to develop better problem solvers and increase sense of belonging in STEM," ACS national conference, San Francisco, Calif., August 13, 2023.

Peters, S., and French, J. "Quantifying Students' Sense of Belonging in General Chemistry," ACS national conference, San Francisco, August 14, 2023.

Schmid, K.M., and Wiles, J.R. "Exploring Approaches to Engaging Undergraduates in Research: Differential Impacts on Students' Self-efficacy and Science Skills," accepted for presentation at the National Association for Research in Science Teaching international conference (canceled due to COVID), 2020.

Wheatly, M.G. "Inclusion, diversity, equity and accessibility in STEM: A course to transform the STEM culture," AAC&U North Carolina Project Kaleidoscope (PKAL) Regional Network conference, 2022.

Wheatly, M.G., Dewey, J., and Willingham-McLain, L. "Inclusion, Diversity, Equity and Accessibility in STEM fields: Tools to assess the effectiveness of curriculum in helping STEM students become change agents," AAC&U North Carolina PKAL Regional Network conference, 2023.

## Celebration of CHANcE Project, June 6-7, 2023

Platform presentations (convened by French, J.)

- Becklin, K. "Writing-to-Learn @ SU: Promoting student learning and science identity."
- French, J. "Bringing Active Learning into the General Chemistry Classroom."
- Zheng, W. "Design Scaffolded, Research-Based Lab Curriculum Course Transformation of CHE 422 Inorganic Laboratory Technique."

Faculty panel (convened by Willingham-McLain, L.)

- Coleman, H., McDermott, M., and McLain, V. "How Has Changing Your Teaching Changed You as an Instructor?"

Posters (new posters and posters created for other conferences)

- Becklin, K.M. "Transforming BIO345 with Writing-to-Learn."
- Bonomo, G., Kerwood, D., and Willingham-McLain, L. "Investigating the Impact of Inclusive Pedagogies on Student Outcomes in the General Chemistry Laboratory: Preliminary Implementation and Data Collection."
- Coleman, H. "Backwards Design and Increased Transparency in an Upper Division Biology Elective."
- Erdman, S., and Shepherd, R. "Development of a New Core Course – Bio 300 Cellular and Molecular Biology."
- Korendovych, I. "CHE 678 Perspectives in Biochemistry."
- Maisva, T., Maxwell, M.C., and Wiles, J.R. "Impacts of an Introduction to Primary Literature Course on First-year Undergraduate Biology Students' Science Identity and Interest in Research."
- Makhlynets, O., and Edirsinghe, D. "Biochemistry II BCM 476."
- Maxwell, M.C., and Wiles, J.R. "Lessons Learned During a Pandemic: Cyber Peer Led Team Learning (cPLTL) Supports Marginalized Groups, Including Women, in STEM."
- McDermott, M., and Grzegorzolka, P. "Calculus I – Leveraging Recitations to Increase Active Learning."
- Peters, S., Dewey, J., and French, J. "Building a Sense of Belonging in Chemistry through Written Problem Solving."
- Sponsler, M.B. "Transformation of Organic Chemistry Laboratory."
- Wheatly, M., Dewey, J., and Willingham-McLain, L. "Inclusion, Diversity, Equity, and Accessibility in STEM Fields: Tools to Assess the Effectiveness of Curriculum in Helping STEM Students Become Change Agents."
- Willingham-McLain, L., Dewey, J., Diede, M., Mwayaona, J.S., French, J., Coleman, H., Wiles, J.R., Tillotson, J., Ruhlandt, K., Garland, M., and Langford, G.M. "Active Learning and Inclusive Pedagogies through Course Transformations: Proof-of-Concept in Biology and Chemistry."
- Zheng, W., Chu, C., and Dewey, J. "Design Scaffolded, Research-Based Lab Curriculum: Course Transformation of CHE 422 Inorganic Laboratory Technique (2020-2023)."

# The College of New Jersey

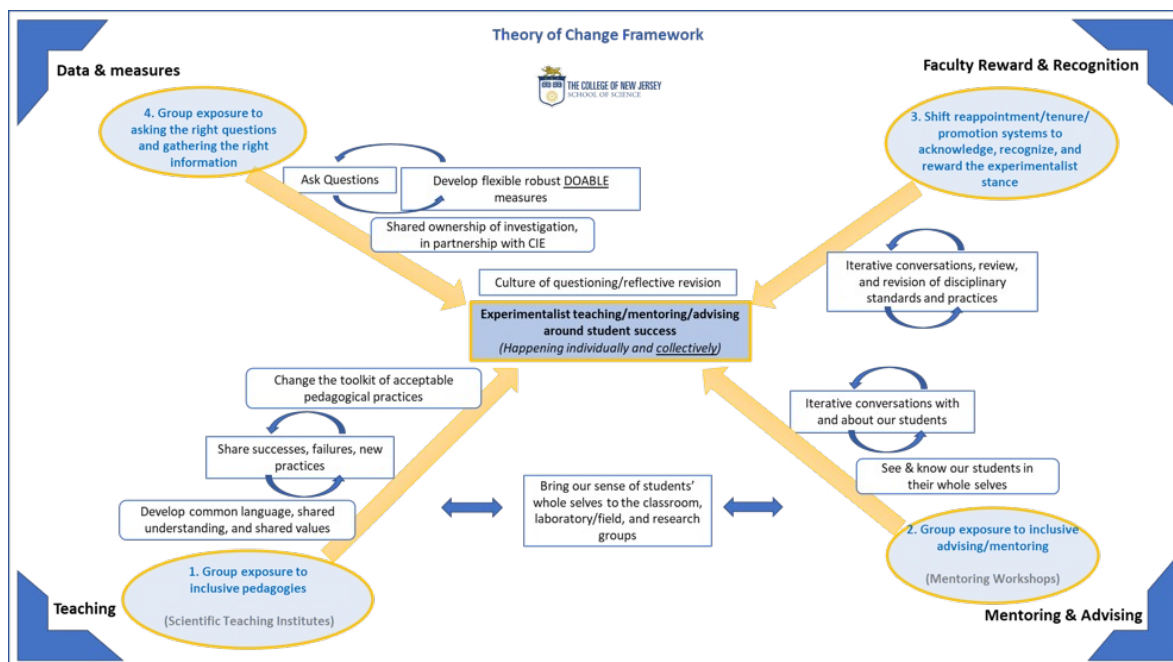
## Ewing, New Jersey

### The beginning of our journey

We knew that students in the School of Science at The College of New Jersey (TCNJ) who are minoritized, first-generation, and/or transfers experienced persistent outcome gaps. We saw success in grant-funded, cohort-based programs, but these did not reach all students and were aimed at “fixing” the students. We therefore changed our stance, to address inequities by making structural/cultural changes that reduce institutional barriers to student success. We adopted three main strategies. We aimed to:

- 1 Create a more inclusive culture among our faculty and in our core science courses, Move away from practices based on a student-deficit model;
- 2 Develop inclusive academic advising and research mentoring systems and cultures;
- 3 Enhance our capacity for assessing inclusivity so that we could iteratively learn and retool.

These strategies are embedded in a theory of change framework centered on a dynamic stance toward IE with, at its core, a faculty willing to take an experimentalist approach to their teaching, advising, and mentoring (see Figure 1).



**FIGURE 1:** Inclusive excellence work in the School of Science at The College of New Jersey is motivated by a robust theory of change framework. At its core is a faculty community identified as experimentalists in all of their roles, working within a culture of questioning and reflective revision, which enables a dynamic stance toward inclusive excellence.

## During our journey

To create a more inclusive culture among our faculty and in core courses, we held two Scientific Teaching Summer Institutes (SIs) that were attended by faculty from all departments. The shared knowledge about evidence-based, inclusive pedagogy and curricula was then broadly implemented, as 22 core courses were redesigned over five years (see Figure 2). This was enabled by reassigning time to faculty leads for each core course, a step made possible because the IE grant funded full-time teacher-scholar fellows in our departments for two years each. Now all 22 courses are taught with the redesigned approach, but it will not be static. TCNJ faculty were trained as facilitators for the second SI, so we can offer retraining on a regular basis. We also now have a system to conduct formative assessments of our IE efforts (see below), allowing us to learn and respond to the ever-changing student population. With increased student-active teaching and course-based research, we also now use student course assistants to facilitate group learning and lead peer study sessions. We are designing a model inclusive classroom, working with TCNJ's instructional designers and the Accessibility Resource Center and holding a design-thinking workshop with students. Our culture change also is illustrated by informal faculty learning communities whose activities have included reading *Superior: The Return of Race Science* in biology, writing collaborative papers in chemistry, and holding interest group meetings about pedagogy. Finally, TCNJ has entered new pathway agreements with community colleges, which include the potential for transition planning to aid transfers' success in TCNJ's core courses.

Biology Courses	Chemistry Courses	Physics Courses	Math & Statistics Courses	Computer Science Courses
Orientation to Biology	General Chemistry I	General Physics I	Intermediate Algebra	Computer Science I
Foundations of Biological Inquiry	General Chemistry II	General Physics II	Pre-Calculus	Computer Science II
Cell Biology & Biochemistry	Organic Chemistry I	Physics I for Physicists	Calculus A	Discrete Structures
Ecology & Field Biology	Organic Chemistry II	Physics II for Physicists	Calculus B	
Genetics		Modern Physics	Statistical Inference	

**FIGURE 2:** The School of Science at TCNJ used a coordinated approach across all departments' required foundational/core courses to revise pedagogy and course/curricular design based on the principles of scientific teaching, to support the success of all students. For most courses, this work was led by faculty members with partial reassigned time, enabled by the hiring of IE grant-funded teacher-scholar fellows who taught in their stead. In total, 22 courses were revised.

To develop inclusive academic advising and research mentoring systems and cultures, we partnered with the Center for the Improvement of Mentored Experiences in Research (CIMER). Two members of our IE core team were trained in the Entering Mentoring process, then did the training at TCNJ. We then worked with CIMER to develop an undergraduate-focused workshop that combines Entering Mentoring and Inclusive Mentoring; we held it with CIMER online, and now we have internal capacity to offer it regularly. We also improved the Orientation to Science course for transfer students, and our new college-wide Division of Inclusive Excellence spearheaded the annual First-Generation Celebration and in 2023 brought to TCNJ the Alpha Alpha Alpha honor society for first-generation students.

To enhance our capacity for assessing inclusivity, we embedded two assessment experts in our core team, from sociology and academic affairs. They support annual reporting of disaggregated thrive/struggle data. They also developed a system for school-wide joint assessment, which is easily adoptable by faculty in any course via a Qualtrics survey in Canvas, with connection to the college's student database (which contains majors, grades, demographics, etc.). Importantly, decisions about what to assess school-wide are situated in the school's Student Success Committee. Finally, we also partner with an external assessment consultant, who is helping us with a deep data dive.

The pandemic was our paramount obstacle. It delayed the implementation of course redesigns and all other IE work due to the workload of online teaching. It also muddied assessment efforts, since all student outcomes are/were affected. We are also understaffed in the assessment area; our team is wonderful but has limited time. In addition, we have had three science deans over five years, though strong support from all deans and consistent leadership from within the core team allowed the work to continue.



Our supportive structures have been a committed and creative faculty; incentives for faculty (e.g., reassigned time, stipends for summer trainings); the school-wide student success committee; expertise from the SIs and CIMER; the growth of IE college-wide due to a new Division of Inclusive Excellence and a vice-president-level head of it; the community within HHMI and our peer implementation cluster meetings; advice from our external assessment consultant; and the feedback we've received during periodic site visits from our external advisory committee.

## Sustaining our journey beyond HHMI

We are at/near a permanent culture change, with a nimble, experimentalist faculty that is responsive to changing student needs. Our formal training in inclusive teaching and mentoring can be refreshed and offered to new hires because we now have internal capacity to facilitate workshops. By partnering with the college's teaching center, we can also offer training to other schools. Because we focused on the core courses, in which nearly all faculty members teach, the vast majority of our faculty is now experienced with inclusive, evidence-based, student-centered teaching and course design; this has become much more the norm. Finally, we have in place a formative assessment system, with an easy way to collect data on questions we have about our IE progress.

## Reflections and lessons

**The pandemic highlighted the changing nature of students, reinforcing our dynamic stance toward IE.** This is ongoing work that must be part of the regular culture of teaching and mentoring. We also realized the importance of cross-discipline culture change; our work must be permanently coordinated and integrated into school-wide structures. Additionally, we saw the importance of effective central leadership, which needs sufficient, ongoing support. It must be valued (such as with support staff, reassigned time, etc.) and must rest on leadership within each subunit (i.e., department). It also became clear that assessment must be very easy for faculty to implement: plug-and-play modules are best. Finally, it is helpful to be transparent in the classroom about the IE work that is going on and its benefit to the students.

## Grant-Derived Dissemination Products

Guarracino, D., Baker, J.L., Gazley, J.L. (forthcoming). "Increasing undergraduate student-driven engagement with biochemical structures using visual molecular dynamics (VMD) and protein molecular modeling with real-world applications in biochemistry class," *Journal of College Science Teaching*.

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# Towson University

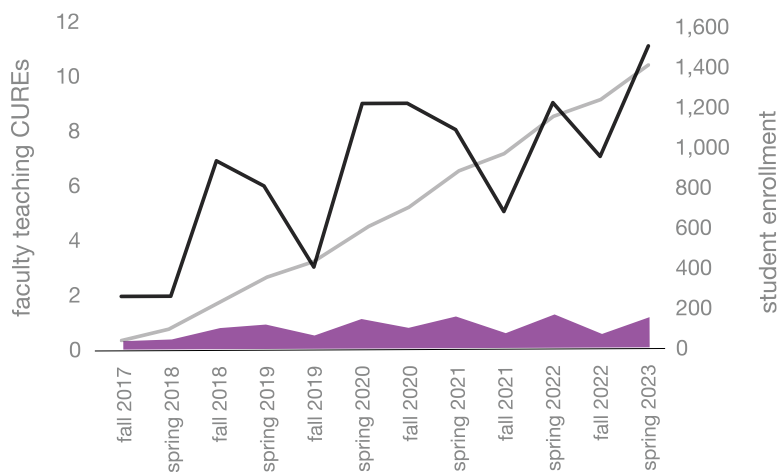
## Towson, Maryland

The goal of our HHMI IE grant, Towson University Research Enhancement Program (TU REP), is to retain STEM majors and prepare them for STEM careers. We approached this goal by creating laboratory classes that incorporate authentic research and by training faculty in STEM pedagogy and inclusive teaching. In addition, we partnered with colleagues across the university to engage in inclusive excellence-focused activities more broadly and facilitated interactions among high school teachers and STEM faculty at the university.

### Increasing student access to research

Towson University (TU) is a public, comprehensive, master's-granting university serving a diverse population of about 19,700 students from the Baltimore area and throughout the East Coast. Approximately 50% of TU's undergraduates have transferred from another institution; many of these students commute to campus, work at least part-time, and have family caregiving responsibilities. TU's undergraduate student body is diverse; Black and Hispanic/Latino students make up 47% of STEM majors, while white students make up about 35%. Multiple studies have shown that research participation has a beneficial impact on student performance and retention in STEM, including of students from historically excluded groups. The challenge we addressed in TU REP was to increase STEM student retention by providing more research opportunities for TU students.

To achieve our goal, we integrated authentic research into new and existing laboratory classes. These course-based undergraduate research experiences (CUREs) allow students to conduct research in courses that count toward their major requirements and are particularly valuable for students with time constraints due to work and/or family commitments. CUREs are considered a high-impact practice and can serve as launch points for additional research engagement for many students who otherwise would not explore such opportunities.



Over a period of five years, 25 CUREs were created or revised across all five departments of TU's Fisher College of Science and Mathematics (FCSM), and more than 1,400 students enrolled in a CURE (see Figure 1). Students enrolled in biology CUREs better reflect the diversity of our student body, with a higher percentage of transfer students and students of color than is the case for students conducting traditional independent research with biology faculty (see Figure 2). Further, CUREs engage about three times as many students in research, so the CUREs are achieving our goal of including more students, and particularly more students from historically excluded groups, in research experiences at TU.

**FIGURE 1:** Increases in the number of TU REP faculty teaching CUREs (black line) and in student enrollment in CUREs each semester (dark purple line) and cumulatively (gray line) since our HHMI funding began in fall 2017.

Credit: TU Institutional Research

Variable	Category	Independent Research (n=321)	CUREs (n=920)
Gender	Male	30	28
	Female	70	72
Race/ethnicity	Black	24	33
	Asian	11	10
	Hispanic/Latino	6	10
	White	51	38
	> Two Races	5	6
Pell Grant recipient	Yes	46	52
	No	54	48
Entry status	First Year	59	51
	Transfer	40	48

**FIGURE 2:** Percentage of undergraduates participating in independent research with biology faculty members, compared with those enrolled in biology CUREs from fall 2017 through fall 2022.  
Credit: TU Institutional Research

## Training faculty to improve pedagogy and teach inclusively

CUREs, although gaining in popularity, are still new pedagogical approaches for most faculty. Much of TU REP focused on helping faculty learn how to teach a CURE and incorporate inclusive teaching practices into their courses. Professional development (PD) was designed around creating professional learning communities composed of faculty cohorts trained in CURE-focused and diversity, equity, inclusion, and justice (DEIJ)-focused pedagogy. Faculty cohorts participated in about 50 hours of PD across one year, with activities including internal and external speakers and workshops on diversity and inclusion, assessment, managing students working in groups, discussion of CURE papers, and other topics relevant to STEM pedagogy and teaching research-based classes. TU REP provided funding for a course release or a month's summer salary for faculty to incentivize their participation. In the five-year period, 35 faculty, representing every department in the FCSM, participated in TU REP. Faculty were overwhelmingly positive when describing how these activities prepared them to teach their CUREs and helped them approach their teaching and mentoring through a DEIJ lens.

## Collaborating across TU to promote sustainable inclusive excellence

We worked closely with members of the TU community to administer TU REP and promote inclusive excellence. The TU Office of Inclusion and Institutional Excellence (OIIE) ran our inclusion and diversity PD activities, providing us with an important connection with that office, which has led to additional collaborations. The TU Center for STEM Excellence ran two summer workshops for local high school teachers, to help them learn more about authentic research in the classroom by working closely with TU REP faculty. The Office of Undergraduate Research and Creative Inquiry helped organize our annual CURE poster session and has been promoting CUREs across campus. Continued CURE development and success will require financial and peer support; we are building on these relationships and others to ensure the sustainability of CUREs.

## Integrating DEIJ training into high-impact practice learning and valuing peer interactions

When we began this work in 2017, HHMI encouraged us to consider that inclusive excellence is a “dynamic stance,” that we need to reflect on our progress, approaches, and goals regularly and thoughtfully. Individuals participating in our PD were energized and prompted to try new pedagogical or mentoring approaches and to bring up concerns regarding DEIJ issues in various settings. Since we framed CUREs as a way of improving research access for all students, faculty embraced learning about DEIJ issues and approaches as part of their PD.

Importantly, at a university like TU with relatively high teaching loads, the opportunity to teach CUREs allows faculty to generate data for their own scholarship while meeting their teaching expectations. Teaching CUREs has helped with obtaining federal research grants, as well as creating opportunities for faculty to teach the subjects about which they are most passionate. We know that the benefits to our students are also numerous, as we have seen many students continue with research following CUREs and move on to STEM careers. Although we could have developed the CUREs without an explicit focus on inclusive excellence, we believe that building in a DEIJ emphasis ensures that students will be even more successful as faculty implement strategies in their CUREs and elsewhere that can help all students persist in STEM.

## Reflections

**Perhaps the biggest lesson from TU REP was the value of faculty peer relationships.**

Faculty reported that hearing about each other’s approaches in CUREs and how their experiences affected their other teaching and scholarship was critical to their own success. Much of this discussion occurred during meals, as well as outside of formal PD time. With support from our faculty development center, we created a new CURE Community of Practice to provide the time and space (and food) to facilitate faculty discussions about their courses, successes, and failures.

## Grant-Derived Dissemination Products

### Publications

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- Cheng, D., Stapleton, M.K., Miles, R.\*\* (2023). "Solving Society's Problems by Solving Science and Math Problems," Mathematical Association of America MathFest conference, Tampa, Fla., 2023.
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- Elkins, K.M., and Zeller, C.B. "The CURE for introducing students to forensic research: Introduce next generation sequencing," International Chemical Congress of Pacific Basin Societies (virtual), Honolulu, Hawaii, December 18, 2021.
- Elkins, K.M., and Zeller, C.B. "Using a course-based undergraduate research experience (CURE) to introduce massively parallel sequencing (MPS) in forensic science to Towson University students," American Chemical Society (ACS) meeting and expo (virtual), August 17, 2020.
- Ghent, C., Gough, L., Atuobi, T., Miranda, R., and Hemm, M. "Towson University's Research Enhancement Program (TU REP)" (poster), Network of STEM Education Centers national conference, June 2018.
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Gough, L., Hemm, M., and Miranda, R. "Outcomes from an inclusive excellence project focused on CURE development" (poster), AAC&U Transforming STEM Higher Education conference, Arlington, Va., November 2022.

Gough, L., Miranda, R., Atuobi, T., Hemm, M., and Oufiero, C. "Towson University Research Enhancement Program: Providing Authentic Research Experiences in the College Classroom to Better Educate All STEM Majors" (poster), AAC&U Transforming STEM Higher Education conference, Atlanta, Ga., November 2018.

Gough, L., and the TU REP team. "Lessons learned: CURES beyond cell and molecular biology (and taught online)," Capital PKAL Regional Network conference, March 2021.

Hemm, M., Miranda, R., Atuobi, T., Beauchamp, V., Beck, H., Doyle, J., Oufiero, C., and Gough, L. "Lessons learned: CURES beyond cell and molecular biology at Towson University" (poster), AAC&U Transforming STEM Higher Education conference, Chicago, Ill., November 2019.

Kimble, S., Margulies, B., McDougal, K., Snyder, M., Warren, C., Hemm, M., Atuobi, T., and Gough, L. "Teaching research courses online during a pandemic: Challenges and lessons learned" (poster), AAC&U Transforming STEM Higher Education conference, November 2020.

McDougal, K. "Using *All of Us* Data in Teaching: A CURE Approach," National Institutes of Health SciEd, Washington, D.C., 2023.

Oufiero, C.E. "The Organismal Form and Function lab-course: A new CURE for engaging students in authentic research experiences beyond in organismal biology" (poster), Society of Integrative and Comparative Biology annual meeting, Tampa, Fla., January 2019.

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\*Undergraduate student

\*\*Graduate student

# Trinity Washington University

## Washington, D.C.

The College of Arts and Sciences at Trinity Washington University is the university's historic women's undergraduate college, which houses biology, biochemistry, chemistry, and forensic science. Trinity has been classified as both a predominantly Black institution and a Hispanic-serving institution by the U.S. Department of Education. Approximately 90% of the students in Trinity's College of Arts and Sciences are African American and/or Latina, and 80% are first-generation college students. Approximately 70% of students receive Pell Grants and have a median family income of \$25,000 or below.

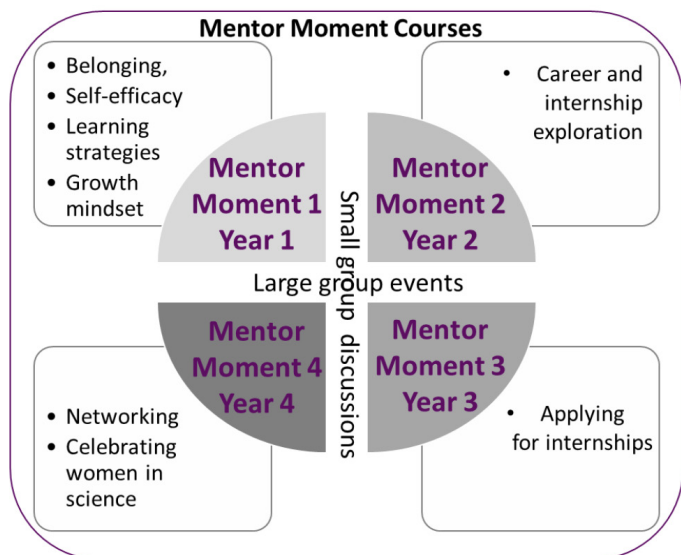
As we began our inclusive excellence project, we aimed to increase the number of women of color, women from low-income areas, and first-generation students, so that students not only complete a degree in the natural sciences, but also develop a greater sense of confidence and belonging within the community at Trinity and in the science community beyond.

With support from professional development, we aimed to remove barriers by changing policies and practices and developing a holistic curriculum to support student belonging and self-efficacy. We aimed to 1) implement professional development for STEM faculty that would extend to instructional staff and faculty in disciplines across the university, to transform attitudes and build practices that promote inclusive excellence and 2) redesign the curriculum to implement a mentor structure throughout courses taken during each academic year, to require an experiential learning opportunity and to increase course sequencing flexibility.

To begin our journey, we held workshops for faculty that included work time to redesign our science curriculum. We also hosted university-wide workshops and included updates and take-aways at faculty meetings. To further expand the impact of our efforts, we developed a semester-long faculty learning community, called Instructor-Excellence x Confidence Equals Leadership (I-ExCEL) which included faculty from over 10 disciplines. Faculty participated in workshops and developed a project to change policy or practices to promote inclusive excellence. Professional development topics included reducing implicit biases, developing skills to upend microaggressions and marginalizing language, adopting inclusive and culturally responsive teaching, engaging in inclusive mentoring, and fostering a sense of belonging and community.

To inform curricular revision, we first identified barriers to student success. Because many students have commitments outside of classes, we recognized the need to incorporate all program elements into the curriculum to be truly inclusive. Our undergraduate version of the program (U-ExCEL) included four major changes:

- 1 Increased flexibility in course sequencing,**
- 2 Student support within classes via embedded tutors,**
- 3 Required experiential learning opportunities, and**
- 4 Mentor courses to support students throughout their major.**



**FIGURE 1:** Structure of the one-credit Mentor Moment courses scaffolded across four academic years.

We redesigned introductory, sequenced science courses to allow flexibility in the order in which they are taken and to provide students with earlier exposure to science faculty and content. To support students in introductory science courses, we developed an embedded tutor program in which student tutors who had already completed the course assist students during class. Another change was to require students to participate in an experiential learning opportunity for course credit. Additionally, we developed an in-curriculum mentor structure that includes four courses to support students at each academic level (see Figure 1). Mentor Moment 1 focuses on Women in STEM, building belonging, self-efficacy, and goal setting. In Mentor Moment 2, students focus on communication skills, including self-advocacy, career exploration, and processes to obtain internships. Mentor Moment 3 further develops students' skills for applying to internships. And in Mentor Moment 4, students practice networking and prepare for careers and belonging in STEM after graduation. During class periods throughout the semester, all science majors from each academic year meet together for events such as alumnae

career panels and small, faculty-led mentor groups. During mentor groups, students share successes and challenges, allowing for peer mentorship across academic years, as well as faculty mentorship.

Our curriculum revision positively impacted student success. The average retention from a first- to a second-semester science course increased from 57% before implementing these changes to 85% after the curriculum revisions. Furthermore, 100% of graduating science students participated in experiential learning. Average Likert survey responses for students' perception of seeing themselves with a future in science increased with statistical significance from their first to third academic year. Additionally, the average number of students graduating with a science degree increased from seven during the years before we received the grant (2012–2017) to 11 during the early years of the grant (2018–2019) to 17 after implementation of the new curriculum (2020–2022). Finally, open-ended responses suggest that students experience an increase in confidence and in their identity as women in science. These outcomes suggest that the inclusive and holistic curriculum revisions we have made to our science programs are supporting student success and building inclusive excellence across the university.

The success of our ExCEL programs has helped create institution-wide sustainable cultural change. Professional development with an IE focus has become standard practice. Majors beyond science are incorporating mentorship courses into their curriculum. Additionally, commitment to inclusive excellence is now an expectation in new hires and is valued in promotion applications. By implementing changes in the curriculum, we have created sustainable practices. As a component of the mentor structure, we created a network by inviting alumnae to speak to current students. As students value these experiences, they, too, will likely participate as alums to share their experiences and advice with students. Our experience and training has equipped us to continue to identify barriers through our program assessments and to create effective solutions.

We recognize that our own attitudes and approaches must change if we are to fully welcome students into the culture of science and to create inclusive spaces. This necessitates that inclusive practices are incorporated beyond the science programs and throughout the university and STEM fields. We have expanded learning groups and found support across the university. We have also connected with graduate programs to support continuation of inclusive experiences during internships and graduate programs as well. A crucial lesson is that inclusive excellence must permeate every aspect of students' experiences. We must change our ways of thinking and gain a deeper understanding of barriers and ways in which we as instructors or administrators may dismantle barriers to achieve inclusive excellence.



# Tufts University

## Medford, Massachusetts

Tufts University's Listening Project sought to address *inclusion* with respect to the differential participation and success of underrepresented groups in natural science majors, as evidenced in course grades and rates of attrition from majors. At the same time, we sought to address *excellence* by cultivating practices of instruction centered on eliciting, attending to, and engaging with the nascent disciplinary thinking of all students. We took an asset-focused view that students have valuable knowledge and abilities for STEM learning, but instructors may have difficulty recognizing value that presents in unfamiliar forms.

We ran a series of year-long professional development workshops for multidisciplinary groups of STEM faculty and teaching assistants, in which we practiced deep examination of the possible student reasoning underlying selected examples taken from classroom video recordings and written work. Each participant met once a month with a partner from another discipline and a listening coach, and there was one larger multidisciplinary, facilitated workshop each month. Participants were pressed to put aside – for the moment – issues of evaluation, grading, or correction and focus on the ideas that might lie beneath the students' expression. The idea was that with the relative abundance of time in this series of sessions extending over a full academic year, and with the perspectives of peer instructors in disciplines besides their own, participants could develop their inclination and ability to attend more effectively to student contributions – even those that at first seem surprising or difficult to understand. We anticipated that participants would come to recognize the need for greater attention to student thinking, and that their expanded awareness would animate their interest in exploring changes in their instruction. Thus we designed our approach to elicit, attend to, and engage with the nascent pedagogical thinking of our participants. Rather than selecting and promoting a set of “proven” instructional techniques, we aimed first to help instructors experience their own need for new ideas, and from there to support their seeking, invention, and experimentation.

There are indications that the project produced some of the intended cultural change. We succeeded in involving a large fraction of science faculty – from lecturers to senior professors – as well as teaching assistants. Many participants expressed great appreciation for the intellectually and cognitively challenging nature of the activities that they took part in, for the revelation that student work that initially appeared to contain little of value often contained valuable disciplinary thinking, and for the respectful and dedicated community they found in the workshops. Some described the experience as transformative. They found themselves more curious to understand students' thinking, more empathetic to students' struggles to understand difficult and unfamiliar material, and more aware of their own biases (both positive and negative) based on how students present their work (e.g., neatness, use of scientific terms, and syntax). Some reported changes in their own instructional methods or ways of interacting with students or brought ideas from the project into departmental curriculum discussions. There is now a community of instructors throughout the university's STEM departments whose assumptions about the nature of science teaching, learning, and assessment have been productively destabilized and shifted through their experiences in our workshops.

Actual changes in instructional practices, however, have been slower to be effected and more limited than we had hoped, particularly in the introductory courses that are critical to student persistence. It is not surprising that changes in perspective promoted by the project would take time to gain a foothold in classroom practice. At the same time, however, structural obstacles to change are formidable. Attending to student thinking unavoidably takes more time than simply assessing answers as right or wrong, and instructors' time is the resource in shortest supply.

While some faculty have sought to address this issue by using graduate or undergraduate assistants, training and supervising them in effective listening presents an additional burden on instructors' time. Rapidly growing STEM enrollments, COVID, and other disruptions further increased the pressures on faculty. The institution has expressed a strong commitment to issues of diversity, equity, inclusion, and justice, and has devoted significant financial resources to them, but has not recognized instructional reform as an important component of that effort.

In addition, we have found that many faculty are firmly anchored in the traditional instructional norms of their disciplines, which often include a vision of teaching as the delivery of information, of student interactions as being centered on identifying and correcting errors and misconceptions, and of assessments as limited to correctness and incorrectness. For a few faculty, we were a catalyst for a major shift in practice. Many others, however, found value in our workshops but often seemed to see paying attention to students' ideas as a nice add-on to conventional instruction, rather than a fundamental shift in what effective and equitable teaching and learning look like. A final-year program to support the efforts of past participants to find ways to enhance listening in their classes has received limited interest, and much of the interest it did draw came from faculty who were already strongly committed to listening-oriented pedagogy.

We are also working through existing university structures to integrate listening activities and examples of student thinking into existing and emerging faculty and graduate student development programs.

Looking back, we continue to believe that our perspective on listening to student thinking and our innovative approach to faculty development hold promise for shifting the culture of instruction toward more effective and equitable teaching and learning. At the same time, we are vividly reminded of the daunting stability of long-established societal, institutional, and disciplinary norms; the difficulty of inducing even modest shifts; and the strong countervailing pressures to move our practices and our mindsets back to the starting point.

## Reflections

**More promisingly, we have found much higher enthusiasm and openness to fundamental change among graduate student participants, and we are working to leverage that energy to sustain the influence of the program beyond the grant.**

## Grant-Derived Dissemination Products

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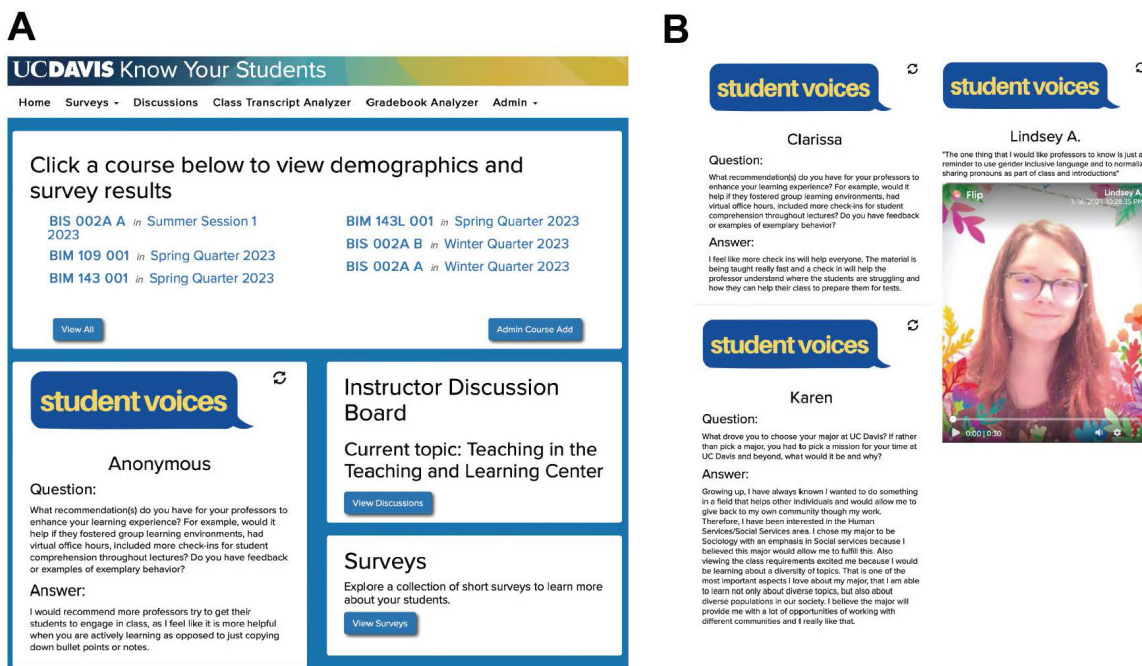
# University of California Davis

## Davis, California

### When we began our journey

When we first embarked on our Inclusive Excellence journey at the University of California-Davis (UC-Davis), we aimed to address a significant problem: the lack of faculty awareness of and engagement with IE, especially among those teaching high-impact, lower-division STEM courses. Faculty had limited knowledge, aside from a vague sense, about the demographic changes occurring on campus and the increasingly diverse range of student motivations for studying at the university, about students' prior experiences and preparation, and about priorities that accompanied them. Similarly, faculty were mostly unaware of how their traditional campus structures, instructional approaches, and personal attitudes intersected with the evolving needs and desires of our student population.

In this context, our main objective was to create opportunities for faculty to actively recognize and engage with IE-related issues within their own classrooms. We wanted to empower them to play an active role in the development of IE at UC-Davis by learning about these issues, taking action, and reflecting on how their teaching and mentoring practices could potentially impact their students' personal and professional outcomes, either positively or negatively. We hypothesized that by providing instructors with access to demographic, academic outcome, and contextual information about their students, particularly highlighting the various dimensions of diversity in their classrooms and the potential disparities revealed by this data breakdown, we could effectively raise awareness of structural inequities and biases in our educational system. Additionally, we believed that once greater awareness was established, we could develop additional tools to facilitate further learning, action, and reflection. This initial concept sparked our journey and ultimately led to the development of the Know Your Students data dashboard and its accompanying resources (see Figure 1).

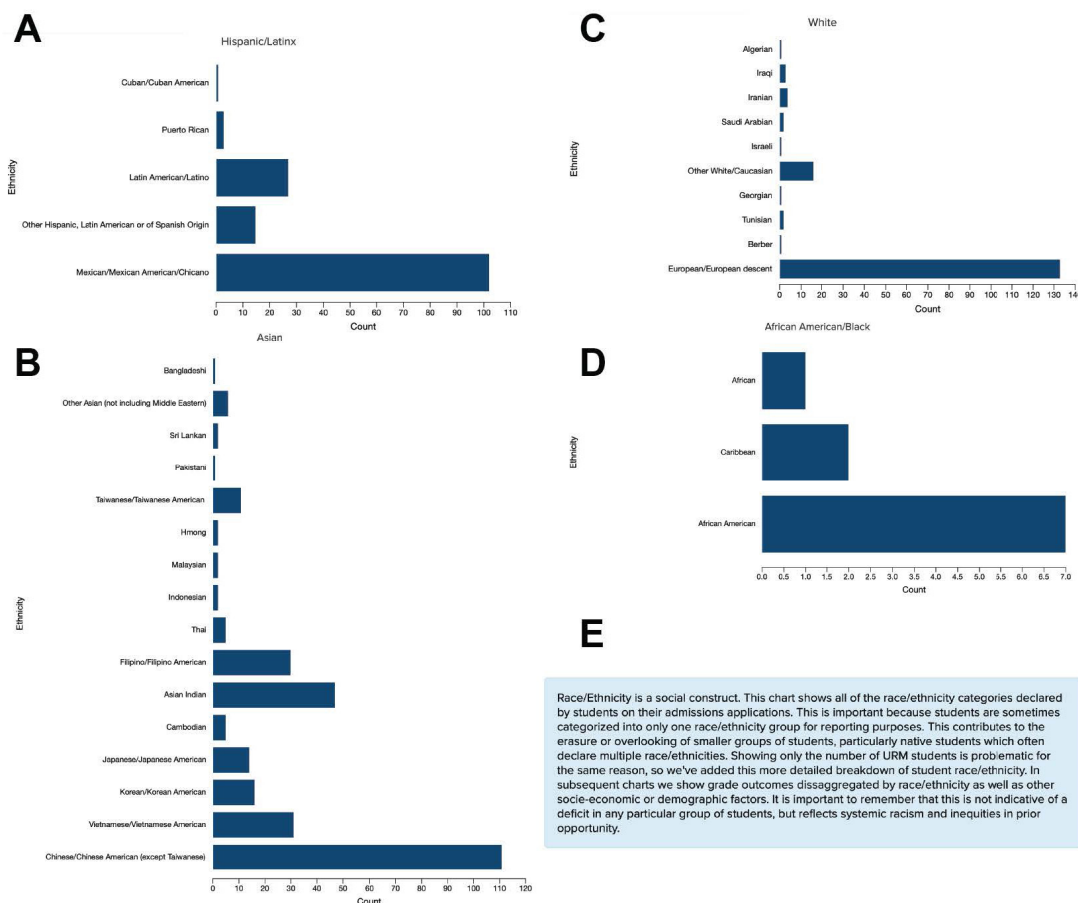


**FIGURE 1: Know Your Students at UC Davis.** Panel A shows key design elements of the Know Your Students data dashboard, selected to prioritize easy access to instructor-specific course data, individual student stories (Student Voices), faculty collaboration and learning (Instructor Discussion Board), and information-gathering tools (Surveys). Panel B shows examples of the different prompts and types of student contributions (text and video) that students make to the Student Voices projects and how they appear to instructors within Know Your Students.

## During our journey

Excluding the multitude of challenges posed by the COVID-19 pandemic, we encountered significant obstacles early on in the project. These challenges can be categorized into three main groups: 1) Resistance against the established norms we sought to challenge. 2) Distrust and skepticism from community members who possessed extensive experience, both lived and scholarly, in the field of IE about our motives, approaches, and ability to create positive change while doing no harm; our team was viewed as newcomers to this work, lacking a proven track record or reputation for thoughtful engagement in IE. 3) Interference from a key administrator.

We addressed these challenges through various approaches. In some instances, we recognized that the cost of pushing forward with an idea in the face of opposition – such as implementing optional methods and tools to track reflective teaching practices to enhance merit and promotion cases – did not justify the benefits in the short term. The process of navigating our colleagues’ apparent distrust and skepticism of us became an opportunity to learn from our colleagues and deepen our understanding of the work we were undertaking. These experiences greatly influenced our approach to the rest of the project, directing our energy toward developing tools and resources that could help other faculty colleagues appreciate the insights we’d gained as we expanded our own understanding of IE work (see Figures 1 and 2). Additionally, we were fortunate to collaborate with colleagues in our peer implementation cluster who shared our motivation to learn and translate existing IE knowledge into their own projects. We are grateful for their contributions to our work.



**FIGURE 2: Examples of disaggregated demographic categories as displayed in Know Your Students.** Traditional demographic categories (e.g., Hispanic/Latinx, African American/Black, etc.) provide a limited understanding of the diversity of sociocultural experiences, beliefs, and identities in a population and can contribute to a limited understanding of the complex factors that shape people’s lives. Relying solely on traditional demographic categories may lead to false generalizations and help to perpetuate biases and stereotypes. The charts in panels A-E attempt to explicitly and visually inform users of Know Your Students about the diversity of identities (as self-reported by students) that may be represented in some of the more aggregated demographic categories in subsequent charts. The breakdown of self-reported identities for students traditionally classified as: (A) Hispanic/Latinx (a) (B) Asian (C) White and (D) African American/Asian. Panel E shows accompanying text that informs users about why these data are shown.



Through a journey filled with ups and downs, we have reached a point where we believe our project has contributed to building a community of faculty on campus who are aware, knowledgeable, and driven to make IE an integral part of their work. Prior to 2020, our project played a role in fostering this community by involving them in the design and development of Know Your Students. This community – and many others – continues to convene annually at an on-campus conference about the scholarship of teaching and learning (SoTL), which owes its existence to support provided by our project and the dedicated members of the extended IE1 team at UC-Davis. Moreover, the availability of a widely accessible software tool that engages nearly 1,000 faculty members on campus in thinking about IE and the diversity of our students, with new faculty being trained to use it as soon as they're hired, has become a new standard at our institution.

## **Sustaining our journey beyond HHMI**

As mentioned above, we believe that our project has played a role in establishing new cultural norms regarding the availability of resources that faculty have to guide them in the work of growing capacity for IE at UC-Davis. While we believe that our project has positively influenced the culture of IE on our campus and provided an expectation that resources like Know Your Students should be available for all faculty, sustaining these gains will nevertheless continue to require active engagement from faculty leaders and some level of financial support and administrative allowance for these gains to become completely normalized/engrained in campus culture. Everything, including institutional and sociocultural norms, requires continued investment and nurturing beyond their initial construction if they are to survive.

## **Reflections**

**A few things stand out:** 1) Change models speak the truth. Events that create urgent need for change can motivate people to engage. 2) Humility and continuous learning, particularly for those who are new to IE work, are critical. The problems we face in this domain of work will reveal themselves to be far more nuanced than they may initially seem, even problems one might originally deem “simple.” 3) Engaging with and listening to people in your community is critical and powerful. Having the confidence/courage to change direction in response to what you learn is key. 4) Even if you aren't an expert, working with proper intention toward a righteous goal can open opportunities to contribute in ways that one may not initially anticipate. 5) The work is never done. Small victories and steps forward need to be celebrated to carry one through the inevitable frustration that will come when the next challenge presents itself.

# University of California Los Angeles

## Los Angeles, California

### When we began our journey

At the start of our journey, we looked carefully at equity gaps experienced by students from underrepresented groups (URGs) – including Latine, Black, and Native American/Indigenous populations – as well as students transferring from community colleges. We were keenly aware that systemic solutions required us to evaluate all aspects of our teaching mission and to undertake both institution-centered and student-centered approaches. Hence we tackled the structure of the curriculum, course content, and pedagogy. Additionally, we focused on instructor attitudes and behaviors that hampered our ability to eliminate equity gaps. The approaches can be summarized as follows:

#### Institutional approaches:

1. Examine the curriculum to address equity gaps in introductory courses
2. Implement professional development opportunities to address faculty and teaching culture

#### Student-centered approaches:

1. Work with our community college partners to smooth transfer students' transitions to UCLA and to enhance their experiences once they arrive
2. Identify and remove barriers for community college students

One of the challenges we faced was similar to those faced by STEM institutions across the country: STEM faculty sometimes lack awareness about how their own practices affect the classroom climate and student learning. Implicit biases, a student deficit mindset, and microaggressions could compromise any progress we made through our student-centered approaches. In fact, the maximum impact of activities aimed at supporting students could not be realized without careful attention to the attitudes and behaviors of instructors and faculty. Hence this was an important focus of our inclusive excellence work.

### During our journey

To address the structural and systemic nature of the problem, we focused on improving life sciences (LS) curriculum and pedagogy, particularly lower-division coursework, and on empowering faculty to understand and dismantle practices that thwart inclusive excellence in the classroom and in research labs. In the interest of space, we are not able to describe in detail all of the activities we undertook as part of our IE program. Below is a brief summary.

#### Institutional:

- Developed pedagogy focused on active learning that was particularly responsive to the pandemic
- Held annual Inclusive Excellence Institutes
- Conducted professional development on inclusive and active learning pedagogy

#### Student-centered:

- Community College Partnership Program
- Transfer student week-zero “boot camp”
- LS110: Career Exploration for Life Sciences Transfer Students
- Annual Community College Summit: Building a Transfer Sending and Transfer Receptive Culture in STEM



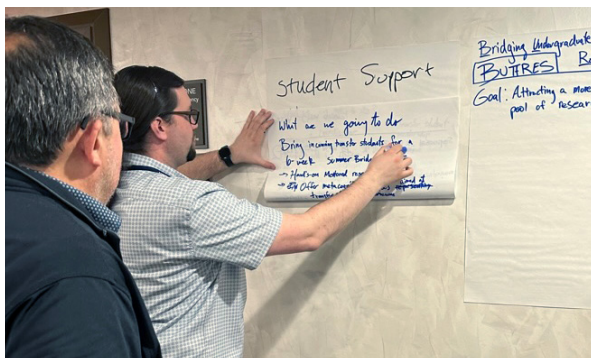
**FIGURE 1:** Participants in the Winter 2020 HHMI IE Faculty Institute in Santa Barbara, Calif.



**FIGURE 2:** Participants in the Winter 2023 HHMI IE Faculty Institute at Mandalay Beach, Calif.



**FIGURE 3:** A discussion during the Winter 2023 HHMI IE Faculty Institute.



**FIGURE 4:** A session during the Winter 2023 HHMI IE Faculty Institute.

The pandemic presented a significant obstacle, as it disrupted all in-person activities. It also highlighted persistent inequities and critical areas of need. We discovered these through extensive discussions with students and student-facing staff, as well as by utilizing surveys, town halls, and discussions with small groups of faculty and staff.

Around this time, traumatic events that catalyzed a nationwide racial reckoning also brought the community together to explicitly discuss and address systemic racism on campus and in the academy more generally. We received essential support from campus leaders, who rallied to advance our efforts to address barriers to inclusive excellence, such as systemic racism and pedagogical impediments. Critical partnerships emerged, such as CEILS (the Center for Education Innovation and Learning in the Sciences), the Academic Advancement Program (through the Division of Undergraduate Education), and its Center for Community College Partnerships.

To address the pressing needs, we pivoted to an online teaching format that explicitly incorporated anti-racist pedagogy. Three major faculty development initiatives emerged, propelling us toward inclusive excellence.

The first was Out of the Box (OOTB), which supported the pivot to remote teaching by using an equity-minded lens. Faculty, who received a \$1,000 incentive, participated in 10 collaborative workshops led by CEILS that were focused on implementing inclusive and anti-racist student engagement. Deliverables included numerous practical tools, such as an equity-minded syllabus. An estimated 9,400 enrolled students were impacted by changes made to courses taught by participating faculty.

An outgrowth of OOTB was an explicit focus on developing conversations around anti-racist theory and practices. Starting in the fall of 2020, the CEILS Becoming an Anti-racist Educator Conversation Series created a space for discussion of faculty members' own racial identity development and its implications in academic learning environments (e.g., classrooms, laboratories, meetings). By fall of 2022, 140 LS participants at various levels of leadership had taken part in the series.

Lastly, over half of the LS faculty who teach undergraduates have attended the two-day HHMI Inclusive Excellence Institute (see Figures 1 to 6). In these sessions, invited faculty and deans in the life and physical sciences are guided by external facilitators through a process of self-reflection and conversation. In a 2020 publication, we described significant changes in attitudes and student outcomes after instructor participation. In 2023, the institute shifted its focus to address structures, attitudes, and practices that negatively impact the overall culture within the life and physical sciences. This cohort evolved into communities of practice that are currently implementing specific projects developed during the institute that will be funded by seed grants.





**FIGURE 5:** A session during the Winter 2023 HHMI IE Faculty Institute.



**FIGURE 6:** A session during the Winter 2023 HHMI IE Faculty Institute.

## Sustaining our journey beyond HHMI

With the IE grant, we were able to pilot a number of activities, assess them with a professional team, and use the data to make the case for their institutionalization. In addition to HHMI’s financial support, its gravitas, reputation, and outspoken support for inclusive excellence helped us to directly connect scientific excellence with creating a culture of inclusion. Our annual, two-day Inclusive Excellence Institutes will continue to be promoted as a program initiated with support from HHMI. Finally, authentic relationships with other IE members have led to ongoing collaborations across campuses.

## Grant-Derived Dissemination Products

Liu, A., Shapiro, C., Gregg, J., Levis-Fitzgerald, M., O’Leary, E.S., and Kennison, R.L. (2022). “Scaling up a life sciences college career exploration course to foster STEM confidence and career self-efficacy,” *Research in Science and Technological Education*. DOI: 10.1080/02635143.2022.2083599

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O’Leary, E.S., Shapiro, C., Toma, S., Levis-Fitzgerald, M., Johnson, T., and Sork, V.L. (2020). “Creating Inclusive Classrooms by Engaging STEM Faculty in Culturally Responsive Teaching Workshops,” *International Journal of STEM Education*, 7:32. <https://doi.org/10.1186/s40594-020-00230-7>

UCLA Center for Educational Assessment. *Going Above and Beyond for Transfer Students: A report on the Transfer Student Bootcamp* (a report based on a two-part interview with Dr. Debra Pires about the inception, evolution, and impact of the Transfer Workshop Program, which enrolled about 80 students annually; data from surveys before and after the program was also included).

## Reflections

**One of the most important lessons we learned is that data-driven decision-making is essential and must involve strong collaborations in order to access and analyze data.**

Honesty, humility, and a deep commitment to the values underlying inclusive excellence have supported our ability to build capacity; we have built strong partnerships with campus leadership (including department chairs), CEILS, the School of Education and Information Studies, and our Center for Educational Assessment. We’ve also recently become an American Association for the Advancement of Science Stem Equity Achievement (SEA) Change institution to maintain a structure that helps to operationalize this collaboration.



# University of California Merced

## Merced, California

We aimed to improve the Biology Program at the University of California-Merced (UC-Merced) by building capacity in inclusive excellence in these three areas:

1. Establishing and institutionalizing a faculty development program in inclusive teaching methods.
2. Incorporating faculty collaborations and student interests in new research-based biology laboratory courses.
3. Developing and institutionalizing faculty-student learning communities that foster conversations on academic success, perseverance, and diversity and the collective diversity of the backgrounds on our campus.

We established several programs that embody IE practices. For faculty-student learning communities, we adopted a learning assistant (LA) program in our large-enrollment, introductory STEM courses. The LA program hires undergraduate students experienced in the courses to assist their peers in learning the material in the course lectures. The LA program was adopted by all departments in the School of Natural Sciences (SNS) and has been elevated by the Office of Undergraduate Education (UE) as a high-impact practice correlated with higher grade point averages and lower rates of students receiving a D or F or withdrawing from a course. Our campus is facing budget deficits, and the faculty have been tasked to think of alternative teaching resources to reduce costs. We hope the LA program will be a solution for this; however, significant implementation obstacles include the funding for it and the faculty time needed to train and manage LAs. Another low-cost program we established is the Bobcat Biology Mentor Program, which focuses on orienting students to professional development opportunities and social connections outside of class.

## “What’s Your Story?”

Our “What’s Your Story?” themed dinners connected biology faculty to first-year students in an informal setting to build community early in students’ academic careers. These dinners were halted due to COVID-19 restrictions on in-person gatherings and were challenging to reinstate when the campus reopened, due to everyone’s limited bandwidth. But some conversation ideas from the dinners may be applied to a new general education freshman seminar.

To grow research opportunities for students, we expanded our undergraduate course-based research experiences (CREs) from three to seven courses over the last five years, and some of the newest courses were delivered in fall 2023. These courses build capacity for IE in undergraduate research and provide important hands-on training and critical thinking skills for students. This was in part enabled in partnership with the Office of UE, which hosted a three-day Course Redesign Institute that helped biology faculty design a common syllabus for CREs. IE funds were used for pilot CRE testing during summer sessions and to fund graduate student researcher positions to assist in executing the first CRE iterations. CREs require more human and financial resources than traditional lab courses, so if and how they can continue will depend on budget pressures and campus priorities moving forward. Currently, we are receiving mixed messages from the administration about the CREs. Initially, they were considered to be exciting and aligned with the research mission of the campus, but recently, the need to address budget deficits, the increased cost of TAs, and a need to scale up the size of courses with CREs may make continued implementation of CREs challenging.

The IE grant funds supported several activities related to education research, including a campus-wide Discipline-Based Education Research (DBER) Journal Club, started in fall 2018 in conjunction with the Department of Chemistry’s National Science Foundation Hispanic-Serving Institution grant. The SNS dean funded the STEM Education Research Seminar Series for the 2022-2023 academic year. Our Quantitative and Systems Biology Graduate Program houses at least six PhD students who perform biology education research. We are partnering with our neighboring institutions through the Central Valley Regional Interdisciplinary Symposium on



**A:** UC-Merced hosted the Central Valley Regional Interdisciplinary Symposium on Education Research (CV-RISER) in 2022. **B:** At the end of spring semester 2023, we held a send-off event for our students, and mentees and mentors received certificates of completion. Some of the mentees said they are willing to be mentors the following academic year. **C:** The meetings of the Bobcat Biology Mentoring Program also include a lightning round to help students make mentor-mentee matches. Here, at the fall 2022 meeting, Dr. Laura Beaster-Jones is guiding that process's "mingle and switch" activities. **D:** Here, at the same Bobcat Bio Mentoring meeting, students are introducing themselves to each other during the "mingle and switch" activities. **E:** The 2022 participants in CV-RISER posed for a group photo. **F:** Dr. Jennifer Manily is pictured talking with a student about research opportunities at our spring 2023 meeting of the Bobcat Biology Mentoring program.

Education Research (CV-RISER), which was hosted by UC-Merced in 2022 and by Fresno State in 2023. These education research efforts could help identify areas of improvement for IE in STEM programs at minority-serving institutions.

Faculty training in inclusive pedagogy was done via our Mobile Summer Institutes on Scientific Teaching (MoSIST), using curricula from the National Institute on Scientific Teaching. We hosted two MoSISTs and delivered our third one in person in August 2023. The first MoSIST was successfully delivered remotely with over 20 participants in 2021. The second MoSIST had over 20 registrants, but only four attended. We are exploring how to increase faculty buy-in and institutionalize this program. Facilitators from UC-San Diego and UC-Los Angeles trained the UC-Merced facilitators and helped run the first two institutes. Our goal is that only UC-Merced facilitators will run future institutes.



Our grant activities have increased faculty awareness of the effects of IE on student success, persistence, and retention. For example, we made plans to redesign our introductory biology course series in the 2022-2023 academic year, with an intentional focus on inclusive teaching practices and a welcoming experience for students. The goal is to achieve deeper learning and retention of students in the biology major.

SNS values scholarship focused on teaching and learning to mitigate historical inequities in STEM. We have good working relationships with the teams in the Office of Equity, Justice, and Inclusive Excellence and the Teaching Commons. These teams helped us collect data for our education research and faculty training. We also have strong partnerships with our academic advisers, who serve as key supports for students.

Over time, we have developed a greater appreciation for intentionally building a supportive classroom culture that contributes to inclusive excellence. We have learned to listen carefully to students in class and outside of class. The pandemic gave many faculty deeper insight into students' lives and the obstacles they face in completing their degrees. A crucial lesson about building institutional capacity for IE was learning to work with allies across campus.

## Grant-Derived Dissemination Products

Beaster-Jones, L., Findlater, M., and Kranzfelder, P. (2023). "A guide to building an inclusive and equitable STEM classroom with community, structure, and engagement," *Course Source* (under review).

Pusey, T., Presas, A., Signorini, A., and Kranzfelder, P. (2023). "Breakout rooms, polling, and chat, Oh COPUS! The adaptation of COPUS for online synchronous learning," *Research & Practice in Assessment*, 18(1), 62-81.

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Dulai, K.S., Kranzfelder, P., Signorini, A., Pusey, T.S., Valencia, A.P., Urbina, C., and Oviedo, N.J. (2022). "Collaborative Teaching plus (CT+): A Timely, Flexible, and Dynamic Course Design Implemented during Emergency Remote Teaching in an Introductory Biology Course," *CBE – Life Sciences Education*, 21(4), ar61.

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Alkhouri, J.S., Donham, C., Pusey, T.S., Signorini, A., Stivers, A.H., and Kranzfelder, P. (2021). "Look who's talking: Teaching and discourse practices across discipline, position, experience, and class size in STEM college classrooms," *BioScience*, 71(10), 1063-1078.

Troy, K., Donham, C., Sollberger, Babalola, A., García-Ojeda, M.E., Menke, E., Manilay, J., Kranzfelder, P. Reflecting on cultural wealth and repaying educational debt in the biology classroom: measuring student achievement using GenBio-MAPS at a research-intensive, minority-serving institution. *CBE Life Sciences* (under review).

# University of Colorado Denver

## Denver, Colorado

When we began our IE journey at the University of Colorado Denver (CU Denver), our aim was to correct inequities and to support inclusion in our introductory biology course sequence. At the time, over 40% of the undergraduates in the College of Liberal Arts and Sciences (CLAS) majored in biology or in a program that required satisfactory completion of the biology course sequence. Historically, the first course in the sequence had one of the highest enrollments of any course on campus and, regrettably, one of the lowest pass rates (over the six-year period prior to the award, the pass rate was 62% for all students and 51% for underrepresented minority students). We hoped to develop solutions and strategies in the process of reforming these courses that could be used to effect systemic change at the university and serve as a model for transformation of other gateway courses. Our work was organized to build these four pillars of support:

- 1 **Institutional awareness and accountability,**
- 2 **Faculty development,**
- 3 **Climate and curriculum reform, and**
- 4 **Student support.**

During our journey, we created a data dashboard that disaggregated students' grades by race/ethnicity. We used this dashboard to better understand patterns of student outcomes across gateway biology course sections and to guide the development of our activities. Subsequently, we improved the data dashboard to include data for all sections of all courses taught by CLAS faculty. This dashboard is updated each semester and is used by every CLAS department to prepare student graduation and retention plans (e.g., to identify courses with inequitable outcomes and to articulate a plan to address them).

We created the CLAS Office of Inclusive Excellence in STEM to organize and elevate our efforts on the HHMI Inclusive Excellence project, as well as to recognize and support other related efforts in CLAS and on campus. The faculty and staff who work on projects supported by this office have important experience working on institutional change efforts in support of equity and inclusive excellence. The office provides direct support to STEM departments in CLAS, working to create more inclusive teaching cultures and to reimagine STEM courses and curricula to better support our students.

We created an Inclusive Pedagogy Academy (IPA) to support faculty professional development in inclusive teaching pedagogy and practice. This six-week course focuses on 1) disciplinary and classroom culture, 2) identity and identity safety, and 3) inclusive policies, environments, and classroom practices that promote belonging and self-efficacy. The IPA was created initially for the biology faculty members engaged in the HHMI IE reform work, but it has since been offered to nearly 50 STEM faculty and postdoctoral fellows from two colleges on campus. This HHMI IE initiative will continue as a campus resource through the Division of Teaching Innovation and Program Strategy, with the goal of bringing this experience to faculty in all seven schools and colleges on campus.



Reform of the introductory biology course sequence was 1) supported by faculty participation in the IPA (including other biology faculty members involved in department-level curriculum and merit committees), 2) guided by the development of a vision document (facilitated by an outside expert) that articulates the goal of the course and the inclusive principles that form the foundation of instruction, 3) complemented by transformation of laboratory curricula from confirmatory labs to course-based undergraduate research experiences (CUREs), and 4) bolstered by new hiring and staffing decisions to align equity-minded faculty who had expertise in inclusive pedagogies with introductory courses. Outcomes of the reform efforts have included 1) an overall increase in the pass rate, 2) the use of learning assistants in all introductory biology sections, 3) a reordering of the courses in the sequence so that students have a semester of chemistry before they learn molecular/cellular biology, and 4) modification of course syllabi and policies to remove exclusive language and policies and to include inclusive language and practices (e.g., a welcome letter from the instructor, a higher formative to summative assessment ratio, and inclusive policies for late work and attendance).

To sustain our journey beyond the HHMI IE award, we have built structures, made investments, and adopted mindsets and practices that will help our work endure. We have expanded the use of our data dashboard to all courses in CLAS. Now, departments must reference these data as standard practice in the development of student success action plans. We have funded a position of director of the Office of Inclusive Excellence in STEM to support CLAS STEM equity goals beyond the HHMI award. We have institutionalized and funded the IPA through the CU Denver Division of Teaching Innovation and Program Strategy, with the goal of making this experience available to all CU Denver faculty members. We have hired new equity-minded faculty in biology who bring experience with inclusive teaching practices to our introductory biology sequence. We have leveraged our new understandings and relationships to join other groups, both internally (e.g., our campus Equity Task Force) and externally (e.g., the Alliance of Hispanic Serving Research Universities) to share knowledge and influence change. In short, we are better prepared to take on the new campus challenge to become the nation's first equity-serving institution because of the work on this project.

Our thinking evolved as the project proceeded. As a team, we approached our challenge with various perspectives and experiences. Learning to listen to each other, carefully and reflectively, was an early lesson learned and one that grew in importance as our engagement with the project encountered points of stress. Doing so yielded several insights about IE efforts that were crucial in building our capacity. We learned we must understand the process of institutional change in a scholarly way and apply the ideas of change scholarship to our efforts. We learned that pass rates are a signal of other problems at our institution – structural problems that we've come to address in our work. And we learned that the identities, mindsets, and training of our faculty, staff, and administrators are critical to achieving our goals. Changes in policy and practice are most effective when they are driven by changes in mindset about equity and inclusion. Otherwise, such changes are hollow and ineffective. Experiences that support institutional and individual growth and a shifting of mindsets about equity and student success are foundational to inclusive excellence.

## Grant-Derived Dissemination Products

### Publications

St. Onge, S. (2019). "Long-Term Urban Wildlife Research Potential Through Course-Based Undergraduate Research," Master's Thesis, University of Colorado Denver.

### Presentations

Hartley, L., and St. Onge, S. "Involving university students in collecting long-term urban wildlife data using a 4DEE course-based undergraduate research experience," Ecological Society of America annual meeting (online), August 2021.

Beyer-Purvis, A., Hartley, L., Hamilton, L., and Allen, R. "Increasing the Capacity for Inclusive Excellence in STEM: Launching an Inclusive Pedagogy Academy," American Association of Colleges and Universities Transforming STEM Higher Education conference, November 4-6, 2021 (virtual), 2021.

# University of Houston Downtown

## Houston, Texas

### Beginning our journey

Initially, the SynergIE program at the University of Houston-Downtown (UHD) intended to increase underrepresented and marginalized students' access to and success in STEM fields via these three strategies:

1. Train natural sciences (NS) faculty in IE principles, transparent pedagogies, and cultural awareness.
2. Adapt our current mentoring system to support naturally forming student cohorts in entry-level, gateway, and strategic upper-division courses to enhance student agency, teamwork, and achievement.
3. Develop a learner ecology model to integrate curricular, cocurricular, and extracurricular activities that solicit family involvement to support learning.

Except for providing faculty training, our initial strategies implicitly approached students from a stereotypical deficit model.

Attending the initial meeting for principal investigators at the Howard Hughes Medical Institute revealed the real problems to us – the culture of white supremacy and the inherent institutional racism in higher education and the culture of science. The SynergIE team's introspection and reflection on our personal biases and prejudices – as well as the application of critical race theory to an interrogation of UHD's policies, practices, cultures, structures, degree programs, and courses – caused us to shift our strategy from “fixing” our students to focusing on enlightening and encouraging faculty to recognize and dismantle white supremacy and institutional racism in NS, our college, and broadly at UHD.

### During our journey

Our work, dismantling white supremacy and institutional racism at UHD, included these initiatives:

- A strategic campaign of anti-racism/antibias/multicultural educational workshops for faculty and staff.
- Family Night, which brings new students and their families to campus to learn about the college experience at UHD (with Spanish translation provided throughout the main session and breakout sessions); they meet with UHD alumni and faculty who are persons excluded due to ethnicity or race (PEERs), and since its inception, this event has been identified by students as one of their most memorable UHD experiences (see Figure 1).



**FIGURE 1:** Each fall since 2019, SynergIE has hosted a family night for new first-year students and their families; the event includes faculty and alumni talking with students in breakout sessions, including at least one done primarily in Spanish.



**FIGURE 2:** The SynergIE Program brings early-career scholars from around the Houston region and the country to campus to share their STEM journeys, including how they attained their professional positions. In 2022, these scholars included Christopher Thomas of TC Energy; Dr. Chris Bolden of the University of Texas Health Science Center; Dr. Jaye Gardiner of the University of Wisconsin-Madison; Dr. Danielle Twum of the American Association for the Advancement of Science IF/THEN Ambassadors program; Dr. Terrell Morton of the University of Illinois Chicago; and Dr. Caroline Palavicino-Maggio of Harvard Medical School. Also pictured are members of the SynergIE leadership team: Cleopatra Frazier, Dr. Yuan Yuan Kang, Dr. Adriana Visbal, Dr. Lisa Morano, and Dr. Judith Quander.



**FIGURE 3:** The early-career scholars that the SynergIE Program brings to campus begin by sharing their stories in a panel session. In 2022, the panelists included (from left to right) Dr. Xyanthine Parillon of the University of Texas Health Science Center; Aimee Stevenson, a graduate student at UHD; Dr. Kattia Palacio-Lopez, a new UHD assistant professor of biology; and Dr. Chris Bolden of the University of Texas Health Science Center.



**FIGURE 4:** The early career scholars that the SynergIE Program brought to campus in 2022 also participated in breakout sessions with students, to do a deeper dive into their life into and through a STEM education and career. In this photo, Dr. Chris Bolden of the University of Texas Health Science Center is engaging in a vibrant conversation with students.

- The IE Book Club, which meets monthly during the academic year and brings together staff and faculty to learn about the history of systemic racism in the U.S. and how it marginalizes citizens.
- The Diversity in STEM Scholars Series, which brings in panels of young PEER scholars to discuss their educational and professional journeys (see Figures 2–4).
- Anti-racism and multicultural awareness workshops for enlightening and inspiring new NS pedagogical approaches; professional organizations began these workshops, which are now a major programming component of UHD’s Center for Teaching and Learning Excellence (CTLE).
- Policy revisions, including credit toward NS faculty members’ annual performance evaluations and promotion criteria when they develop inclusive pedagogy.
- An IE Professorship Award that allows faculty time and supplies to explore inclusive pedagogy; this is now also part of the programming in our CTLE.
- A DEI teaching circle in the college, focused on incorporating DEI content and practices into upper-level courses.
- A partnership with and induction of NS faculty into UHD’s Center for Critical Race Studies.

Highlights of some of our work is on the SynergIE website, at: <https://www.uhd.edu/academics/sciences/hhmi/Pages/default.aspx>.

We encountered numerous obstacles in our pursuit of inclusive excellence. Some faculty resisted acknowledging white supremacy’s ubiquity, historical oppression, and presence in our disciplines and refused to engage with the anti-racist framework. Additionally, statewide and national attacks on DEI efforts brought negative attention to our IE work. Texas recently passed legislation banning DEI offices, officers, and the use of state funding for DEI work. Despite these challenges, we recruited a critical mass of faculty, staff, and students at UHD who are committed to IE.

Our journey was greatly informed and advanced through our engagement with our colleagues in IE1&2 and our peer implementation cluster (PIC) group, and some of the revisions in our activities were inspired by what we learned from them.

## Sustaining our journey beyond HHMI

We intend to continue leveraging the culture of activism that UHD’s dedicated stakeholders demonstrate. Inclusive pedagogy continues to be adopted by more faculty around campus, with an emerging expectation of programming that encourages self-reflection and journeys towards social justice. More faculty are applying for external funding to continue the work of inclusion to circumvent the ban on using state funds for DEI work.



Two NS faculty were invited to become fellows of UHD's Center for Critical Race Studies, which is inspiring the development of scholarship aimed at critical race science and the promotion of transparent, inclusive, and anti-racist frameworks in science curricula in order to highlight and respect the intersectional identities of UHD's mosaic student population. A critical mass of NS faculty continues to interrogate the white supremacist framework of science education in the modern university and continually engages in self-reflection and intentional actions to dismantle white supremacy and institutional racism. Within the college, this effort expanded to include a couple of math professors who are becoming active leaders in our IE work. Our goal is to develop a broader IE alliance across UHD.

We continue to be inspired by our IE1&2 and PIC colleagues, leading us to explore the use of personal and professional stories as a mechanism to develop belonging and identification as a scientist (see <https://www.storycollider.org/>).

## Reflections

**We began our journey toward inclusive excellence entrenched within the white supremacist framework**, struggling to interrogate it and to extract ourselves from it. Now, we see that white supremacy has constructed science and science education to maintain itself and to privilege the white, heteronormative patriarchy that has dominated scientific thought for the past four centuries.

We know that ...

- White supremacy must be intentionally dismantled.
- We will not enroll everyone in the goal of IE.
- Our responsibility is to call people *into* the work of inclusion, not call them out for resisting.
- Our activism is crucial to making the IE transformation irreversible.
- The struggle for equity and inclusion is vulnerable, mission-critical, and existential for the future of science education, science, and our nation.

White supremacy saturates our institutions and maintains itself through denial, defensiveness, and our society's refusal to engage in difficult self-reflection. Desaturating the white supremacist framework in science education requires that we ceaselessly interrogate, name, and design alternative frameworks that undermine this complex adaptive system.

As we continue this work, we must advocate both with our marginalized colleagues and students and for ourselves through the work of reparation, equity, and social justice. Inclusion and anti-racism are the most fundamental elements we can infuse into future scientific enterprises.



# University of Illinois Chicago

## Chicago, Illinois

We identified two major barriers to STEM degree attainment for transfer, first-generation, and underrepresented minority (URM) students at the University of Illinois Chicago (UIC). First, there were limitations in faculty knowledge and awareness of culturally relevant, evidence-based pedagogies in STEM disciplines. While we credit faculty with dedication to undergraduate STEM education, we recognized that UIC had not provided adequate support and training for faculty to create a context of inclusion that took advantage of the cultural capital and funds of knowledge of our diverse student body. Thus, we aimed to develop and implement a STEM-focused professional development (PD) program with our Center for the Advancement of Teaching Excellence (CATE), with the goal of providing faculty with tools to deliver culturally inclusive and evidence-based STEM pedagogy. Second, rigidity in our course and curriculum progression resulted in narrow paths to degree completion. Administrative policies regarding course registration, withdrawal, and credit accumulation could disproportionately affect the most vulnerable students. This effect could be most acute at the early stages of students' college careers, when they take gateway STEM courses, which have no alternatives in pursuit of a STEM degree. We had an approach to offering PD in three major departments within the College of Liberal Arts and Sciences (LAS) responsible for gateway STEM courses: biological sciences, chemistry, and physics.

3  
BIOLOGICAL  
SCIENCES



CHEMISTRY



PHYSICS



Our primary strategies to build inclusive classrooms at UIC included engaging in collaboration with key stakeholders, while simultaneously evaluating the efficacy of our efforts. We partnered with external consultants; three departments (biological sciences, chemistry, and physics); UIC's Office of Diversity, Office of Faculty Affairs, and Learning Sciences Research Institute; and other administrative units to draw upon and engage with us to foster cultural change and inclusion and to assist in developing programs and strategies for change. This PD program consisted of two parts: First, external experts in issues related to identity in higher education held interactive workshops to challenge faculty to consider how educational strategies may affect student success in their classrooms. Second, short, multipart workshops were spread throughout the fall and spring semesters, led by internal experts in the Office of Diversity and on the grant leadership team. Topics of the workshops included inclusive pedagogy in STEM, growth mindset, and inclusive assessments. We then collaborated with CATE to institutionalize IE programming within their efforts aimed at the larger UIC teaching community.

We recruited 23 UIC STEM faculty distributed across the biological sciences, chemistry, and physics. Faculty members participated in biannual PD workshops where they gained knowledge and strategies about issues of inclusion, identity, promoting students' sense of belonging in STEM disciplines, implementing active learning strategies in large lecture courses, analyzing institutional data on UIC students' backgrounds and experiences, engaging in valid and fair assessment practices, and interpreting student evaluations aimed at promoting engagement. Faculty also learned what UIC's undergraduates typically seek from campus support units and their perceptions of what they really need from faculty. Data was also discussed pertaining to the lived experiences and sociocultural and socioeconomic realities of our students.

Following each of these PD workshops, faculty enacted change by developing positive classroom environments, creating more accommodating assessment and attendance protocols, adjusting the language used during instruction to create more inclusive learning environments, providing more examples rooted in the real world, and revising laboratory report formats to improve transparency and readability. Faculty reported increased understanding of their students and greater sensibility toward students' needs, diverse backgrounds, and economic hardships, especially during the pandemic. The biggest obstacle for most faculty in trying to restructure their classes was the significant time and effort involved, with little reward system to support these efforts. In recognition of faculty members' hard work and to advance their visibility within their departments as agents of change, we formally communicated about their dedication and accomplishments with the heads of the three departments, the dean, and the provost and also

publicized their work in an article in UIC Today. Our team also advocated at committees across campus for DEI to be integrated within the campus promotion and tenure process (a step that has been approved). Our faculty have also shown dedication by leveraging what they have learned to effect broader cultural change in UIC STEM departments by applying for national-level funding supporting inclusive classroom and curricular efforts in STEM, engaging in additional PD and campus-wide efforts to initiate and advocate for change, and requesting communities of practice to continue learning about evidence-based practice.

HHMI has positioned our institution to advance toward inclusive excellence in countless ways and continues to impact our faculty and grant leadership team as we pursue future opportunities in support of this grant's goal that "this is ultimately about changing people and cultures and not just about changing courses and prerequisites." More specifically, through this grant, faculty have fostered campus connections, developed new grants focused on inclusion, and supported critical changes to include DEI as a metric in yearly evaluations of all our deans. In addition, the fact that DEI efforts and evidence of inclusive teaching and mentoring processes is now part of our promotion and tenure process will ensure the continuation of this work.



“this is ultimately about changing people and cultures and not just about changing courses and prerequisites.”

Our institution has been engaged in a number of efforts to address barriers, including having all faculty engaged in a campus plan for advancing racial equity. A number of STEM departments, including biological sciences and chemistry, created diversity committees within their departments, which generates additional support for DEI issues for faculty and students. Additionally, this project has promoted the spread of curricular reform within and across STEM departments. We have a number of faculty who were engaged in this project who applied for grants and are now leading curricular reform efforts in STEM focused on inclusive pedagogy with faculty, academic units, or community colleges and transfer students across Chicago.

A valuable lesson is that all levels of an institution need to commit to and collaborate on transformative change toward DEI. The change process requires engagement and intentional efforts at various levels, including individual faculty, throughout departments, and across the institution. Efforts have to be intentional and meaningful, and it is important to understand that having an impact on students can be immediate at the classroom level but takes multiple years at the institutional level.

# University of Massachusetts Amherst

## Amherst, Massachusetts

The IE journey at the University of Massachusetts-Amherst originated in four life science departments with long-standing commitments to engaging undergraduates in authentic research. This research was conducted primarily through apprentice-type independent study or honors thesis investigations. With earlier HHMI STEM education funding, we had embedded research in the curriculum through upper-level course-based undergraduate research experiences (CUREs). Our analysis of student participation in these upper-level, high-impact experiences revealed racial disparities, financial barriers, and a hidden curriculum surrounding access to the CURE opportunities. Our primary IE strategy was to address these inequities by converting the required first-year introductory biology lab course, which serves over 1,000 students a year, to a CURE format, as well as to create a CURE community of practice to expand this format across more early STEM curricula.

We also recognized that, to enhance inclusion, the curricular changes needed to be accompanied by a change in attitudes among faculty and staff, so they approached their curricula through a lens of inclusiveness and developed a mindset supportive of success for every student. Our approach was to engage faculty and staff in activities (e.g., workshops and an IE Fellows program) to guide and support their journey toward inclusivity.

An important step in converting the introductory biology lab course to a [CURE format](#) was securing college and departmental commitments to provide faculty able to lead instruction within the new CURE, as well as staff and infrastructure to support what is currently the largest institutional offering within the HHMI SEA-PHAGES (Science Education Alliance-Phage Hunters Advancing Genomics and Evolutionary Science) program. Training of and resources for our SEA-PHAGES team from the University of Maryland, Baltimore County, were pivotal to our success. Also important was the continued assessment and modification of our program to ensure that the course objectives were met during the enrollment ramp-up.

The pandemic presented significant obstacles to implementing our programming. However, the institution quickly provided support for a pivot first to fully remote and then to hybrid learning. While our full implementation scale-up was delayed, it was accomplished in Year 5, and the program is now embedded into the life sciences curriculum.

The pandemic, and the murder of George Floyd in May 2020, profoundly impacted our ability to engage faculty and staff in learning about biases and in acting to improve inclusivity within their own spheres. In 2020-2021, 39% of STEM faculty participated in one or more DEI events. We came together as a broader STEM community through these activities, fostering relationships that blossomed into our HHMI Driving Change Learning Community.

Importantly, we were able to identify a core group of inclusion allies. We nurtured their efforts to improve the undergraduate experience by forming our IE Fellows program, which engaged teams of IE fellows in identifying and working on projects such as training faculty to serve diverse student populations, developing a peer mentoring program, and recruiting diverse students. This program strengthened department-based and collaborative inclusion efforts. These groups, coupled with new departmental DEI committees, formed critical departmental foci to analyze student success data and the results of a campus climate survey and then develop equity action plans to increase classroom inclusivity.

Part of our IE program involved recruiting and training faculty to initiate new STEM CUREs outside those developed as part of SEA-PHAGES. However, while faculty participation in our CURE workshops was robust before the pandemic, it was greatly reduced afterward. As a result, only one upper-level CURE was developed and offered, and one other is still in development. Based on an analysis of disaggregated student success data from STEM foundation courses, we found that our historically minoritized students were more likely to earn a D or F or to withdraw from



**FIGURE 1:** To celebrate the full implementation our UMass SEA-PHAGES CRE in all sections of our introductory biology lab course (Biology 153), we produced this video, which can be viewed at [Improving Student Success with Course-Based Undergraduate Research: The UMass Amherst SEA-PHAGES Program](#). The video was produced in collaboration with Communiqué No. 1 (see <https://cn1productions.com/>).

these courses than the student population at large. As a result, we have shifted our focus to center our CURE development efforts more intentionally on STEM foundation courses, especially courses that exhibit student retention disparities by race.

Our IE program has demonstrated the value of CUREs in engaging, retaining, and graduating STEM students. It models how a foundation course CURE can be implemented, supported, and sustained at scale. We have found that a CURE is more economical (on a cost-per-student basis) when taught in a large-enrollment format rather than a smaller format.

In parallel with our IE efforts, the campus at large has taken actions aimed at increasing inclusivity. An institutional self-study resulted in interactive dashboards of disaggregated student success measures and in campus climate survey results with tool kits to guide data interpretation. In response to climate survey results that highlighted historically marginalized students' disparate experiences, an Academic Affairs Equity Action Plan program was launched to focus on improving equity in students' sense of belonging and of connectedness in the classroom. All academic departments were provided with a priority list of classroom belonging/equity actions and were asked to survey their use of such actions in their courses. Departments selected at least one action to advance belonging and connectedness in their curriculum or pedagogy, in a place where it would be most impactful in improving inequities in student retention and completion rates. These plans are expected to build on the intentions articulated in department strategic plans by formalizing a specific evidence-driven path to achieving them.

Our initial proposal emphasized a single strategy: to scale the use of CUREs in foundation courses. We accomplished this, but not through in-house CURE development, as we had planned. Adopting SEA-PHAGES was instrumental in our success and allowed us to redesign our approach to in-house CURE development. While faculty interest in creating and teaching with CUREs exists, the time investment required to do so has discouraged many from initiating such an effort. The interruption of the pandemic had a particularly deep impact on this aspect of our program because faculty and departments discontinued working on innovations during the pandemic and the recovery from it, as the added cognitive load simply could not be accommodated then. However, faculty who were specifically paid for working on SEA-PHAGES projects and had already begun those efforts were able to continue that work.

## Reflections

**Most importantly, our experience allowed us to recognize the interdependence of pedagogical training with intercultural and antibias training.** These aspects of our project took on increasing priority over time. It is critical, we realize, to continuously engage the campus community in awareness-building and discussion about the effects of structural inequality and unconscious bias; it is not a one-and-done effort. This ongoing dialogue and training will help to lay the foundation for future efforts to change pedagogy.



## Grant-Derived Dissemination Products

### Publications

Bamgbowu, D., Bsoumai, J., Butura, J., Cady, E., Cholod, G., Collibee, I., Dompereh, L., Eisner, S., Elmaleh, M., Fitzgerald, K., Gillis, E., Horgan, A., Judd, D., Keefe, J., Kovalski, E., LaBianca, K., Lee, P., Lin, F., Maiuri, H., McDonald, C., McKnight, A., Meseerole, M., Mizra, F., Monger, E., Moore, E., Nguyen, N., Noel, B., O'Connor, D., Pagani, R., Palmgren, M., Pan, K., Pech, B., Qian, J., Rastegar, S., Simas, B., Southard, A., Tracy, M., Vuong, H., Whelan, S., Zou, A., Punska, E., Pause, R., Zhang, F., Ribbe, A., Chien, P., and Rocheleau, J. "Genome Sequences of *Microbacterium foliorum* Phages Anseraureola, Pondwater, and Yasuo," *Microbiol Resour Announc*. 2022 Nov 17;11(11):e0084922. doi: 10.1128/mra.00849-22. Epub 2022 Oct 13. PMID: 36227095; PMCID: PMC9671004

### Open-Access Teaching Materials (published with other SEA-PHAGES instructors)

Rocheleau, J.M., Mastropaolo, M.D., Sunnen, C.N., Beyer, A.R., Ndolo, T., Williams, D., Saha, S., Dean, N. "Exploring Functions for Common Phage Proteins," *QUBES Teaching Materials*. doi:10.25334/3YA4-H358 2020

### Phage Genomes Published to GenBank

*Microbacterium* phage Yasuo, GenBank Accession [ON108648](#), 2022  
*Microbacterium* phage Typher, GenBank Accession [ON260821](#), 2022  
*Microbacterium* phage TurboVicky, GenBank Accession [ON970583](#), 2022  
*Microbacterium* phage Pondwater, GenBank Accession [ON081334](#), 2022  
*Microbacterium* phage PineapplePizza, GenBank Accession [ON724010](#), 2022  
*Microbacterium* phage Morrill, GenBank Accession [ON081328](#), 2022  
*Microbacterium* phage Anseraureola, GenBank Accession [ON108642](#), 2022  
*Microbacterium* phage PermaG, GenBank Accession [MZ150782](#), 2021  
*Microbacterium* phage Asayake, GenBank Accession [MW712723](#), 2021  
*Microbacterium* phage BaghaKamala, GenBank Accession [MW712730](#), 2021  
*Microbacterium* phage Pumbaa, GenBank Accession [MZ171380](#), 2021  
*Microbacterium* phage Hail, GenBank Accession [MZ005672](#), 2021  
*Microbacterium* phage Ulysses, GenBank Accession [MZ322025](#), 2021  
*Microbacterium* phage Concrete, GenBank Accession [MZ028628](#), 2021  
*Microbacterium* phage TatarKPM, GenBank Accession [MT771350](#), 2020  
*Microbacterium* phage BodEinwohner17, GenBank Accession [MN945900.1](#), 2019

# University of Missouri Columbia

## Columbia, Missouri

### When we began our journey

The Thrive project at the University of Missouri (Mizzou) focused on reducing barriers, fostering belonging, and promoting an inclusive culture within the natural sciences. A key objective of the Thrive project was to enhance the science identity of “new majority” undergraduates. By validating and amplifying the voices of students, the project aimed to strengthen their sense of belonging and value as experts.

We initially addressed five challenges:

1. Attitudes toward racialized groups
2. Inattention to student voices
3. Rocky pathways for target students
4. Resources and training on decentralized teaching and advising
5. Barriers to data access and interpretation

We primarily focused on capacity-building among faculty and students. We introduced the concept of inclusive excellence and invited faculty and students to reformulate it through individual analysis and separate focus group discussions within faculty learning communities (FLCs) and Thrive student communities (TSCs). Next, we addressed self-awareness and cultural capacity at a primarily white institution (PWI) and designed FLC meetings to build cultural competency (see Figure 1). Seven cohorts of FLCs focused on inclusive teaching. We encouraged professors to reflect on their own cultural backgrounds and biases, fostering self-awareness and introspection through analysis of intersectional identities, discussion of readings on inclusive teaching strategies, and meetings with TSCs. In turn, the TSCs (see Figure 2) shared ideas at FLC meetings and extracurricular events (see Figure 3 and 4). As we proceeded, certain aspects of our comprehensive plans were dropped – e.g., community college pathways and collaborative cross-institutional FLCs – to narrow the focus of our activities.

**Proven Pathways to Inclusive Excellence: THRIVE FLCs**

**1 PURPOSE OF THE THRIVE FLC**  
The Faculty Learning Community (FLC) expands the capacity of STEM faculty to adopt inclusive and anti-racist teaching practices. Faculty become agents critical to creating institutional change.

**2 HOW TO CONCEPTUALIZE THE THRIVE FLC**  
THRIVE FLC, a Community of Practice, facilitates collaboration and deepens knowledge, fostering cultural change in education over the course of three semesters.  
As faculty complete action research, their projects promote inclusive teaching practices featuring: identity, active learning, anti-racism, belonging and reflection on practice.

**3 PLANNING PHASE**  
**Recruit Participants** by aiming for 8-12 faculty in each cohort through digital applications, word-of-mouth and departmental referrals.  
**Design Incentive Structure** where each participant receives a stipend once their year-long project is complete.  
**Track Outcomes** through survey responses and faculty interviews, FLC session discussions, online discussions, faculty interviews, notes on additional roles undertaken by faculty.

**4 ANTICIPATE TRANSFORMATIVE GAINS**  
**Improved Inclusive Teaching Practices:** Overwhelmingly, participants discussed their improvement in pedagogical skills for inclusive teaching and increased awareness about and resources for promoting classroom inclusion.  
**Leadership and Change:** Our facilitators and participants advocated for inclusive practices at department, college, and campus levels.  
**Reforming STEM Learning Environments:** Inclusivity requires ongoing support, addressing faculty resistance, and promoting transformative change.  
**Empower faculty as Agents of Inclusivity:** Impact both classrooms and institutions. See the full article below for details!

Check Out Our Work!

Source: Faculty Learning Communities as a Route to Inclusive Excellence in STEM  
M.A. Siegel, Y. Bee, et al. | Publication: <https://rb.gy/ztft>

hhmi | Howard Hughes Medical Institute | Mizzou | University of Missouri

**FIGURE 2:** These Mizzou students are among those who participated in our Thrive student communities.

**FIGURE 1:** The faculty learning communities at Mizzou aimed to enhance professors’ cultural competency.

**FIGURE 2:** These Mizzou students are among those who participated in our Thrive student communities.



**FIGURE 3:** Fostering greater interaction between faculty and students was a key component of Mizzou’s Thrive IE project.

## During our journey

Given existing research and our current theoretical frame, we actively built capacity for inclusion at our institution by nurturing relationships, cultivating science identities, and developing change agents. We equipped students and faculty to conduct the real work, by teaching them to write community guidelines, organize effective groups, critique traditional procedures, and facilitate difficult discussions. We scaled up these efforts by developing change agents able to make an impact in various departments and units across campus. Students learned to access critical resources and connections within the IE network and gained skills that strengthened their own agency and amplified their voices as they navigated existing structures. They continue to broadcast change within existing structures and societies and their peer groups. Faculty and administrators have also assumed an active role in the project through commitment of resources.

In the latter years of the project, we addressed inequities and expanded involvement in our efforts beyond the participants and leaders of Thrive through a policy culture change (PCC) group. PCC consisted of multilevel teams of staff, undergraduates, faculty, graduate students, and administrators. Using a critical lens, we focused on areas of improvement, then collectively envisioned bold IE aspirations involving strategic collaboration. Campus-wide conversations led by PCC ignited the interest of stakeholders in multiple disciplines. We hosted disruptive and inclusive dialogues around equity and then took action. PCC secured the interest and commitment of members willing to invest in long-term culture change.



**FIGURE 4:** The Thrive project hosted multilevel dialogues about equity and inclusion; pictured here (from the left) are faculty member Charles Nilon and graduate research assistants Patrick Bokolo and Mary Dickson-Amagada.



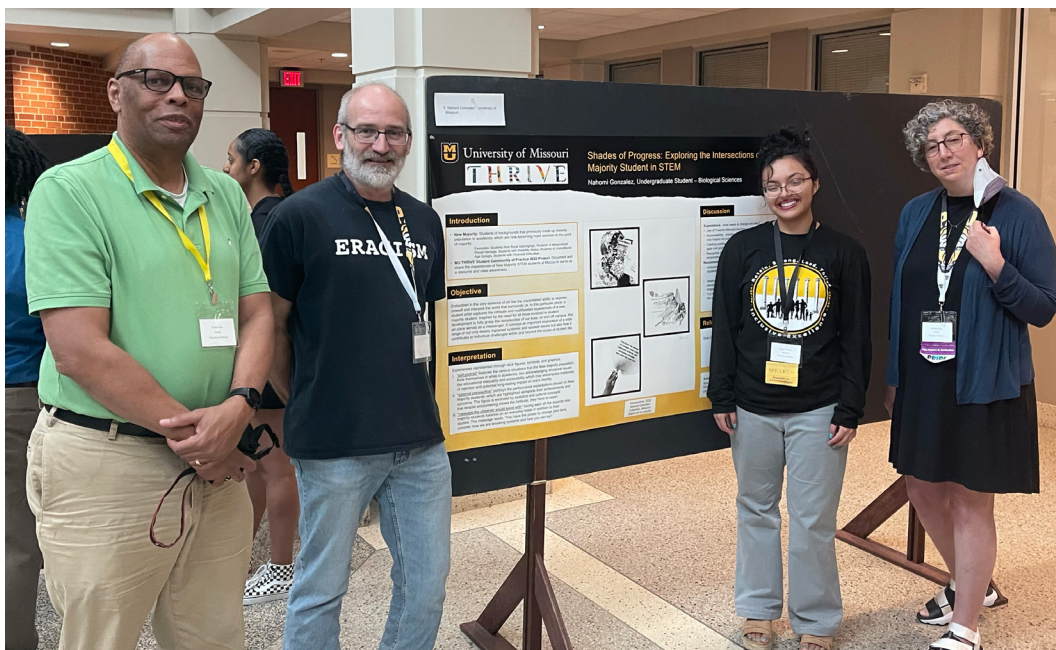
A key obstacle we encountered was the required investment of time and expertise from team leaders – the individuals who co-led either an FLC, TSC, or PCC to ensure its success. Over time, and with shifting responsibilities, one or more leaders showed signs of burnout due to compassion fatigue. In response, we restructured engagements to intermittently alleviate their emotional load.

## Sustaining our journey beyond HHMI

Through partnerships with various campus units, we leveraged the resources, expertise, and knowledge of stakeholders across our campus, developing comprehensive strategies and initiatives. These partnerships will continue to support Thrive participants after the grant period and will create a ripple effect of positive outcomes.

In addition, research tools and professional development resources that we developed during the project will be useful in sustaining change. We designed and validated instruments to measure belonging in undergraduate science departments (Bae, Siegel, et al., 2022) and representation. We developed a new instrument for observing inclusive practices in the classroom (Nguyen, Siegel et al., 2023). Our literature review on inclusive assessment tools promises to generate discussions around pedagogical possibilities and challenges in inclusive education (Franca, Nguyen, et al., 2023). We also tracked teaching and leadership gains made by faculty involved in FLCs, learned ways to scale change, and identified the resources that were most essential to growth (Khajeloo et al., 2021; Siegel, Bae, et al., 2022; Siegel et al., 2022). Thrive research further led to an analysis of effective coping strategies and transformational resistance among undergraduate and graduate students (Khajeloo et al., 2020; Bae et al., 2022).

To address institutional barriers, we've worked on early inversion strategies, such as building a wave of change to sustain momentum and create lasting impacts on our students and early career researchers. The PCC strand was designed to create pockets of structural change and grow additional equitable leaders to sustain the work of the project. Our institution acknowledges the need to shift the prevailing culture over time. We will remain involved in this work as change agents – shaping the mindset of faculty, researchers, and practitioners in the natural sciences. Concerns over surrounding territories, goals, and circumspection have threatened to hinder our initiatives, but Thrive continues to “...highlight the initiative’s early success at avoiding such conflicts and [highlight] how the initiative began in the positive, collaborative ways to create these productive partnerships.”



**FIGURE 5:** Mizzou undergraduate Nahomi Gonzales (second from the right) presented Thrive-related research at a peer implementation cluster meeting with PIs (from the left) Charles Nilon, Johannes Schul, and Marcelle Siegel.



## Reflections

We attempted to sustain student, faculty, and institutional branches of our project; that proved to be too ambitious, as this work takes a toll when change is slow-going. We now understand that the well-being of faculty, staff, and students must be shored up before they become involved in healing systems. We also learned that, as a small group, we need to celebrate local, incremental change as real progress; because we have limited access and control, we must slow down and cite shifts as wins to sustain forward momentum.

A critical strategy we embraced recently was an expansive approach toward STEM. Incorporating the social sciences and humanities within the STEM framework highlights the significance of examining the social, cultural, aesthetic, and ethical dimensions of science. This inclusive approach demonstrates a strong commitment to addressing systemic inequalities and to ensuring that the benefits of STEM are accessible on campus and in society.

Peer implementation cluster (PIC) engagement and HHMI visits reminded our IE teams they aren't alone in facing institutional barriers (see Figure 5). In the context of our current sociopolitical climate, HHMI could additionally support programs by creating more opportunities to engage with peer institutions. Interaction and collaboration among institutions is essential, as fostering community across institutions enables participants to exchange ideas and best practices.

Finally, we acknowledge that larger institutional change requires cultivating major allies on campus and beyond. In this broader mix, Thrive may remain a future asset within a larger project.

## Grant-Derived Dissemination Products

### Conference Papers

Bae, Y., Du, A., Siegel, M.A., and Mahapatra, S. "Building Transformational Resistance of STEM Graduate Students through an Inclusive Excellence Initiative," International Organization for Science and Technology Education, Recife, Brazil, July 25-29, 2022.

Bae, Y., Siegel, M.A., Khajeloo, M., Morton, T.R., Nilon, C., Schul, J., and Shim, H. "College Students' Sense of Belonging in the STEM Learning Ecosystem: Classroom, Department, and University Culture," National Association for Research in Science Teaching (NARST) annual international conference, Vancouver, British Columbia, Canada, March 2022.

Morton, T.R., Bae, Y., Ngai, C., Nilon, C., Siegel, M.A., and Sharma, R. "When Disaster Strikes: Components of the Environment That Shape How New Majority Students Navigate STEM During a Global Disruption to Life and Learning," NARST annual international conference, Vancouver, British Columbia, Canada, March 2022.

Khajeloo, M., Siegel, M.A., Bae, Y., Morton, T.R., Nilon, C., Schul, J., Ngai, C., and Du, A. "The Power of Faculty Learning Communities on the Development of Inclusive Teaching in STEM Learning Environments," National Association for Research in Science Teaching (virtual conference), April 2021.

Khajeloo, M., Taylor, J., Morton, T.R., Siegel, M.A., Schul, J., and Nilon, C. "New Majority Students' Challenges in STEM Education and their Coping Strategies to Thrive," NARST annual meeting, Portland, Ore., March 2020.

Franca, N.,\* Nguyen, T.H.,\* Ngai, C., Siegel, M.A., and Sharma, R. (\*these two first authors contributed equally). "Literature Review: Tools for Assessment of Inclusive Practices," NARST annual international conference, Chicago, Ill., 2023.

Nguyen, T.H., Siegel, M.A., Franca, N., Sharma, R., and Bae, Y. "ITPOP: Development of an instrument for observing inclusive teaching practices in undergraduate science classrooms," NARST annual international conference, Chicago, Ill., 2023.

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# University of Northern Colorado

## Greeley, Colorado

The Inclusive Excellence Teacher-Scholar Workshop (IETSW) program at the University of Northern Colorado (UNC) was developed to support STEM faculty in creating inclusive and equitable spaces. The goals of the program included increasing faculty awareness, providing practice-based strategies, and supporting faculty as they made equity-minded changes in their classrooms to support students historically marginalized by higher education, including students of color, students who identify as LGBTQ+, and first-generation students. In addition, the grant supported the leadership of the College of Natural and Health Sciences (NHS) in increasing their expertise to engage broadly with IE. Both initiatives were designed to provide the college and the campus with a common language to facilitate conversation, institutional introspection, and systemic change.

An early challenge for the project was creating a community of like-minded individuals with the understanding and tools necessary to support equity initiatives on campus. We began this journey with a six-month train-the-trainer series facilitated by Dr. Lindsay Malcom-Piqueux, then of the University of Southern California Center of Urban Education (cue.usc.edu). This opportunity for the grant team, key administrators, and campus equity advocates to gain a shared understanding of our campus's equity challenges, explore disaggregated data, and develop a language for campus conversations was invaluable to our project's success. In retrospect, we would increase the size of the invitation list for this event to include more faculty, as faculty tend to stay longer at a university than administrators.

90%

Developed as a year-long, cohort-based program, IETSW was piloted in early 2018 and implemented and evaluated for four faculty cohorts between 2018 and 2022. The program reached 35% (n=40) of the college's full-time faculty across 11 departments, with a 90% completion rate. Using an equity-minded approach, the IETSW program emphasized faculty members' personal growth, based on the necessity for individual cultural competence in order to achieve long-term change, and explicitly challenged the notion that higher education and STEM content are culture-, race-, and gender-free (or -neutral). The program was supported by over 35 hours of professional development meetings.

The topics covered in IETSW were organized into four categories that reflect various aspects of teaching. Starting with a foundation of faculty cultural competency (who we are), IETSW participants explored the content of their courses (what we teach), their pedagogical approaches (how we teach), and the evaluation paradigms they used (how we assess); they covered the mainstays of academia, including the syllabus, classroom participation, course content, and grading and assessment strategies. Through the iterations of the IETSW program, we faced challenges in supporting faculty as they adopt IE practices. These challenges included 1) shifting faculty members' perception from a student-deficit lens to an equity-minded lens, which requires looking at the institution's responsibility for inequities; 2) helping faculty understand equity and IE as a journey that involves a multitude of ongoing actions rather than a one-and-done approach; and 3) shifting our perception of our work from primarily offering evidence of inequities and strategies to address them to centering faculty members' personal growth and cultural competence as necessary for faculty to engage in this work authentically during and after their participation in the IETSW program. Faculty time continues to be a barrier to exploring complex IE changes, such as developing truly inclusive curriculums.

**THE INCLUSIVE EXCELLENCE TEACHER-SCHOLAR WORKSHOP (IETSW) PROGRAM**

A faculty development model designed to help faculty build inclusive classrooms. A year-long, cohort-based program developed on the understanding that academic spaces are not race-neutral, and that faculty can create more equitable environments for learning when they understand how their practices impact students marginalized by higher education

<p><b>GOALS</b></p> <ul style="list-style-type: none"> <li>Increasing faculty awareness</li> <li>Providing practice-based strategies</li> <li>Supporting faculty to make equity-minded changes in their classrooms to create inclusive spaces</li> </ul>	<p><b>FOCUS ON INSTITUTIONAL AND FACULTY CHANGE RATHER THAN PERCEIVED STUDENT DEFICITS</b></p>
<p><b>CHANGE DEPENDS ON</b></p> <p style="font-size: x-small;">surfacing and challenging assumptions participants have about the role of race in higher education and learning and focusing on small but impactful changes in practice</p>	<p><b>KEY FINDING</b></p> <p style="font-size: x-small;">Over the course of the four years, 40 faculty participated in the yearlong workshops. Throughout these sessions, faculty demonstrated commitment to the program through attending and engaging in conversations at workshops, reading articles, and completing reflection assignments</p>
<p><b>KEY FINDING</b></p> <p style="font-size: x-small;">The knowledge faculty gained stretched beyond theoretical and practical understandings of race, racism, and other biases to including understanding themselves</p>	<p><b>KEY FINDING</b></p> <p style="font-size: x-small;">Data from across measures indicated that participants were making changes in their courses such as making syllabus revisions, increasing communication with students, and indicating that they would continue to implement equity-minded practices</p>

**EXPLORE AND DOWNLOAD WORKSHOP MATERIALS**

We approached sustainability by starting conversations about institutionalizing the IETSW program early in the project. In collaboration with UNC's Center for the Enhancement of Teaching and Learning, the IETSW program was institutionalized in 2021 as the Teaching for Inclusion and Equity (TIE) program. Nine cohorts of faculty and administrators have participated in the TIE program to date. A second avenue to ensure the sustainability of the IE focus more broadly was the development, with institutional funding, of the STEM-Inclusive Excellence Collective (IEC).

The STEM-IEC offers opportunities for faculty, staff, and administrators to continue to engage in IE; supports access to disaggregated data, including equity disparities at the course level; and facilitates faculty, staff, and administrative learning communities.

Gains have included a standing NHS equity and inclusion committee, an annual NHS IE professional development day for faculty and staff that is attended by over 120 college community members, equity-focused changes to our hiring practices, and a faculty associate to the NHS dean for IE. Some of these initiatives have garnered the attention of the Provost's Office, helping to speed up their campus-wide adoption. Many IETSW participants are active members of university-wide conversations and committees committed to creating equitable and inclusive environments for our students – an essential step as our campus purposely continues to emerge as a Hispanic-serving institution.

We learned many valuable lessons as our understanding of IE continuously evolved throughout the project. First, a critical evolution of the IETSW program was challenging the participants to take their own, more personal journeys. By focusing on reflection and reflexivity as well as action, IETSW participants were empowered to make lasting changes in their courses and instructional practices. Second, when designing sessions around small, impactful changes, we learned to avoid the temptation to teach a theory. Instead, we applied the theory to the context; participants want to know what to try in their classrooms, not learn a new theory. Third, creating appropriate documentation was worth the effort because it allows others to adopt our work at UNC and beyond. All the materials for the IETWS program are available at [www.unco.edu/nhs/stem-inclusive-excellence-collective/](http://www.unco.edu/nhs/stem-inclusive-excellence-collective/). The materials have a creative commons license that allows for the use of derivatives with attribution, and they are supported by detailed facilitation guides to decrease barriers to their implementation.

More generally, we found that perceiving this work as an ongoing conversation is essential, and the time taken for learning and creating a common language and understanding is worth the investment. For example, discussions within the NHS leadership team draw on shared experiences and a collective willingness to experience discomfort. These conversations allow us to better serve our campus. We challenge ourselves to humanize equity data by converting percentages to people, which increases buy-in by faculty and administrators alike. And, finally, we continue to institutionalize the work, to address the fact that change takes time and we need to onboard new faculty and staff to the norms and expectations around IE in the college and university.



## Grant-Derived Dissemination Products

### Publications

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# University of Puerto Rico Humacao

## Humacao, Puerto Rico

When we started our inclusive excellence journey at the University of Puerto Rico at Humacao (UPRH), we knew we needed to focus on capacity-building – including enhancing our educational resources, curriculum, and physical infrastructure – and/or on increasing our competencies, leadership, effective behaviors, and university members’ expertise. Our main challenge was the lack of a faculty development culture, since activities revolved around student improvement, and without the community accelerating activities’ success, most were unsuccessful. In 2015, a university subcommittee on retention identified characteristics of high-risk students. The high-risk cohort, which accounts for 10% of the total student population, included 20% of first-generation college students, 80% of those from low socioeconomic status families, and 65% of admitted students who registered with the intent to transfer to other academic programs; also, 22% more males than females drop out. Additional risk factors were a perceived lack of relevance in courses outside their discipline and the lack of a sense of belonging within the academic community.



**FIGURE 1:** The PROUD program sponsored a “Draw your favorite scientist” contest.

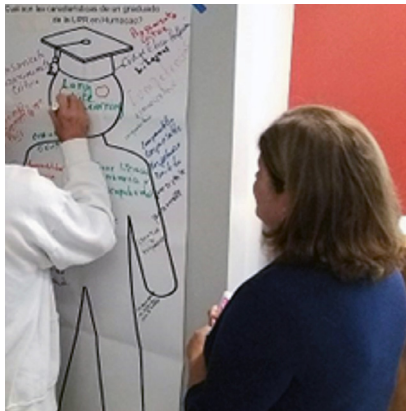
Our Puerto Rican Outstanding Undergraduate Diversified (PROUD) program focused on understanding the various UPR institutions’ deficiencies to properly support our students, improving our STEM curriculum, enhancing faculty-student interactions, increasing students’ out-of-class engagement and sense of belonging, and expanding experiential opportunities – with the ultimate goal of increasing graduation rates for at-risk students. The project focused on creating a Center for Inclusive Teaching and Learning (CITL) to provide long-term benefits to Latino/a students in STEM, including first-generation students, Afro descendants, and women from low socioeconomic status families. We focused on the strengths of our Latino/a students, not their deficiencies, and on empowering faculty (see Figure 1 and <https://www.uprh.edu/proud/>).

Our main strategies were to create, validate, and impart a Latinx culture survey; develop learning communities within academic departments and for service personnel; unravel the power of storytelling; design a science communication course; produce a publication on the lack of Black Puerto Ricans in STEM anti-colorism trainings; and develop a hub for STEAM (science, technology, engineering, arts, and mathematics) Puerto Rican researchers at the 64 Hispanic-serving institutions (HSIs) on the island.



**FIGURE 2:** Attendees at the 2019 inclusive excellence STEM boot camp.

Interviews with upper-level administrators revealed a high level of commitment. We confirmed that our students see structural barriers to their success, including transportation, accommodation, parenthood, and economic challenges. We also identified a need to improve connections and communication with faculty, implement better teaching methods, and institute scaffolding opportunities. As a result, we planned and executed a presemester STEM boot camp from 2019 to 2022 for all incoming STEM students (see Figure 2). About 200 students enrolled; participants rated the camp as an excellent experience, and it has resulted in a 94% retention rate four years after its implementation.



**FIGURE 3:** Inclusive excellence trainings were held for faculty and staff at UPRH.

We also identified training opportunities for faculty, such as the Partnership for Undergraduate Life Sciences Education (PULSE) Ambassador program and regional Project Kaleidoscope (PKAL) conferences offered by the American Association of Colleges and Universities. Our general chemistry course was revamped using inverted classrooms, which raised the rate of A, B, or C grades to 82%. The most critical change was PROUD faculty development. Faculty are now empowered to present their STEM educational findings at national conferences ( $n \approx 13$ ), offer seminars ( $n \approx 9$ ), and be trained as entrepreneurs in education ( $n \approx 10$ ). Activities were conducted by Puerto Ricans familiar with the context of colorism who also inspired faculty to plan novel trainings to ensure their sustainability (see Figure 3).

The grant-writing training sessions encouraged adjunct faculty to write grants and supported them in that effort. The learning communities and innovation grants provided opportunities to conduct research and present the findings. Examples include the recently funded HEARTS (Puerto Rican Higher Education Researchers Association, Thriving not just Surviving) conference (see Figure 4) and a DIVAS (*Diversificadas y Valientes* – Diversified and Brave) HSI grant from the National Science Foundation (NSF). HEARTS convened faculty from all over the island to stimulate well-being and collaboration, and DIVAS aims to improve the math self-efficacy of Latinas in STEM.

The center has become a generator of innovative ideas to increase institutional efficiency and decision-making effectiveness. Nonfaculty (*no-docente*) and staff have become part of the PROUD community and have provided trainings on the use of electronic signatures/official documents. Staff, especially Black Puerto Ricans, are joining the anti-colorism trainings and telling their stories of discrimination at home and at work – a real second-order change.



**FIGURE 4:** The NSF-PR HEARTS conference, for faculty across all higher ed institutions in Puerto Rico, was held in San Juan in December 2022.

The main obstacle faced by the PROUD program was lack of an institutional culture around educational research and faculty training. Findings from various initiatives are being published and compiled into an electronic manual that can be disseminated to spread word of strategies to foster Latinx inclusion in STEM. An example is our publication on the interrelationships among colorism, colonialism, and the culture of STEM in Puerto Rico – a real eye-opener for STEM faculty who had never even considered the lack of Black Puerto Ricans in their programs. As scientists, we didn't consider the relevance of colonialism on our island, but now we have an awakened group that wants to decolonize their STEM classrooms and highlight Afro-Latinx discoveries.

The HHMI grant has made a significant difference in achieving institutional buy-in, faculty incentives, and impactful second-order changes at the institutional level. Dr. Edwin Barea's workshop, *Creating Synergies amongst Latinx Higher Education*, was open to faculty across the island's public and private higher education communities (including community colleges). The grant enabled us to establish a centralized Center for Inclusive Teaching and Learning and implement an entrepreneurship professoriate. Dr. Lilliam Casillas was appointed to a committee of the University of Puerto Rico board of trustees to establish a new DEI policy at a system-wide level. And we hosted the NSF-HEARTS conference in collaboration with PKAL.

The center has become a generator of innovative ideas to increase institutional efficiency and decision-making effectiveness.

The grant also strengthened the institution's capacity-building. Faculty discovered and explored approaches for self-care and wellness, gained an improved sense of belonging, established sustained dialogue on how to support mostly rural, low-income, first-generation Hispanic students in STEM, and gained strategies and tools for competitive grant-writing and streamlining bureaucracy.

Having HHMI staff from all levels on our side has been remarkable. UPRH is a small and insignificant institution, and having funds to achieve so much has been wonderful. The ability for faculty to travel with our kids has been invaluable – so we can grow as women without having to decide whether to be a mom or a professional. We did not worry about our intersections as parents, friends, spiritual beings, peers, and, above all, Latino/a Caribbeans being criticized. We felt very free, and that came from the wonderful team of professionals in the HHMI IE Initiative. HHMI has set a high standard for others to follow. Dr. David Asai spoke with our undergraduate students and made them feel special – this spoke louder than words. The evaluation system of measuring our reflections and not our numbers allowed us to really compete against institutions with more resources.

We have learned that building institutional capacity requires patience, self-care, and stubbornness, as well as empathy; that we must champion those willing to lead institutional change; and that we need to take things one day at a time, but without losing sight of our vision.

## Grant-Derived Dissemination Products

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Vazquez, Y.S. "Active learning: Experiences from the Neuropsychopharmacology course," Department of Biology, UPR-Humacao, 2023.

Casillas-Martínez, L. "Beyond Broadening Participation: Research to Progress to Impact" (panel presentation), National Academy of Sciences Committee on Advancing Antiracism, Diversity, Equity, and Inclusion in STEM Organizations, 2023.

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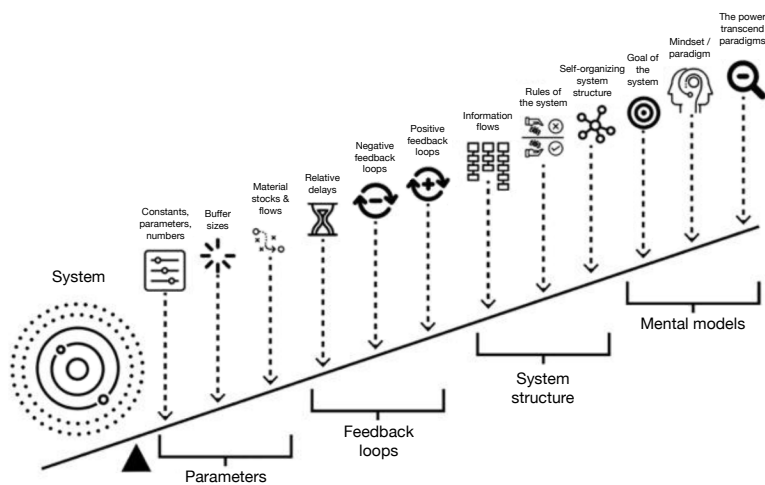
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# University of South Dakota

## Vermillion, South Dakota

South Dakota is a predominantly white state; as of 2020, 80.8% of South Dakota residents were non-Hispanic white. The University of South Dakota (USD) is even more predominantly white than the state, with 83.2% of students identifying as non-Hispanic white in fall 2022. The difference between the state and USD demographics is even larger for Native American people, with 9.0% of the state's residents identifying as "Native American only" in 2020, and 1.4% of USD students identifying as "Native American only" in fall 2022. Within USD, the percentage of science majors who are persons excluded due to ethnicity or race (PEERs) is lower than the percentage of all students who are PEERs, with 9.3% of science students identifying as PEERs and 0.5% of science students identifying as "Native American only" in fall 2022. Therefore, the goal of USD's HHMI Inclusive Excellence project (USD-HHMI IE project) was to increase the percentage of science majors at USD who are PEERs, with a focus on Native American students.



**FIGURE 1:** Hierarchical list of leverage points from least effective (left) to most effective (right) from Meadows, 1999. (Figure credit: Angheloiu and Tennant, 2020)

Because the systems that were designed to exclude some people from higher education have developed over centuries in the United States, correcting those systems will also likely be a long-term process. Systems scholar Dr. Donella Meadows developed a hierarchical list of 12 leverage points based on their ability to effect change in systems (Meadows 1999, see Figure 1). Most of the leverage points targeted in the USD-HHMI IE project were lower-order leverage points that targeted “parameters” and “feedback loops” in USD’s system (see Figure 2 for a summary of the USD-HHMI IE project activities). These activities generally sought to facilitate PEER, especially Native American, students’ ability to persist at USD. The activities included financial and personnel support for PEER-focused student services, programming, and science-focused student organizations; peer mentoring; and applied introductory science course offerings. A few of our efforts sought to effect change

at higher-order leverage points (in “systems structure” and “mental models”). For example, we sought to change the rules of the system through policy changes in faculty promotion, tenure, and annual evaluation guidelines. We also worked toward changing mental models by offering faculty and administrator trainings around diversity, equity, and inclusion.

The USD-HHMI IE project was not a linear progression toward increasingly more impactful leverage points. We began the activities to facilitate PEER persistence in Year 1 of the project and were generally able to continue those activities throughout the project. In most cases, we have found longer-term options to continue these activities beyond the HHMI grant funding. We added more of the higher-order activities in Year 2 of the project, and in Year 3, systems larger than USD began to stall and reverse most of our higher-order activities. For example, the USD policy changes in faculty promotion, tenure, and annual evaluation guidelines were almost completely undone after political pressure against DEI work increased at the state level. In response, the USD-HHMI IE project pivoted to doing more “feedback” activities for faculty and staff – largely seeking to dampen the positive feedbacks that were causing, and will likely continue to cause, faculty, staff, and administrators supportive of DEI initiatives to leave USD.

One critical lesson that we learned over the course of the USD-HHMI IE project was that sometimes institutions move two steps forward and six steps backward. During these backslides, some people will need to leave USD to go to places where they are valued and supported. Some people will want or need to stay. During these more challenging times, we need to be strategic about how to use our (limited) capacities. We need to help our students, faculty, staff,

Audience	Activity	Years conducted	Primary leverage point
Students	Panopto lecture recording technology <sup>1</sup>	Years 1-3	Buffer size
Students	Support for student science organizations: American Indian Science and Engineering Society (AISES) & Advancing Chicanos/Hispanics and Native Americans in Science (SACNAS)	Years 1-7	Constants, parameters, numbers
Students	Wawokiya peer mentoring program	Years 1-7	Negative feedback loops
Students	Applied science first-year experience courses	Years 2-5	Material stocks & flows
Students	Biology peer mentoring program	Years 3-7	Negative feedback loops
Students	Native American living learning community	Years 5-7	Positive feedback loops
Students	Native student services programming	Years 5-7	Positive feedback loops
Faculty	Course design fellowship training	Years 1-7	Positive feedback loops
Faculty	Developing more inclusive promotion, tenure, & annual evaluation guidelines	Years 2-3	Rules of the system
Faculty	Creating implicit bias in promotion and tenure guidelines	Years 2-3	Rules of the system
Faculty	Digital accessibility mentor program	Years 5-7	Information flows
Faculty	Developing inclusive academic advising training	Years 6-7	Positive feedback loops
Faculty, staff, & graduate students	Entering Mentoring training (especially for research mentors)	Years 1-7	Positive feedback loops
Faculty, staff, & administrators	DEI-focused trainings and workshops (on and off campus)	Years 2-7	Mindset/paradigm
Faculty and staff	DEI-supportive committee	Years 6-7	Negative feedback loops
Administrators	Anti-racism training	Years 2	Mindset/paradigm
USD-HHMI IE leadership team	Peer implementation cluster (PIC) DEI-focused trainings and workshops	Years 1-7	Mindset/paradigm
All USD	Native American and DEI-focused programming (on campus)	Years 1-7	Mindset/paradigm

**FIGURE 2:** Summary of USD-HHMI IE project activities.

<sup>1</sup> We began this before the COVID-19 pandemic.

and administrators to persist while continuing to inch forward toward making USD a place that recognizes that historical contexts affect people differently and that USD is a better place when we are striving to be more equitable and inclusive.

We have also learned that holding space is important, and that people with more privilege and security at USD should do more of the organizing work for these efforts. We created a standing committee for DEI-engaged faculty and staff to set a time and space to gather. We have used HHMI IE grant funds to support physical spaces and programming for PEER students. Having these spaces provides community around the challenges, and it provides space to share wins from across campus to remind ourselves of the tremendous amount of good work that is still happening.

Although our project was not able to push forward on many of the higher-order leverage-point activities, we were able to educate hundreds of USD faculty, staff, and administrators through

our activities. As one of our former associate vice presidents of diversity said, he saw his position as planting seeds, and he understood that he may never see the fruits of that labor. We feel the same about the USD-HHMI IE project: we have planted a lot of seeds and are continuing to nurture the seedlings of our efforts.

## Reflections

The USD-HHMI IE project was not a linear progression toward increasingly more impactful leverage points.

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Turgeon-Drake, J. "Entering Mentoring: Inclusive faculty to student mentoring," AAC&U Conference on Diversity, Equity, and Student Success, New Orleans, La., March 17-19, 2022. <https://red.library.usd.edu/isi/26>



# University of St. Thomas

## Saint Paul, Minnesota

The racial, ethnic, and socioeconomic diversity of students at the University of St. Thomas has grown dramatically over the past 10 years, but the retention of these students in the sciences was not keeping pace with that growth. Disaggregated institutional data suggested that the university's culture was not as supportive of students of color, first-generation college students, and low-income students in the sciences as it was of students on average.

Prior to the university's receipt of the HHMI IE grant, many individual faculty members in STEM departments at St. Thomas had implemented first-order inclusion strategies. However, there had been no coordinated efforts to inculcate a culture of inclusion at the college-wide level. Disciplines were largely siloed, without much interdepartmental communication among faculty. Departments invested little time or money in inclusion efforts, few departments had DEI committees, and no individual or committee was tasked with coordinating DEI efforts.

The STEM Inclusive Excellence grant gave St. Thomas the ability to grow in significant ways – namely, investing in culturally sustaining faculty advising, developing an internal team of faculty with DEI expertise who could support each other within and between disciplines, and investing in university-wide community-building efforts that empowered faculty and staff to develop habits of inclusion that will outlast our funding from HHMI.

### **Faculty advising**

Faculty advisors can be a source of support and mentoring for underrepresented undergraduates, but faculty were not receiving explicit training in how to communicate with and support students who might feel alienated by the dominant culture at St. Thomas. Our STEM Inclusive Excellence team realized that fostering more personal connections between advisers and advisees could be a powerful way to support students and nurture communication and trust. Using this lens, STEM Inclusive Excellence developed a training for faculty advisers that was centered on appreciating personal narratives, forging healthy advising/mentoring relationships, exploring cultural values, recognizing and dealing with biases and stereotypes, and sharing the hidden curriculum of higher education. All these trainings started with STEM faculty, and they have since expanded to serve faculty from many other departments as well.

These IE-trained faculty advisers were then assigned underrepresented science-interested students; they also participated in an adviser learning community to continue to learn and practice their advising skills, as well as to share their experiences so as to learn from each other. More recently, faculty advisers have taught St. Thomas's new one-credit, first-year

experience course to their advisees, increasing adviser/advisee face time and strengthening their relationships. These courses are also each assigned an upper-level science major, who serves as a peer mentor for the students taking the course. Student feedback suggests that the remarkable increase in the retention of underrepresented STEM students between the first and second year is largely due to the strengthened relationships in the first-year advising model.

## STEM professional development

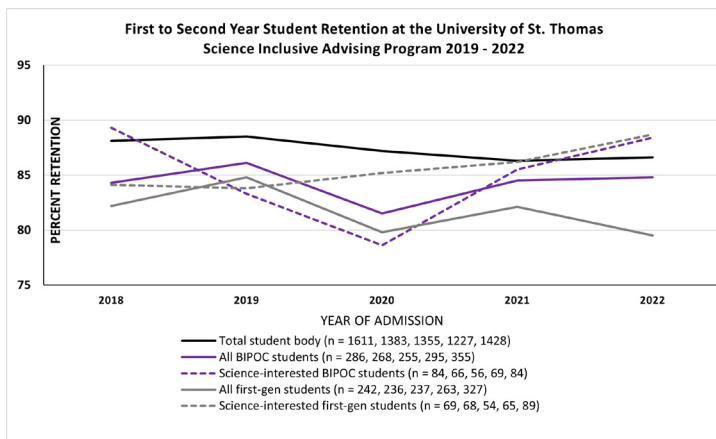
Part of the success of our IE programming was due to aligning its activities with the culture of STEM departments. Professional development efforts had previously sometimes been dismissed by STEM faculty because they were perceived as being intended for liberal arts audiences, were offered at times incompatible with STEM class and lab schedules, or were held in buildings physically distant from the campus's STEM buildings. Offering seminars and workshops that meet the specific needs of STEM faculty was one key to the success of our efforts.

## STEM pedagogy experts

STEM Inclusive Excellence gave small grants to STEM faculty to experiment with making their class and lab spaces more inclusive, and then those faculty presented the insights they gleaned to their colleagues at Lunch and Learn workshops. Faculty not only have become more likely to try new inclusion techniques, but also have reported being inspired to try new things based on their colleagues' experiences and have come to see colleagues as sources of knowledge across STEM fields.

## Investing in community

St. Thomas already had inclusion-oriented activities underway that STEM Inclusive Excellence supported to get more STEM faculty involved (e.g., Ramadan iftar meals). These activities included Seeking Educational Equity and Diversity (SEED) groups, faculty and staff reading groups, summer social justice student/faculty discussion groups, and training in nonviolent communication. Built into structures that already existed, these activities built community across all disciplines and ensured that inclusion efforts became more widely distributed and sustained.



**FIGURE 1:** Student retention from first to second year at the University of St. Thomas (with the data presented in graphic form).

## Sustainability

The efforts made by the STEM Inclusive Excellence team have largely been institutionalized. Faculty advising is taking the lessons learned from our program and is incorporating them into new advising models based on culturally sustaining approaches. For example, first-year experience courses are intentionally revealing the hidden curriculum of higher education; STEM departments have now created DEI committees that encourage department-wide inclusion-focused pedagogy; our Center for Faculty Development has committed to sponsoring STEM-specific workshops; and STEM faculty are more involved across campus in efforts that foster inclusion.

The activities mentioned above, including the synergies with other parts of campus, have improved the retention of science-interested underrepresented students to a rate equal to the university average (see Figures 1 and 2). Showing that our work improved student retention motivated upper-level administrators to adopt our strategies beyond the life of the HHMI grant and spurred the creation of a faculty position focused on maintaining this momentum.

		Year		
Population		2019	2020	2021
Total student body	Percent retention	87%	86%	86%
	Number of students	1,383	1,355	1,227
All BIPOC students	Percent retention	85%	78%	83%
	Number of students	268	255	295
Science-interested BIPOC students	Percent retention	83%	79%	86%
	Number of students	66	56	69
All first-gen students	Percent retention	84%	77%	82%
	Number of students	236	237	263
Science-interested first-gen students	Percent retention	84%	85%	86%
	Number of students	68	54	65

**FIGURE 2:** Student retention from first to second year at the University of St. Thomas (with the data presented in tabular form).

## What did we learn?

One important thing we saw again and again was that building a culture of institutional capacity for inclusive excellence requires building relationships of trust within and across disciplines. One-and-done workshops were able to impart specific skills, but semester-long book studies were better at increasing the likelihood that faculty would work together toward equity in the future. Developing a culture of internal expertise was also helpful. Outside presenters can bring fresh perspectives, but knowing whom to contact within the school builds better networks and emphasizes that we all contribute to this work. This network has built a culture where people hold each other up when things get tough. This network has also supported individuals transitioning to formal leadership roles within the university (e.g., associate deans).

This work takes time and sustained energy. When this energy comes from the bottom and is supported in words, actions, and

funding from the top, people on the edges of this work get pulled in. The commitment from above and below also creates a culture of innovation and support for newer faculty, who come with ideas but might not immediately have the confidence or sense of security to try new things.

There are challenges ahead. Changes in leadership slow the progress of this work as new leaders get up to speed and relationships of trust are established. Efforts at inclusion are worthwhile when students perceive them as supportive, but we do not have an effective, sustainable way to get student feedback on our efforts. Although St. Thomas has more work to do, our community is committed – with both actions and funding – to creating space for everyone.

## Grant-Derived Dissemination Products

### Publications

Introductory chapter and three narratives in *Green Card STEM Voices: Stories from Minnesota Immigrants working in Science, Technology, Engineering, and Math*, ISBN: 978-1-949523-14-0. (2021)  
<https://www.greencardvoices.org/stem-voices-mn/#1625110306548-ed54b292-2d138da2-46e5>

### Presentations

Acton, K., Besser, D., Nepal, K., and Holte, J.E. “Engineering a Transfer Friendly Experience with Alternative Pathways to Excellence” (poster), American Society for Engineering Education annual conference, 2023.

Bru, L., and Prichard, R. “How Can We Confront Barriers and Center Students in Undergraduate Research?” American Association of Colleges and Universities (AAC&U) Diversity, Equity & Student Success conference, March 2023.

Loe, M., Smeltekop, H., and Hart, R. “Inclusive Advising: Building Equity into STEM Education,” AAC&U Transforming STEM Higher Education conference (virtual), March 2021.

Loe, M., and Smeltekop, H. “Inclusive Advising: Building Equity into STEM Education,” University of St. Thomas Equity in Action: Cultivating Antiracist Universities conference, April 2021.

Prichard, R. “Incorporating Maslow’s Hierarchy of Needs into Considerations of Student Support and Achievement,” AACU Transforming STEM Higher Education conference, October 2018.

# University of Texas Rio Grande Valley

## Edinburg & Brownsville, Texas

### When we began our journey

The University of Texas Rio Grande Valley (UTRGV) is a Hispanic-serving institution (HSI). Many of the students who attend UTRGV are first-generation college students and some are also from migrant, bilingual or non-English-speaking, and/or impoverished families. These students often do not have family guidance to help them navigate college life, and sometimes they also must work to financially support their family and themselves. They find earning an undergraduate degree in STEM difficult, so their retention rates in STEM programs and careers are low.

We proposed to create a “community of care” for students in our BS in biomedical sciences (BMED) program, so that the transition to college from high school would be easier, in the hope that eventually underrepresented minority participation in STEM careers would increase. The major components of this “community of care” were a student success manager, an instructional facilitator, and peer mentors who would provide academic as well as non-academic advising and support. Our plan also included tutoring/instructional facilitation through mandatory coached study hours during students’ freshman and sophomore years.

### During our journey

- Although the objective of the innovative “community of support” was to improve BMED students’ academic performance, academic success, retention, four-year graduation rate, and successful entry into biomedical careers, we have not yet seen statistically significant differences between the various cohorts since 2017. But first-year retention and four-year graduation rates for BMED students were already higher than our institution’s averages.
- However, qualitative measures – such as student exit surveys, student panels, and BMED alumni testimonials – attest to our success in creating an environment of inclusion in the BMED program. Students express a sense of belonging in the BMED program and feel recognized and supported as individuals by faculty, staff, and peers. This has attracted students from beyond the RGV as well. And 25% of the students in the prestigious Luminary Scholars program, launched by UTRGV last year (it waives educational expenses for four to eight years, from undergraduate through graduate/medical school) were BMED freshmen.
- We started with a student-deficit mindset, but we realized that engaging in faculty development to foster a student-asset mindset was critical to achieving inclusive excellence. To enable this, several of our team members attended the faculty development workshops at the annual peer implementation cluster (PIC) meetings held at Western Washington University (WWU); the University of Utah; and the University of California-Davis. At UTRGV, we hosted a two-day Courageous Conversations “Beyond Diversity” workshop, which was eye-opening as well as generally well received. We also provided faculty and administrators with training in inclusive research mentoring from the Center for the Improvement of Mentored Experiences in Research (CIMER) and virtual training in data-driven decision-making from the American Association for the Advancement of Science’s SEA CHANGE (STEMM Equity Achievement Change) project. There are numerous other opportunities to participate in training or faculty learning communities (FLCs) at UTRGV’s Center of Teaching Excellence (CTE). One of them was an inclusive pedagogy FLC that several STEM and BMED faculty attended. However, few faculty typically apply to be recruited to FLCs and professional development sessions, and it is often the same people who do so. Therefore, we have decided to focus on a core group of equity- and inclusion-minded faculty and are training them, in the hope that they will help us broaden the scope of IE thinking to more faculty through their leadership, role modeling, and facilitation of further faculty training. They can also help influence revisions of faculty review, tenure, and promotion policies and processes, so that rewards for engaging in IE initiatives are incorporated in those processes.



- This year, after a site visit evaluation, we received “silver” recognition from the National Science Foundation (NSF) Partnership for Undergraduate Life Science Education (PULSE) program. It became apparent during our journey of self-assessment and evaluation that our curriculum and syllabi may not be as student-centered as we wished. Hence curriculum revisions to align student learning objectives with classroom activities and assessments, and the process of mapping course learning objectives to program objectives and student success, are ongoing.

## Sustaining our journey beyond HHMI

- Our PIC has provided close-knit interactions among members and has resulted in a successful collaboration between UTRGV and WWU, funded by an NSF Improving Undergraduate STEM Education (IUSE) award. This award will allow us to continue our work with STEM faculty and administrators by offering professional development in research-based equitable and inclusive pedagogy, effective peer observations, and policies and processes that reward faculty who implement equitable and inclusive pedagogy.
- We have continued to collaborate with UTRGV’s CTE – and will keep doing so – to sustain our faculty development efforts.
- The Learning Center has partnered with us over the past few years to provide BMED tutors who can help faculty provide supplementary learning activities to our freshmen and sophomores during the mandatory coached study hours.
- Finally, we also successfully expanded our efforts through a National Institutes of Health-funded Bridges to Baccalaureate (T34) award to help transition local community college students to the UTRGV BMED program, increasing our institutional capacity to be inclusive. We have put in place articulation agreements between our institutions to ease the transfer of community college students into the BMED program – a process that can be utilized by both funded and non funded students.

## Reflections

- We evolved in our understanding of the fact that excellence truly comes from inclusion of diverse perspectives, experiences, and beliefs and from ensuring that equitable opportunities are created for differences in student and faculty experiences. From this understanding, we have started to move away from student-deficit to student-asset mindedness. This has meant investment of time and effort to create faculty and peer mentoring opportunities for students, revising curricula to be student-centered and inclusive, and creating processes and policies that reward faculty who engage in inclusive and equitable practices. This is work in progress and is taking place largely at the department level.
- Institutional collaboration/support has come from the Office of Student Success, the CTE, and the Learning Center, all of which practice student-centered and students-as-assets thinking. The thing we should have done differently is to engage more across-campus institutional partners, by communicating earlier and more frequently with university stakeholders about what we were trying to do with this funded project – although word of it eventually spread, even though we did not actively publicize it other than during interdisciplinary team leadership meetings.
- Public dissemination of our work, through educational research conferences and publications, should have happened earlier, but the impact of the pandemic delayed collaborations and meetings.

## Grant-Derived Dissemination Products

Nair, S., Lopez, L., Guajardo, H., Rodriguez, H., and Chew, S. “A biomedical community of support to enhance Hispanic student success and diversity, equity, and inclusion,” Scholarship of Teaching and Learning Conference at UC-Davis, December 1-2, 2022.

# University of Utah

## Salt Lake City, Utah

When we started this journey, our aspiration for the University of Utah (the U) was to become a model for R1 institution-community college partnerships that aim to provide a supportive and cohesive experience for transfer students and marginalized students. Our goal was for faculty to gain the skills to teach effectively and inclusively and to remove barriers to student success from institutional policies. The problems we addressed through our Utah Pathways to STEM (UPSTEM) project included the following:

- Low numbers of STEM students transferring from Salt Lake Community College (SLCC) into STEM disciplines at the U.
- High attrition rates among transfer students and marginalized students from STEM disciplines at the U, relative to attrition rates among “traditional” students and/or non-STEM students.
- Unrealistic degree pathways.
- Loss of credits upon transfer.
- Exhaustion of financial aid.
- Mixed messaging about the benefits of early completion of general education requirements versus prerequisites for STEM courses.

Our team used several strategies to work toward these five intended outcomes:

### Outcome

1

#### **Develop articulated, clear academic pathways for STEM transfer students**

Disciplinary articulation teams composed of faculty and advisers from both institutions worked together to align learning outcomes and course sequencing and to build realistic pathways for transfer students. This resulted in two new transfer-specific AS degrees based on actual math entry points. They accomplished this by shifting some general education requirements to make room for math and science prerequisites. Although this disrupted the standard model for AS degrees in the state, by working with partners across the state system of higher education, they were able to get the new degrees approved. Another impactful outcome from the articulation teams has been strong relationships that have developed between faculty at both institutions. Faculty and advisers who had never interacted before are now collaborating on research projects, curricular innovations, and student advising.

### Outcome

2

#### **Increase the capacity to make data-driven decisions**

We engaged the U’s senior associate vice president of academic affairs, SLCC’s provost, and the directors of each institution’s institutional advancement division to broker an agreement for sharing student-level data. Significant resistance was encountered based on perceptions of law, policy, and tradition around data availability. The essential features that allowed us to overcome this resistance were incorporating double-blind coding of student identities and placing a term limit on the agreement. This data is now being used to inform programmatic interventions and to identify areas where students need more support. This level of data-sharing is unprecedented among Utah’s higher education institutions.

### Outcome

3

#### **Build a model curriculum for STEM inclusion**

The Being Human in STEM course was implemented in 2019, based on work at Amherst College. The course engages students and faculty in learning about equity in STEM and culminates in student-led projects. Four faculty coteach the course, but it is intended to be a learning experience for the faculty as well as the students. UPSTEM will support the course through 2024, with long-term support from the U currently pending.



**FIGURE 1 (LEFT):** Over 400 potential transfer students and 60 faculty and staff attended the 2022 STEM Success Fair at Salt Lake Community College’s Dumke Center for STEM Learning. The fair gave students a chance to talk with faculty from both institutions about STEM career paths and helped them foster connections that will support them through the transfer process. The fair was organized by the Utah Pathways to STEM (UPSTEM) project, a collaboration between the University of Utah and Salt Lake Community College that is aimed at building capacity to support transfer students and marginalized students in STEM courses. UPSTEM is funded through our grant from the Howard Hughes Medical Institute’s Inclusive Excellence Initiative. **FIGURE 2 (RIGHT):** Faculty and staff gather annually to share successes, discuss challenges, and make plans for future inclusive excellence work at an end-of-year celebration sponsored by UPSTEM. Over 100 faculty and staff have been involved in the project since its inception in 2017; this photo depicts the 2019 attendees.

## Outcome 4 An ongoing faculty learning community (FLC) committed to inclusive excellence

Originally, we engaged small groups of faculty in projects that addressed issues of institutional capacity for inclusion. This worked well for our first cohort of faculty, who were already engaged in this type of work. However, with each subsequent cohort, faculty seemed to be slightly less knowledgeable about the challenges of achieving equity and more in need of information, training, and community-building. This is clearly a positive result, because it means we have attracted participants not previously engaged with questions of equity, but it’s been challenging to take the work to the next level. Nevertheless, the FLC continues to promote culture change at both institutions. The FLC created recommendations for the dean based on our climate assessment (see below), participated in the Inclusive STEM Teaching Project, created a summer journal reading club, tested out new (to them) pedagogic techniques, and conducted joint research on the impact of diverse Scientist Spotlights on STEM students’ sense of belonging.

## Outcome 5 An inclusive culture for transfer and marginalized populations

This outcome has been our biggest challenge. Our strategies included conducting a college-wide climate assessment and coordinating transfer student support efforts across both campuses. Mistrust of the methods and results of the climate assessment derailed some efforts so, as an alternative, we engaged the FLC in developing recommendations that would help *all* students in the college. Some of these recommendations were acted upon (such as the college equity, diversity, and inclusion committee), and some have not been addressed (such as equity work in retention, promotion, and tenure decisions). However, we feel that we’ve been successful in building and coordinating transfer advising and recruiting across the campuses, including hosting the hugely popular [STEM Success Fair](#) at SLCC, where faculty from both institutions met with over 400 potential transfer students for a “soft handoff” to the U. The dean of the school of science at SLCC was crucial to making this event successful by encouraging faculty and students to attend and by donating space, raffle prizes, supplies, and staff time.

## Reflection and sustainability

**When we started working on this project, we were hopeful about achieving cultural and institutional change.** We can now say that we have accomplished some but not all of our goals. The new degrees, the relationships between faculty, the research on institutional partnerships, the data-sharing memorandum of understanding, and the practice of bringing faculty together to become better mentors and teachers will continue. To date, 66 faculty from both institutions have participated in the FLC, and the U's Office for Faculty will continue to support the FLC for a minimum of two years following the sunseting of the grant. Also, spin-off FLCs formed at SLCC and in the College of Mines and Earth Science at the U and articulation teams continue to communicate within departments. These are real investments in infrastructure that will enable future cultural change; however, achieving lasting change remains a challenge. Entrenched systems are remarkably resistant to change, and this work will require ongoing reflection, iteration, and questioning to continue to drive progress. One crucial lesson we learned is that faculty engagement is critical – more so than administrative buy-in, as turnover is high in the administrative ranks. That said, administrative buy-in is crucial for enabling faculty to engage in equity work, and we are confident that UPSTEM has made lasting impacts on administrative goals.

## Grant-Derived Dissemination Products

Berryman, J., Beagley, T., Godsey, H., and Caldwell, C. "Realistic Transfer Pathways: Redefining the concept of an associate degree," Association of American Colleges and Universities (AAC&U) Transforming STEM Higher Education conference, November 5-7, 2020.

Godsey, H.S., Gerton, J., Caldwell, C., Rocks, A., Frey, R., Taylor, J., and MacArthur, K. "UPSTEM: Transforming institutions to better serve transfer students and marginalized populations," Science of Teaching and Learning conference, University of California – Davis, December 2, 2022.

Godsey, H.S., Gerton, J.M., and Rocks, A. "Driving change by empowering faculty with data on inclusion and equity," National Science Education Centers conference (virtual), June 10-11, 2020.

Godsey, H.S., Saltiban, B.O., Gerton, J.M., Bradley, M., Caldwell, C., and Pataki, D. "Getting to the root of the problem: A discussion about affecting change in STEM," AAC&U STEM Transformation conference, Atlanta, Ga., November 8-10, 2018.

MacArthur, K. "Disrupting the 'Pull up your britches and be a man about it' environment in undergraduate mathematics courses toward a humanizing experience for marginalized students," Science of Teaching and Learning conference, University of California – Davis, December 2, 2022.

Rocks, A. "STEM transfer success: Building community through cross-institutional recruitment initiatives," National Institute for the Study of Transfer Students annual conference, Portland, Ore., February 22-24, 2023.  
[https://www.nists.org/files/ugd/9be191\\_f8f9bdc6f84a4906a83f1d069b927cc0.pdf](https://www.nists.org/files/ugd/9be191_f8f9bdc6f84a4906a83f1d069b927cc0.pdf)

Torres, H., Frey, R., and Hardy, M. "Collaborative research: Assessing effects of behavioral and affective factors on community college students' success in an introductory biology course," Biennial Conference on Chemical Education, Purdue University, August 2, 2022.

Torres, H., Frey, R., and Godsey, H. "Determining factors of a successful transfer-partnership between a community college and a research university," University of Utah Graduate Research Symposium, March 24, 2023.



# University of Wisconsin Madison

## Madison, Wisconsin

When we began our journey, we were seeking to increase the number and diversity of students in the state of Wisconsin who graduate with BS degrees in STEM disciplines. Data from the University of Wisconsin (UW) and Wisconsin Technical Colleges (WTC) Systems told us that most Wisconsin students from backgrounds underrepresented in STEM began their college careers at two-year institutions and that the number who successfully transferred and completed a four-year college degree was low. The primary strategies we used to achieve our goal of increasing the success of STEM transfer students were as follows:

- 1 To provide professional development for faculty, staff, and peer leaders across the two- and four-year institutions to increase their ability to support transfer students;**
- 2 To provide professional development directly to transfer students from the start of their two-year college experience, through to graduation from their four-year institution; and**
- 3 To identify structural barriers to successful transfer and change policies at the state and institutional levels and to remove those barriers.**

During our journey, we encountered and overcame several challenges. The first was the news that one of our primary partners on the project, the two-year colleges within the UW System, were going to be integrated with four-year universities around the state. That meant that they would no longer be able to collaborate with us, so we shifted our efforts to focus on the WTC System and expanded our partnerships to include all five institutions that at that time offered liberal arts transfer (LAT) programs. Today, all 16 WTC institutions have since been granted permission to offer LAT programs, so we've expanded to partner with all of them.

We discovered that the history of transfers and relationships between institutions could be complicated, especially when leadership changes occurred. Therefore, we prioritized building and repairing relationships with STEM faculty, staff, administrators, and transfer professionals across the institutions through cross-institutional transfer initiatives. Though COVID travel limitations made it difficult to bring partners together, meeting online actually made building and maintaining cross-institutional relationships more feasible. It allowed us to more easily bring leaders from across the partnerships together, so they could learn from one another. Their discussions also prompted us to develop a framework with shared goals, to align and guide the work across all the partnerships, and, with shared values, to address common biases and misconceptions that the project revealed about transfer students.

We learned from surveying transfer students that one of the greatest obstacles they faced was transferring their credits, and that there was no documentation about the classes required to transfer into a STEM major. This resulted for many students in a loss of credits or a transfer of some credits as elective rather than major courses, as well as extended timelines for the completion of STEM degrees. To address this hurdle, we designed transfer pathways that

Beyond Access to **Success** in Wisconsin:  
Creating Flexible Pathways to STEM Degrees for 2- to 4-Year Transfer Students

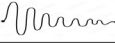





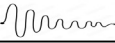
Shared Values:			
<ul style="list-style-type: none"> <li>We believe supporting success for 2- to 4-year transfer students is important.</li> <li>We believe 2-year institutions can prepare students for success in STEM majors at 4-year institutions.</li> <li>We believe transfer students from 2-year institutions can successfully complete STEM majors at 4-year institutions.</li> </ul>			
	Aim 1: Professional Development Programming	Aim 2: Student Development Programming	Aim 3: System Policy Changes
Connect	Build community with others who support STEM transfer students to create a state-wide network of transfer professionals.	Build pathways for STEM transfer students to join communities that increase their social capital and develop their sense of belonging.	Build community across institutions to catalyze policy and procedure changes that support 2- to 4-year transfer student success.
Reflect	Reflect on individual experiences, identity, and biases, and address how these aspects of one's self influence interactions with and support of transfer students.	Reflect on and build transfer student STEM identity through peer leader role modeling and opportunities to increase STEM self-efficacy and sense of belonging.	Review, reflect on, and revise current policies and procedures to better support STEM transfer student success.
Learn	Gain awareness and understanding of the needs and characteristics of STEM transfer students.	Identify, curate, and make accessible resources that increase the cultural capital that STEM transfer students need to navigate institution specific expectations and opportunities.	Share and learn from the portfolio of successful STEM transfer policy and procedure models at institutions across the state.
Act	Apply evidence-based strategies & policies to remove barriers and address challenges to STEM transfer student success.		



identified the courses needed for six STEM majors at all WTC and UW System institutions. Designing system-wide pathways was difficult because institutions have unique course numbering systems, and system-to-system transfer agreements do not exist. We have had to identify each course at each institution and ask the STEM faculty at those institutions to review and endorse the pathways. This work is ongoing.

We also learned that it was very difficult to track transfer students' movement, academic progress, and outcomes between the WTC and UW System institutions. To address this challenge, we asked our partnership team leaders to identify the data they needed, then developed a prototype data dashboard. We presented the prototype dashboard and a request for data to system administrators, who responded positively and will be collaborating to update their data-sharing agreement and make the data we identified available.

Materials for faculty, staff, adviser, and student development were created by our partnership teams and are now available upon request. Materials include case studies and activities for faculty and staff instructors and advisers to raise awareness of the challenges that transfer students face, as well as just-in-time activities and workshops to support transfer students.

Goals	Lessons Learned
AIM 1: Create a common faculty professional development curriculum for 2- and 4-year faculty.	 <ul style="list-style-type: none"> <li>A single curriculum does not meet the faculty development needs. UW and WTC System institutions have very different cultures and needs.</li> </ul>
AIM 1: Embed transfer specific advising information into existing institutional professional development programs.	 <ul style="list-style-type: none"> <li>Greatest need for transfer advising professional development is for inter-institutional connections.</li> </ul>
AIM 2: Create pre- and post-transfer seminar courses to support transfer students.	 <ul style="list-style-type: none"> <li>Students don't want to pay for extra courses and prefer flexible, just-in-time workshops.</li> </ul>
AIM 2: Build STEM transfer student communities to increase social capital and sense of belonging.	 <ul style="list-style-type: none"> <li>Offer multiple, easy opportunities to join; schedule regular check-ins.</li> <li>Virtual resources broaden access, but students appreciate face-to-face opportunities.</li> </ul>
AIM 3: Create system-to-system transfer agreements.	 <ul style="list-style-type: none"> <li>Policies and procedures support transfer agreements between individual institutions, not systems.</li> </ul>
AIM 3: Ask System Administration Offices to create system-wide STEM transfer pathways.	 <ul style="list-style-type: none"> <li>University tenure-track faculty must approve baccalaureate academic programs.</li> <li>Involving hierarchical networks early will expedite discovery of structural barriers.</li> </ul>
AIM 3: Ask all 16 WTCs institutions to offer common set of 18 STEM Pathway courses	 <ul style="list-style-type: none"> <li>Enrollment/Faculty/Budget limitations are hurdles for most WTCs schools.</li> </ul>



After COVID travel restrictions were lifted, our partners across the state were eager to meet and work together. We collaborated with UW and WTC administrative offices to host the first Wisconsin Transfer Conference, which brought together attendees from all the UW and WTC System institutions.

Our priority now is to sustain our journey once the funding from HHMI ends, specifically at UW-Madison, Madison College, and the UW and WTC system offices. We are pursuing these avenues to ensure that the progress we've made is maintained and continues:

- Madison College has integrated the STEM course pathways into their advising system, and UW Madison recognizes the pathways in their guaranteed transfer agreement with Madison College.
- The UW System has adopted and branded the STEM course pathways as the Wisconsin STEM Passport program; they presented this program to the board of regents, which approved it.
- At UW-Madison and Madison College, the Wisconsin Institute for Science Education and Community Engagement (WISCIENCE) and the STEM Center will continue to offer programming for transfer students. In addition, the Madison Teaching and Learning Excellence Program, the Office for Undergraduate Advising, and the Center for Excellence in Teaching and Learning will continue to offer professional development related to transfer students for faculty and staff.
- The UW and WTC Systems have committed to continuing to collaborate on organizing and hosting the WI Transfer Conference and on building and maintaining a transfer data hub based on our data dashboard prototype.

Our reflections on our experiences to date have allowed us to identify several lessons learned, including the following:

- A single professional development curriculum does not meet the needs of both two-year and four-year faculty, who operate in very different cultures and must meet very different expectations.
- The greatest need for transfer advisers is interinstitutional connections.
- Students don't want to pay tuition for transfer transition courses and prefer flexible, just-in-time workshops.
- Students need multiple, easy opportunities to join activities, and they benefit from regular check-ins.
- Virtual resources broaden access for students, but students appreciate face-to-face activities.
- Existing policies and procedures do not support system-to-system transfer agreements.
- University tenure-track faculty must approve all modifications to academic programs.
- Involving system-level stakeholders early expedites the discovery and resolution of structural barriers.
- Most institutions are facing challenges related to enrollment, faculty, and budget limitations.
- It is important to find collaborators who simply need permission and the resources to do work they already want to do.
- It is important not to be afraid to change course if things aren't working.

## Grant-Derived Dissemination Products

Branchaw, J.L., Butz, A., and Mirus, K. "Using Idea Flow Theory to Understand Levers for Change in 2- to 4-year STEM Transfer Between Wisconsin Public Institutions," Alumni Career Services Network and Network of STEM Education Centers Transforming Institutions conference, June 13, 2023.

Branchaw, J.L. "Beyond Access to Success in Wisconsin: Creating Flexible Pathways to STEM Degrees for 2- to 4-year Transfer Students," Wisconsin STEM Transfer Conference, May 30, 2023.

Mirus, K. "The Wisconsin STEM Passport: Course Concentration Pathways," Wisconsin STEM Transfer Conference, May 30, 2023.

Branchaw, J.L., Mirus, K., Theisen, C., and Butz, A. "Innovation Session: Connect, Reflect, Learn: A framework to unite and guide professionals working to advance 2- to 4-year STEM transfer students across public higher education systems in Wisconsin," American Association of Colleges and Universities Transforming STEM Higher Education conference, November 5, 2022.

Theisen, C. H., & Schmid, M. *Promoting Success for Transfer Students Through Faculty Development*. Interactive online session at the Annual Meeting for the Professional and Organizational Development (POD) Network Conference, 2020.

# Utah State University

## Logan, Utah

70%

Utah State University (USU) used its HHMI Inclusive Excellence award to address the need for improved academic and social support for Native American students and to improve the rate of students graduating with baccalaureate degrees in STEM disciplines. USU had recently established a research mentorship program for students from USU's primarily two-year Blanding campus, where the student body is approximately 70% Native American. That program had resulted in a nearly tenfold increase in Blanding students transferring to the university's main campus in Logan. However, the much larger Logan campus serves a student body that is less than 0.5% Native American, and students transferring there from Blanding found little social support and no specific academic support designed to assist Native students. Although the success of Indigenous students arriving from Blanding had not specifically been monitored, conversations with those students led a group of concerned faculty to realize that a more formal program was needed to assist Native students in Logan. USU therefore used its HHMI IE award to establish the Mentoring and Encouraging Student Academic Success (MESAS) program, designed to serve the academic and social needs of Indigenous students, especially on the Logan campus.

The MESAS program drew its Core Leadership Team (CLT) from faculty, academic staff, and administrators at both the Logan and Blanding campuses. The CLT recognized that Native students faced several significant challenges in Logan. In large part, the challenges reflected a missing sense of community, especially in comparison with the students' experiences at the much smaller and more cohesive Blanding campus. In addition, Logan faculty, staff, and administrators were largely unaware of the needs of Native students and of the cultural differences that often impede the success of such students in traditional university classrooms. Therefore, the most important goals of MESAS were to build a sense of community for Native students in Logan and to improve the cultural competence of faculty and other providers on that campus.



**FIGURE 1:** A Native student wearing distinctive turquoise jewelry and holding a diploma after commencement on the Blanding campus.



**MENTORING AND  
ENCOURAGING STUDENT  
ACADEMIC SUCCESS**

**FIGURE 2:** The design element for the USU MESAS program, which evokes the Indigenous ceramic style of the Southwest. Below the acronym for our HHMI IE program – MESAS – is the outline of the Bears Ears mesas, which can be seen along the western horizon from USU's Blanding campus.

Design by Diana Marques



To improve the academic culture on the Logan campus, the CLT recognized the need for two dedicated positions, which were funded by our HHMI IE award. We conducted a national search for a program coordinator and found an outstanding individual with a background in education and prior experience in serving Native students. A second national search was held for a position we described as a faculty advocate, someone to serve as a dedicated faculty member focused on the needs of Indigenous students. That search yielded an ideal candidate with doctoral training in Native American education and connections with Native communities in our region. We also realized that the needs on the Logan campus extended beyond STEM majors, and so we expanded our scope to provide support for Native undergraduates in any programs. In addition, we worked to build stronger connections between the Logan and Blanding campuses, as well as with some of the other campuses in USU's statewide system.

USU's Housing Services office had just embraced the concept of a Native American Living Community, so Native students could choose to be housed in a residence hall with others from similar backgrounds. However, Housing had not considered recruitment challenges nor the services needed to enrich the residents' experience, so MESAS stepped in to address those issues. We identified experienced Native students to serve as resident peer mentors for the Living Community and, most importantly, initiated monthly student activities and weekly Talking Circles, led by doctoral students in the Department of Psychology's American Indian Support Project.

To improve the environment for students, MESAS provided opportunities for faculty, staff, and graduate students to expand their awareness of Indigenous issues and strengthen their ability to work with diverse students. CLT member Melissa Tehee, of the Department of Psychology, worked with her doctoral students to develop a cultural competence training program known as TEACH, to support educators in their work with Native students. We required the course for individuals mentoring students in the summer program, but soon many other individuals also asked to participate. To date, over 300 USU faculty and staff have been trained through TEACH. To further inform faculty and others about the contributions of Native peoples to scientific and cultural knowledge, MESAS initiated an annual Indigenous Knowledge Symposium, consisting of scholarly presentations by researchers working with Indigenous communities in fields such as hydrology, geology, fisheries, fire management, and archaeology. The symposium was initially held virtually due to pandemic restrictions, and its success in that form led us to continue presenting it online each year. The symposia have had excellent attendance, both by our USU campus community and by national and international participants, with the most recent symposium having 575 registrants. All symposia have been recorded and remain available through the MESAS website.

Like many HHMI IE programs, our largest challenge was the COVID-19 pandemic, which impacted Native communities especially strongly. MESAS staff and the CLT worked hard to sustain the momentum of our program during that difficult period. We learned critical lessons about the importance of collaboration with university stakeholders and the value of strong partnerships within and outside of the university, as we enhanced our visibility and developed innovative remote programming to benefit our students.

The outcomes of the MESAS program have included increased student engagement, broader campus awareness, and greater support for Native American students at Utah State University.

In the fall of 2023, USU has proposed a new Native American Cultural Center (NACC) under the recently established Division of Diversity, Equity, and Inclusion (DEI). This is a monumental step, reflecting the university's commitment to Indigenous students. Beginning July 1, MESAS will be housed administratively within DEI – important recognition of the value that our program has brought to the university. Due to the support from HHMI, MESAS has been able to aid the university in identifying and meeting the needs of Native American students, and incorporating MESAS as a unit within DEI will ensure that our established and successful program will continue. In the near future, we hope that we can expand the physical space dedicated to Native students on campus, hold additional social and educational events, and increase community outreach and engagement.

## Reflections

To improve the environment for students, MESAS provided opportunities for faculty, staff, and graduate students to expand their awareness of Indigenous issues and strengthen their ability to work with diverse students.

## Grant-Derived Dissemination Products

Hicks, E.T. (2020). "A brief online acceptance and commitment training for enhancing outcomes of a cultural competence intervention," Master's Thesis in Psychology, Utah State University, xii + 55 pp.

Isaacs, D.S. (2022). "Together, our voices will strengthen the weaving: Using autoethnography and narrative inquiry to Indigenize sense of belonging in higher education," PhD Dissertation in Psychology, Utah State University, xiii + 181 pages.

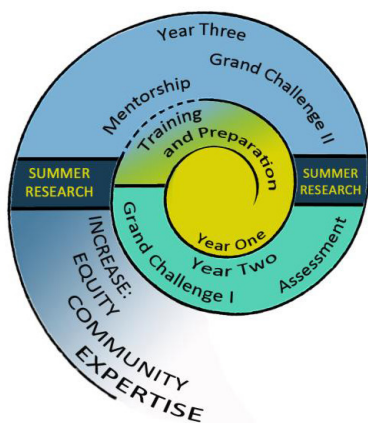
Piper, D., Tehee, M., Killgore, R., & Ficklin, E. (accepted). "Navigating the unknown: Lessons learned from sustaining Indigenous community in higher education during the COVID-19 Pandemic." *In* F. King & W. Davies (Eds.), *COVID-19 in Indian Country* (pp. TBD). Palgrave Macmillan.

# Vassar College

## Poughkeepsie, New York

When we prepared our 2016 HHMI Inclusive Excellence grant proposal, our core team knew that Vassar’s STEM community was struggling to recruit and retain underrepresented students. The college had recently adopted a need-blind admissions policy that led to a quick shift in the demographics of the student population, and the institution had not adequately adapted its support structures to meet student needs beyond financial aid. A broad survey of Vassar STEM students painted an alarming portrait of barriers to success in STEM that disproportionately affected first-generation, low-income (FGLI); BIPOC; and female students.

As a result, we designed our [Grand Challenges](#) program to enlarge Vassar’s capacity for inclusive pedagogy, support students interested in science and math who are traditionally underserved in these subjects, and nurture a more culturally responsive learning environment through improved teaching, peer mentorship, and community-building. From a curricular perspective, the program was designed as an ongoing series of interdisciplinary learning clusters centered on Grand Challenges (see Figure 1). The first was climate change. We successfully organized an engaged cohort of faculty who shared a passion for climate change and an interest in fostering inclusive excellence. Seventeen faculty from across the College taught climate change-themed courses at all levels of the curriculum and became part of a faculty development program that engaged in culturally responsive and inclusive pedagogy



### Fostering inclusive communities of science

#### Grand Challenge I: *Climate Change*

- Faculty Development and Working Groups
- Course Implementation 2019-2020
- Student Catalyst Summer Research
- Community Building
- Course Implementation 2020-2021

#### Grand Challenge II: *Inclusive Excellence*

- Mentorship of GCII folks by GCI folks
- A new cycle begins
- 2021-2023

**FIGURE 1:** This Grand Challenges graphic (otherwise known as the “snail” graphic) depicts the iterative timeline of the Grand Challenge cycle, with a clear focus on mentorship, assessment, and summer research.

Design: Rick Jones, Laboratory Coordinator and Collections Manager, Department of Earth Science and Geography

training workshops and peer accountability groups. During the summer of 2019, we brought VISIONS, Inc. to Vassar for a faculty development workshop during which 36 faculty met to discuss their experiences in the classroom and the barriers and constraints they faced in making their learning communities more inclusive.

It was clear from the outcomes of this VISIONS workshop that Vassar had faculty who were genuinely engaged, committed to student success, and willing to move toward developing a culture of inclusion and belonging. Yet these faculty were also frustrated by a lack of concrete tools to help them get there. One result of this workshop was the creation of the Rising Sophomore research program, which offered FGLI and BIPOC students coming out of their first year at Vassar an opportunity to engage in Vassar’s [Undergraduate Research Summer Institute](#) (URSI). Faculty who participated in the VISIONS training were eager to work with younger students who were not necessarily aware of the benefits of conducting summer research. This program has continued to evolve, providing an excellent, scaffolded pathway for students to engage in STEM research.

In addition to the work of curricular development and faculty development, the Grand Challenges program has been committed to opening informal spaces where faculty and students can engage in meaningful dialogue. Our student interns are integral to our core leadership team and took on the self-appointed title of Student Catalysts. They have organized dinners and conversations focused on building relationships, challenging existing power dynamics, and sowing the seeds for a culture of belonging and inclusive excellence. For example, during the winter of 2021, Catalysts



**FIGURE 2:** This image of our Crochet Coral Reef Project, conducted in spring 2021, shows the results of a community-building Winter Creative Project. The Crochet Coral Reef Project and Expo (see <https://www.vassar.edu/stories/2021/crocheted-reef-project.html>) was a good example of interdisciplinary collaboration and cooperation. Beginning January 13, 2021, and continuing for six Wednesdays, the project hosted Zoom meetings for any members of the Vassar community interested in crocheting coral-like shapes, while learning more about coral reefs, the math of crocheting, fiber arts as protest art, and more. Most weeks included a guest speaker who would share their interdisciplinary expertise as it related to the project, in addition to practical support from some of the community members who were more proficient in crocheting. This project culminated in a Coral Reef Expo that took place later in the spring term with a robust turnout of students, especially first-years.

were integral to creating an online community of faculty, staff, and students focused on collaboratively creating a visually stunning crocheted “coral reef” (see Figure 2).

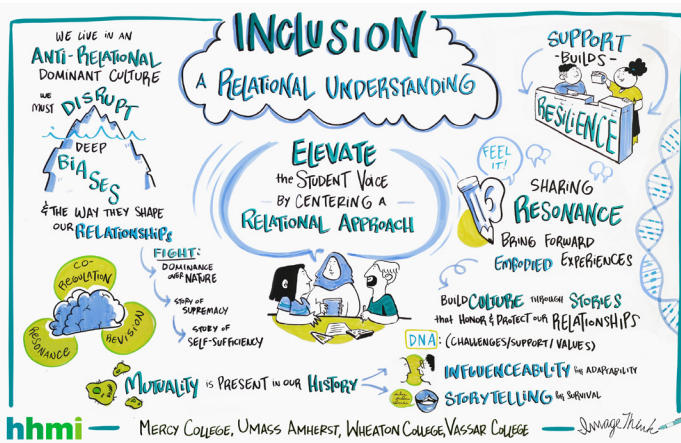
After two years with a thematic focus on climate change, the core team realized that people knew us more as a “climate change” program than as a program focused on inclusive excellence. As a result, we decided to simplify our messaging and make our next Grand Challenge explicitly: inclusive excellence. Since this pivot, our primary goals have been to center our inclusion and belonging work and to find institutional footholds so as to seed second-order change at Vassar. One of the primary mechanisms to accomplish these goals has been to more intentionally partner with existing institutional offices, programs, and initiatives. For example, we have collaborated with leaders of a college-wide [Engaged Pluralism Initiative](#) (EPI) to help support important student-facing efforts like the Inclusive Pedagogy Working Group, the Student Teacher Engaged Pedagogy Partnership (STEPP) program, and a

prematriculation program called Summer Immersion. Finally, because it is imperative that we value and affirm the experiences of our FGLI and BIPOC students at Vassar, we have focused on building strong relationships with the Transitions program and the Jeh Vincent Johnson ALANA Cultural Center. All of these relationships have been important to our work and the sustainability of our mission.

As the pandemic began disrupting and then dominating our lives during the spring of 2020, the Grand Challenges core team stepped up to support students who were losing research opportunities. Born out of a genuine need to support students, the [Catalyst Summer Research Experience](#) has become an essential and lasting element of our IE program, complementing the already successful Rising Sophomore research program. The Summer Catalysts are students who engage in guided summer research projects to explicitly study existing barriers to inclusion and belonging in STEM fields. The program serves as an opportunity for our local STEM community to participate in meaningful self-reflection. Driven by student interests, the research projects probe issues that affect students’ sense of belonging. In some cases, Catalysts conclude their summer research with concrete proposals for interventions to deploy at Vassar. In these cases, we have used mentored coursework (“intensives”) during the academic year to further develop these interventions. We are also proud to report that both the Rising Sophomore and Catalyst research programs have now been fully integrated into Vassar’s URSI program.

Working with institutional footholds and outside experts has given us a different perspective on the ecosystem that is our campus community and culture. Engaging with more, and different, members of our community in ways that engender a sense of engaged pluralism has proven critical to our work. Focusing on a relational culture and the methodologies and vocabularies that support it has proven extremely successful. While some of our partner organizations may have worked with the Inclusion, Diversity, Equity, Access, Leadership (IDEAL) Center for professional development, we believe that we were among the first to engage an intersectional cohort that included not only faculty, but also administrators and staff members. In this training, we learned a lot about how most professional positions on campus have a deep commitment to student belonging. As a result, during the summer of 2022, we reconnected with our peer implementation





cluster (PIC), the PIC7 group, and hosted a symposium titled Elevating the Student Voice (see Figure 3). We asked students to present their research to each other and to mentors from our four PIC partner schools (see Figure 4). The symposium was successful in part because we empowered students and we focused on building relationships.

**FIGURE 3:** A gathering of our peer implementation cluster (PIC) – the PIC7 Symposium, Elevating the Student Voice – was held in July 2022. This is an image of one of four visual-recording illustrations reflecting a lecture and workshop with guest facilitators from Relational Uprising.

Artist: Sasha Brito from ImageThink



**FIGURE 4:** Among the participants in the July 2022 PIC7 Symposium, Elevating the Student Voice, were (from the left) Vassar Grand Challenges Summer Research Experience Catalysts Tiana Ramlakhan '25 and Breille Irahzoza '24, who are pictured presenting their research to the symposium's keynote speaker, Bryan Dewsbury.

## Reflections

Working with institutional footholds and outside experts has given us a different perspective on the ecosystem that is our campus community and culture. Engaging with more, and different, members of our community in ways that engender a sense of engaged pluralism has proven critical to our work.

## Grant-Derived Dissemination Products

Pelletier, M., and Perillán, J. (2022). "Co-creating Dynamic Pedagogical Reflection: Building a Transformational Partnership through STEPP," *Teaching and Learning Together in Higher Education*: Iss. 36 (). <https://repository.brynmawr.edu/tithe/vol1/iss36/3>

Bala, L., and Kahn, J. (2021). "Students as partners in China: Exploring belonging in a pedagogical partnership program," *International Journal for Students as Partners*, 5(2). <https://doi.org/10.15173/ijasp.v5i2.4563>

Bala, N. (2022). "Launching a Pedagogical Partnership Program at Emmanuel College," *Teaching and Learning Together in Higher Education*: Iss. 35 (2022). <https://repository.brynmawr.edu/tithe/vol1/iss35/1>

Schwarz, J., Bjork, C., Cameron, J., Hunter, A.-B., Pacio, T., Perillan, J. *Grand Challenges: Building interdisciplinary communities to tackle complex global issues*. Federation of American Associations for Experimental Biology Journal: Biochemistry and Molecular Biology. Published Meeting Abstract. May 2021. <https://doi.org/10.1096/fasebj.2021.35.S1.05078>.

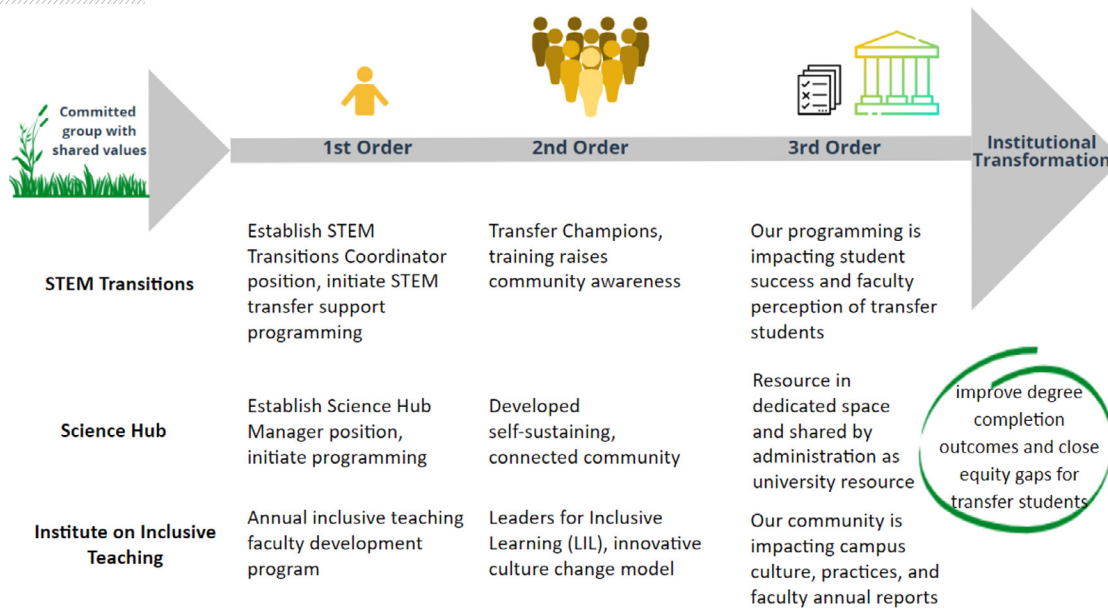
Schwarz, J.A. *Climate Change, Human Displacement, and STEM Education: toward a more transdisciplinary and inclusive culture of science*. 2023 In: *Forced Migration and Higher Education: Now What?* Eds. B. Murray, M. Brill-Carlat, and M Hoehn. Palgrave-Macmillan. ISBN: 978-3-031-12352-8. [https://link.springer.com/chapter/10.1007/978-3-031-12350-4\\_18](https://link.springer.com/chapter/10.1007/978-3-031-12350-4_18)

# Virginia Commonwealth University

## Richmond, Virginia

Virginia Commonwealth University (VCU) is a large, urban, R1 research university with a high percentage of students who are persons excluded due to race or ethnicity (PEERs) or are from first-generation, Pell-eligible, or transfer backgrounds. The VCU HHMI IE program focused on increasing VCU's capacity for inclusion by facilitating transition pathways for community college students in STEM fields. While student success and diversity are drivers of excellence at VCU, outcomes data from STEM courses had shown that marginalized students experienced inequities compared to their majority peers. Transfer students' DFW percentage (a grade of D or F or a withdrawal from a course) was generally 20% higher than that of first-semester first-year students. Our aspiration was to create inclusive communities among students and faculty in our science programs, with the long-term goal of increasing transfer students' sense of belonging on campus, their retention rates, and their persistence to graduation, to close the degree-completion equity gaps for transfer students.

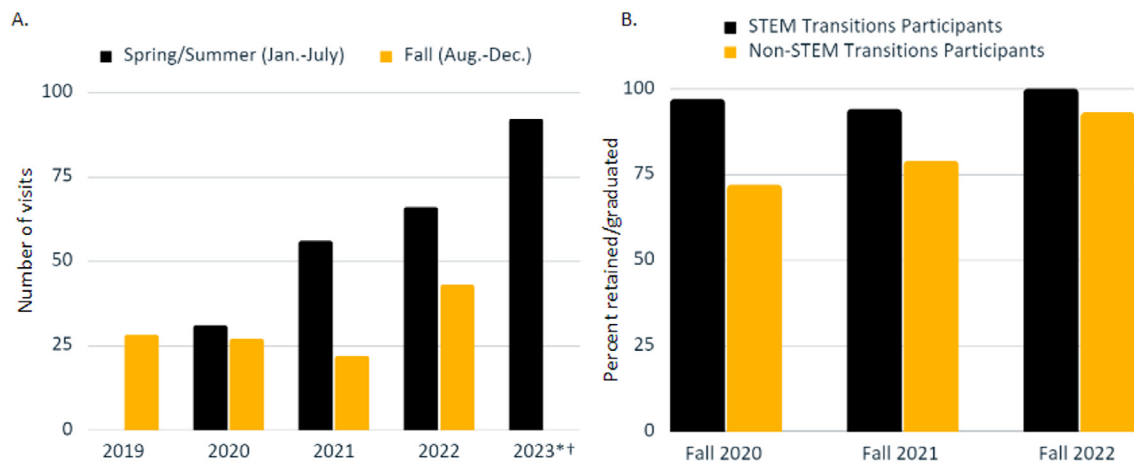
This work is being accomplished through three program areas (see Figure 1), with an equity-minded assessment underlying each area.



**FIGURE 1:** Progress of three grant-funded focus areas aimed at institutional transformation.

## STEM Transitions

This program provides an informed and connected pathway to VCU for STEM students from Brightpoint Community College (CC) and Reynolds CC and facilitates connections between VCU and CC faculty. A STEM transfer coordinator position was established within VCU's Transfer Center; the individual in this position serves as a point person for preenrollment advising, transition support, and onboarding services for CC students transferring into 10 different math and science majors at VCU. The STEM transfer coordinator developed STEM Transitions programming, which takes VCU resources to our partner CC campuses, offers students there opportunities to visit VCU's campus, and provides a holistic introduction to our large and complex campus environment. COVID presented obvious challenges to connecting with CC students;

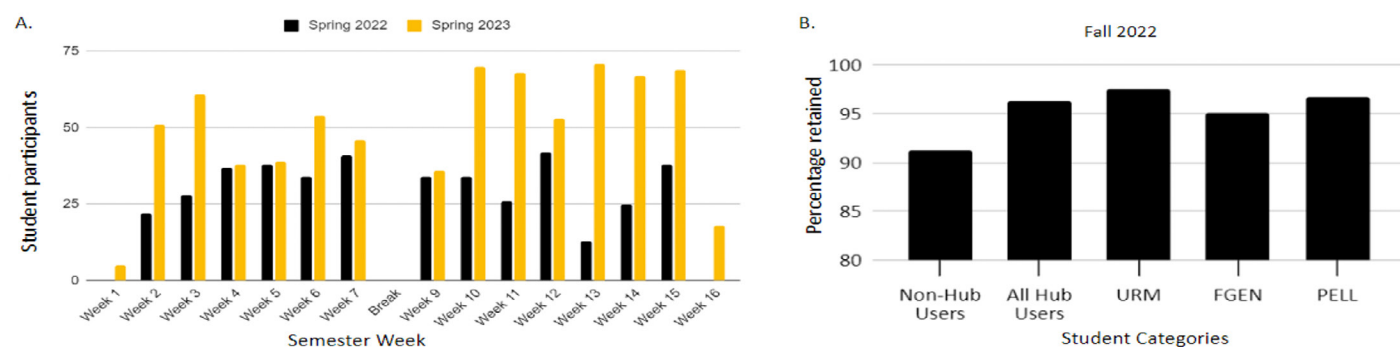


**FIGURE 2:** STEM Transitions participation and impact. A: Preenrollment advising meetings with prospective students are used to discuss everything about transferring – how credits transfer, course recommendations, and advice for a smooth transition to VCU. (\*Data for spring 2023 is through June 16, 2023. †Data for spring includes prospective students from schools other than Brightpoint CC and Reynolds CC.) B: Retention of students who have participated in STEM Transitions programming. Students who participate are more likely to persist to graduation. This is particularly evident for the first cohort of STEM Transitions students (fall 2020); the percentage of STEM Transitions students who either graduated or are still enrolled at VCU is 97%, compared to 72% of the non-STEM Transitions transfer students.

however, by 2022-2023 we saw excellent engagement (see Figure 2A). The STEM Transitions program is working: STEM Transitions participants indicate they are more likely to engage with VCU faculty and learning support resources, and they are likelier to earn a higher GPA and to persist to graduation (see Figure 2B). The STEM transfer coordinator established Transfer Champions training for faculty to impact institutional understanding of the challenges faced by transfer students and a Transfer Peer Advocates group to offer student support. The coordinator also visits our partner CCs regularly, attending CC faculty meetings and making classroom visits to introduce students to VCU. Finally, the coordinator connects VCU and CC faculty to enhance academic cooperation aimed at ensuring student success. This work creates interaction among students, staff, and faculty across the three campuses.

## Science Hub

This campus resource facilitates connections between STEM students and faculty to provide academic support for STEM students (see Figure 3). The Science Hub manager position was established within VCU's Campus Learning Center. Programming focuses on creating ways for students and faculty to interact, including Not On My Resume, a seminar series featuring STEM alums from diverse backgrounds; Study Buddies, which matches classmates for peer studying and support; and a new STEM exploration and professional preparation course. Science Hub's most successful programming has been Student Hours, eliminating the mystery behind faculty office hours. During 2022-2023, 40 faculty from seven disciplines offered academic help in a



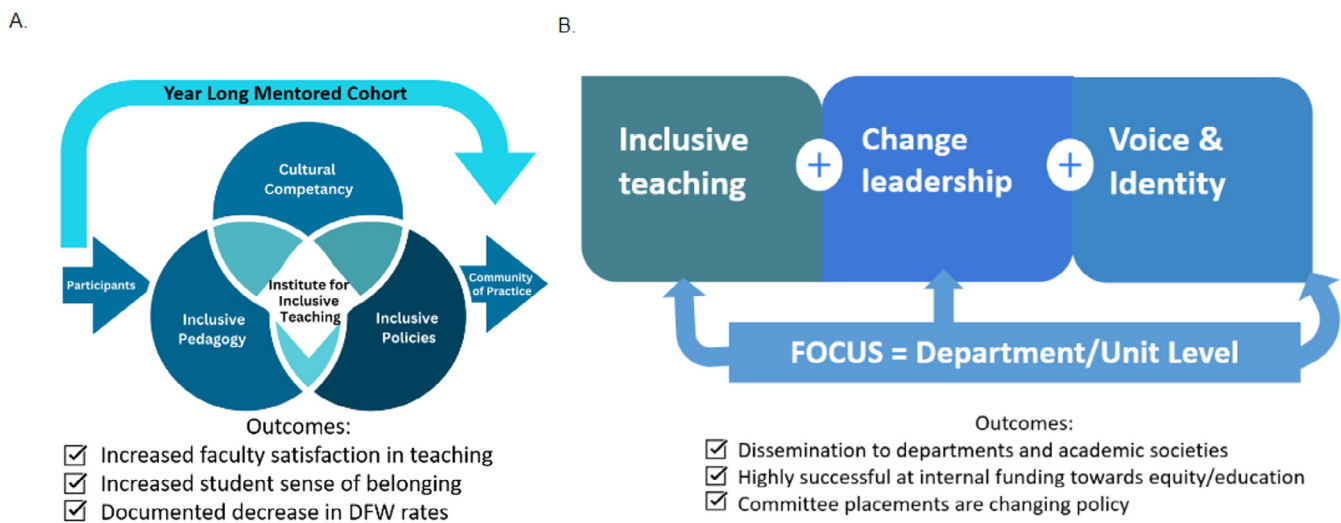
**FIGURE 3:** Science Hub participation and impact. A: Number of students attending Student Hours in Spring 2022 compared to Spring 2023. B: Retention of fall 2022 Science Hub users in STEM majors through spring 2023, compared to non-Hub users. (Student categories are as follows: URM = underrepresented minority students, FGEM = first-generation students, PELL = Pell Grant-eligible students.)



shared space, with students dropping by to ask questions across disciplines. To date, over 543 students have participated, for a total of 1,700 visits. Almost half had not previously attended traditional faculty office hours. Student feedback is positive; 71% report that Student Hours are less intimidating than traditional office hours, and over 96% of attendees are highly satisfied with the support they receive and plan to continue attending. As of fall 2023, the Science Hub will have dedicated space at the center of our state-of-the-art [STEM Education Building](#), bringing our innovations to every STEM student at VCU.

## Institute on Inclusive Teaching (IIT)

To date, this annual professional development program has trained 75 VCU faculty and staff and 12 CC faculty. Instructors revised at least one course using inclusive pedagogy approaches during their initial semester of inclusive teaching, impacting more than 8,000 students (see Figure 4). The institutional impact of this program was expanded through an innovative Leaders in Inclusive Learning program designed to build a cohort of experts to lead significant change in the culture of teaching and learning across VCU's largest academic unit. This program acknowledged faculty resistance to change and recognized that departments must create solutions tailored to each one's unique context. Drawing from two theories of change – diffusion of innovations and systems thinking (see Reinholz, 2021, *International Journal of STEM Education*, 8:37) – we concluded that creating a cohort to support and empower each other would initiate an infusion of systemic change. These faculty are now encouraging their colleagues to adopt inclusive practices and are influencing committee work, policy, and programming. Scholarly work in progress focuses on students' sense of belonging and faculty members' equity-minded practices and on the creation of a repository of inclusive approaches to teaching.



**FIGURE 4:** Faculty development programs. A: The Institute on Inclusive Teaching focused on training individual faculty to help them implement inclusive practices in their classrooms. B: Leaders in Inclusive Learning included the IIT experience as well as innovative faculty leadership development to create a cohort of faculty prepared to implement inclusive changes at the department and college levels.

Combined, STEM Transitions, Science Hub, and IIT have created inclusive pathways and environments for our students, impacting faculty satisfaction as well as student success. Building scalable and permanent change requires careful planning and consistent strategic thinking in our dynamic environment. Two of our three initiatives were embedded within existing Student Success resources to provide institutional infrastructure and administrative connection. The success of our work depended on a large, collaborative team of faculty and staff. Staff colleagues from Student Success came to this project with a robust equity-minded culture and brought that mindset to our work with faculty. Faculty recruited colleagues to support staff initiatives. Discovering and addressing significant obstacles was work that was done together and achieved through diverse viewpoints and access to institutional structures. Our grant team helped move



each of our three initiatives forward in ways that supported each other. As is common in IE programs, administrative turnover is a persistent challenge. We learned to identify administrative champions; achieve small, incremental wins that furthered our goals; and reidentify champions as required by turnover. Through the diversity of roles (faculty/advisers/staff) included on our large team, someone representing our work was always “in the meeting,” providing consistent messaging. We employed consistent strategic thinking to elevate messaging about our work and to use our programming to expand existing resources. This work has been rewarding for our team, enabling them to contribute to meaningful institutional change through a collaborative, inclusive, and student-focused lens.

## Reflections

This work has been rewarding for our team, enabling them to contribute to meaningful institutional change through a collaborative, inclusive, and student-focused lens.

## Grant-Derived Dissemination Products

### Science Hub

Coffey, M., Jennings, D., and Wahl, S. “Goodbye office hours, hello student hours: Building a shared community,” American Association of Colleges and Universities (AAC&U) Transforming STEM Education conference (presentation), 2022.

Carswell, W., and Coffey, M. “Low-Cost, High-Impact Practices for STEM Transfer Success: Practical solutions for all,” National Organization for Student Success conference (presentation), 2023.

Maxwell, M., Maisva, T., and Wiles, J.R. “Building confidence in scientific competence: Impacts of an introduction to primary literature course on undergraduate students’ science identity and interest in research,” Society for the Advancement of Biology Education Research (SABER) conference (presentation), 2023.

### STEM transitions

Carswell, W., and Heck, E. “STEM Transitional Programming Practitioner Panel,” National Institute on the Study of Transfer Students (NISTS) conference, 2020.

Carswell, W., Coffey, M., and Heck, E. “Low-Cost, High-Impact Practices for STEM Transfer Success: Practical Solutions for All,” NISTS conference, 2023.

Heck, E. NISTS conference (member, networking and engagement planning committee), 2023.

Heck, E., Johnson, A., and Neely-Fisher, D. “Cultivating Community College Partnerships,” HHMI IE annual meeting (peer-to-peer workshop), 2021.

Heck, E. Presentations on various topics at annual peer implementation cluster (PIC) 14 meetings, 2019–2023.

Heck, E. Multiple presentations to classes and faculty at partner community colleges, 2019–2023.

Carswell, W., Coyle, I., Heck, E., and Sykes, S. VCU Transfer Summit, an event for Virginia Community College System institutions, 2019.

Heck, E., Hutchinson, M., Sykes, S., and Tolan, M. Transfer Virginia call-to-action capstone presentation, a state-wide initiative examining and improving equity outcomes for transfer students, 2021.

Heck, E. Represented STEM Transitions at various admissions events, such as “Day of the Rams” and “Fall FEAST,” 2019–2023.

Heck, E. Transfer Champions training (multiple workshops offered to VCU faculty and staff to raise campus awareness of transfer student pathways), 2021–2023.

Coffey, M., Cone, B., and Heck, E. SYNCH Symposium presentation hosted by John Tyler Community College (now Brightpoint Community College), 2022.

Heck, E. Presentations at STEM Fest, hosted by Reynolds Community College, 2020–2023.

## **Inclusive teaching**

Jennings, D., Pepperl, T., and Johnson, A. "Institute on Inclusive Teaching in STEM" (workshop for 58 faculty from VCU, Reynolds Community College, and Brightpoint Community College), 2021 and 2022.

Ronquillo, T., Neely-Fisher, D., and Johnson, A. "Institute on Inclusive Teaching in STEM" (workshop for 17 faculty from VCU, Reynolds Community College, and Brightpoint Community College), 2019.

Huang, C.-Y., and Johnson, A. "Inclusive Teaching Statements Increase Students' Sense of Belonging" (workshop at AAC&U Transforming STEM Education conference), 2020.

Huang, C.-Y., and Johnson, A. "Inclusive Teaching" (workshop for 32 faculty from the College of Pharmacy, University of Houston), 2020.

Huang, C.-Y., and Johnson, A. "Walk the talk: Inclusive teaching practices to build a learning community and a sense of belonging" (workshop for 23 VCU faculty), 2020.

Huang, C.-Y., and Johnson, A. "Walk the talk: Five easily-implemented inclusive teaching practices to build a learning community and a sense of belonging" (workshop for 47 VCU faculty), 2020.

Hargraves, R., Johnson, A., Ronquillo, T., and Neely-Fisher, D. "A Multi-Institutional Model for an Institute for Inclusive Teaching in STEM" (workshop at AAC&U Transforming STEM Education conference), 2019.

## **Inclusive teaching and grant administration**

Johnson, A., Ahmadian, M., and Reid, J. "Inclusive and Equitable Teaching Influences Student Belonging and Engagement" (talk at AAC&U Transforming STEM Education conference), 2022.

Golding, S., Johnson, A., and Case, K. "Leaders for Inclusive Learning: Fostering an Equity-focused Faculty" (ideation session at AAC&U Transforming STEM Education conference), 2022.

Golding, S., Johnson, A., Waller, L., and Huang, C.-Y. "Promoting institutional change through fostering an equity-focused faculty," (poster presented at AAC&U Diversity, Equity, and Student Success conference), 2022.

Johnson, A. "Inclusive Excellence in STEM at VCU" (presentation to VCU's Student Success Advisory Council), 2022.

Johnson, A., Golding, S., Coffey, M., and Heck, E. "Success for Every Student: VCU HHMI Inclusive Excellence Project" (presentation at a biology department seminar series), 2022.

Johnson, A., and Heck, E. "Inclusive Excellence in STEM at VCU" (presentation at a BIG PIC meeting hosted by Radford University), 2023.

Heck, E. "Inclusive Excellence in STEM at VCU" ([video](#) about our grant programs shown at a BIG PIC meeting hosted by Radford University), 2023.

Johnson, A., and Jennings, D. "VCU Students Speak: Faculty Impact Students' Sense of Belonging" (presentation at VCU IMPACT, a teaching-focused symposium), 2023.

Golding, S., and Johnson, A. "Inclusive Teaching for First-Year Courses" (keynote presentation to VCU instructors of first-year student success courses), 2023.

# Virginia Polytechnic Institute and State University

## Blacksburg, Virginia

### Beginning our journey

At Virginia Polytechnic Institute and State University, better known as Virginia Tech (VT), we began our IE journey during Beyond Boundaries, a visioning exercise from which emerged the aspiration for a “VT-shaped education,” with disciplinary and transdisciplinary learning embedded in purpose-driven experiences. VT also committed to enrolling 25% “underrepresented” and 40% “underrepresented or underserved” students by 2028.

The IE team recognized the need to build equity into Beyond Boundaries. While VT boasted overall student success, disparities existed for minoritized and historically underserved populations of students, including persons excluded due to ethnicity or race (PEERs), first-generation students, and transfer students. Enrolling more students from these groups heightened the imperative to identify and eliminate institutional barriers to their success and engagement. Additional challenges for VT were our large, decentralized nature and expectations for research productivity that came into tension with the teaching mission.

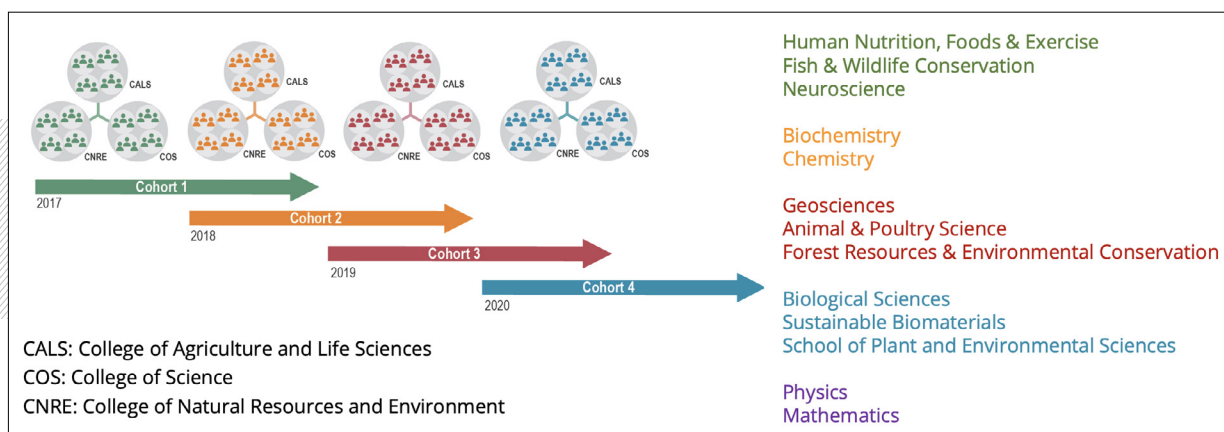
Strategies for building VT’s capacity for inclusion included the following efforts:

- Engaging faculty as learners.
- Situating departments as the units of change.
- Utilizing data to understand which students are not being served.

### Along the way

We increased our capacity for inclusion at three levels, as follows:

1. Inclusive teaching: IE faculty participated in a year of learning to become more inclusive teachers. Our goal was to engage from 36 to 72 faculty across 12 departments (see Figure 1), and we exceeded it, with 76 faculty across 13 departments.



**FIGURE 1:** Overview of the HHMI Inclusive Excellence Initiative at VT.

Faculty learning has evolved in response to participant feedback. Initially, training was theoretical and general, and faculty struggled to apply such learning to their courses. Current learning opportunities meet participants where they are and build community. Recent activities include the following:

- Practical Harm Reduction Strategies: a semester-long program led by Estrella Johnson, a professor of mathematics and the assistant dean for DEI.
- Having the Conversation about Underrepresentation in STEM: a facilitated discussion led by Alma Robinson, a physics instructor, and science students.
- Inclusive Teaching: a book club with Radford University.

After their required year, faculty continue DEI-related professional learning at a high level. Five years of reflection data from IE faculty scholars will contribute to a longitudinal analysis. These faculty reflections provide evidence of impact and also challenges, especially during the pandemic.

2. Inclusive curricula and departmental climate: IE departments were given disaggregated data to identify students who were not well served. Then they collaborated with a data scientist to ask further questions. Departments were awarded about \$12,000 to embark on an IE project of their own design. Most undertook several activities. All required multiple years to accomplish their goals. Successful departments tended to have strong buy-in from department heads and diverse faculty ranks participating.
3. Inclusive VT through a network that sustains change: While departments and faculty proved to be effective change agents, we learned the importance of expanding the network to include stakeholders with additional expertise and influence. Through the efforts of vice presidents and provosts, IE work became recognized as a key part of university initiatives such as Inclusive VT and Access and Affordability. DEI officers in our science colleges have proven to be critical partners. They joined our leadership team, and we funded their participation at conferences. They have helped to conceptualize a path for sustaining IE work through a cross-college coalition.

## Sustaining our work

IE departments have institutionalized their work in the following ways:

- **Reforming curricula**
  - > The chemistry department reconfigured its curriculum for majors, moving General Chemistry II to the second year and Organic Chemistry I to the first year, based on the restructuring of the curriculum at some peer institutions, which mixed up the quantitative and the spatial aspects of chemistry; this improved motivation and retention of more diverse students. Chemistry also increased general chemistry recitations, including a “held recitation” that offered enrollment to students after the first exam; the department found that students who enrolled in these recitations increased their scores from the first test to the second test by 18 points, with 87% of the recitation participants demonstrating an increase. The department has committed to continuing these recitations.
  - > The fish and wildlife conservation department added spring trailer sections for two foundational courses that were gateways to the major and that had previously been offered only in the fall. With this added flexibility in the curriculum, students are now not penalized by falling a full year behind in the major if they are unable to complete these courses successfully in the fall.
  - > The human nutrition, foods, and exercise (HNFE) department has developed several course-embedded undergraduate research experiences (CUREs) to promote access to undergraduate research.



- **Changing policy**

- > Fish and wildlife conservation set ambitious DEI expectations for faculty in their teaching, research, and service as part of the department's tenure and promotion process.

- **Creating traditions**

- > Many departments now include a DEI topic at every faculty meeting.
- > DEI book clubs have become a tradition in HNFE.
- > EngelPalooza, an annual event, gives researchers a chance to introduce undergraduate research to students who have not yet had the opportunity to participate in it (see Figure 2).

- **Addressing affordability**

- > The geosciences and forest resources and environmental conservation departments now provide free access to field equipment and clothing for their students.
- > The neuroscience department launched the J. Michael Bowers Summer Undergraduate Research Fellowship (SURF) to provide a paid summer research opportunity to a PEER student.

- **Leveraging existing programs and resources**

- > Many departments have revamped or extended their first-year experience course to embed mentoring, career planning, and advising for all students.
- > Several departments have utilized the funding and platforms available from their professional societies to extend their inclusive excellence work.



**FIGURE 2 (FAR LEFT):** EngelPalooza, a new tradition in biochemistry.

**FIGURE 3 (LEFT):** Inclusive Excellence Faculty Scholars who emerged as leaders among leaders: (from the left) Deborah Good, Sarah Karpanty, and Megan Emori.

## Lessons learned

**Talk about race:** The 2020 national reckoning regarding systemic racism helped our IE team to recognize that in our efforts to build capacity for inclusion of many identities (disabled, first-generation, transfer, low-income), we rarely addressed racism directly. We adapted our professional learning to include anti-racism training and engaged in important conversations about race.

**Apply a growth mindset toward all:** We came to appreciate the passion and humility that our faculty bring to the work of inclusive excellence (see Figure 3). We explicitly rejected a deficit mindset toward faculty, just as we wanted to disrupt that sort of attitude toward students. We regarded our faculty as caring and capable and recognized that the reward system at a research university like VT does not demonstrate value for inclusive pedagogy or even excellent teaching.

Use data as a tool, not a weapon: Our faculty loved engaging with data about their students and courses and appreciated the opportunity to collaborate with a data scientist. They felt ownership of these data rather than having metrics imposed on them. Equally powerful were the qualitative data gathered from interviews and focus groups with students. These provided stories that have been shown to build empathy.

## Grant-Derived Dissemination Products

### In preparation

Anderson, A.S., and Good, D.J. (2023). "A Course-based Undergraduate Research Experience Paired with a Required Upper-Level Course has Broad Reach Beyond the Lab."

Briganti, J., Brown, A., and Sible, J. (Eds.) (2023). *Fostering Communities of Transformation in STEM Higher Education – A Multi-institutional Collection of DEI Initiatives*, a 15-chapter e-book with articles from many IE1 colleagues from the South Peer Implementation Cluster.

### Submitted

Manseuto, A., and Good, D.J. (2023). "Conservation of a chromosome 8 inversion and exon mutations confirm common gulonolactone oxidase gene evolution among primates, including *H. Neanderthalis*, *J. Mammalian Evolution*" (this was student work, done during a nutritional genomics CURE).

### Published

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Wojdak, J., Phelps-Durr, T., Gough, L., Atuobi, T., DeBoy, C., Moss, P., Sible, J., Mouchrek, N. (2020). Chapter 11: "Learning Together: Four Institutions' Collective Approach to Building Sustained Inclusive Excellence in STEM" in *Transforming Institutions: Accelerating Change in Higher Education*, White, K., et al., (eds.), Pressbooks. <http://openbooks.library.umass.edu/ascnti2020/chapter/wojdak-et-al/>

Good, D.J. (2020). "A low-cost, in silico nutritional genomics course-based undergraduate research experience applicable to multiple disciplines," *Biochem Mol Biol Educ.*, April 11. doi: 10.1002/bmb.21352. PubMed PMID: 32277791. <https://iubmb.onlinelibrary.wiley.com/doi/abs/10.1002/bmb.21352>

Ferqueron, T.R., Anderson, A.S., and Good, D.J. (2020). "The Allele Frequency of the HFE gene mutation H63D (rs1799945) and Its Relationship to a Hereditary Hemochromatosis Diagnosis in Metabolic Nutrition Students at Virginia Tech," *American Journal of Undergraduate Research*, 16(4):51-57 (this was student work done during a genetics of metabolism CURE). [http://www.ajuronline.org/uploads/Volume\\_16\\_4/AJUR\\_Vol\\_16\\_Issue\\_4\\_March\\_2020\\_p51.pdf](http://www.ajuronline.org/uploads/Volume_16_4/AJUR_Vol_16_Issue_4_March_2020_p51.pdf)

# Washington University St. Louis

## Saint Louis, Missouri

Washington University in St. Louis (WashU) started making strong efforts over a very short time period, several years before this grant began, to increase the proportion of students traditionally underrepresented in STEM (including traditionally excluded racial and ethnic groups, students from a broader range of socioeconomic circumstances, women, and students who were the first in their family to attend college). These university efforts have continued throughout the grant period. For example, in 2014, 7.6% of WashU students were eligible for federal Pell Grants, and this cohort increased to 13.2% by 2018 and to 16.0% by 2022. Similar increases in the proportion of students from other traditionally underrepresented demographic groups were also made over this interval.

But while a variety of programs were already in place and new programs had been developed to support the success of students from these backgrounds, there remained a strong student deficit attitude on the part of many at the university when this grant began. Disparities in measures of student success were observed in the years preceding this grant and continued despite the significant effort and clear positive impact of the programs in place. To provide an environment that would allow students from a wide variety of demographic backgrounds to succeed and thrive, we determined that significant education of the faculty, peer mentors, and advisers who interacted with first-year students was needed. Our grant aimed to transform our institution into an inclusive learning environment where students from all demographic groups – regardless of gender, race, ethnicity, or first-generation or low socioeconomic status – were welcome and equally likely to be successful in STEM disciplines at WashU. We planned to work with key stakeholder groups that interact with first-year students, including faculty for introductory STEM courses, career advisers, student services personnel, and peer leaders/mentors who participate in academic support programs. Our program sought to increase awareness of social-identity barriers that students face and help these different groups implement psychosocial strategies that have been shown to positively impact student success and retention. We worked to develop new institutional structures to foster information-sharing about introductory STEM courses and nonacademic support programs and collaboration among these stakeholder groups in supporting student success. By improving communication among these three key groups, we strove to develop a consistent, positive narrative about student success in STEM courses and majors. We hoped this collaborative environment would help implement and disseminate best practices for an inclusive approach to interactions with students in classes, peer-learning groups, and academic adviser meetings and would lead to sustained improvement in inclusion.

At the beginning of the grant period, our program was successful at reaching out to the different stakeholders through various workshops and events. The faculty in introductory STEM courses were receptive to our efforts, perhaps due to faculty development efforts in student-centered and evidence-based teaching strategies previously made by individuals on the principal investigator (PI) team. Efforts with both advising and peer mentoring also showed some initial successes. However, we encountered some resistance, as some groups felt our efforts were duplicative of other trainings/work being done around DEI and struggled to see the benefit of doing this additional work with us. Our efforts were further impeded by the pandemic. However, faculty

Our grant aimed to transform our institution into an inclusive learning environment where students from all demographic groups – regardless of gender, race, ethnicity, or first-generation or low socioeconomic status – were welcome and equally likely to be successful in STEM disciplines at WashU.

were required to make very substantial changes in their teaching to accommodate the restrictions of the pandemic and, under these extreme conditions, were very happy to have a team of supportive individuals who would work with them on course design, data collection on student reaction and impact, and strategies for student engagement. Faculty in STEM introductory courses welcomed support from our team and found that support valuable. Therefore, we focused heavily on this aspect of our grant, as we felt we had an opportunity to help faculty make major changes that would impact inclusion and equity in introductory STEM courses at WashU and that had a chance to be sustained after the pandemic restrictions were lifted.

A key aspect of our work with faculty was and remains collecting data on student perceptions of inclusion in their classes and students' reactions to and perceived effectiveness of various strategies that faculty use in their classrooms – including classroom teaching, assessment, accessibility of resources, etc. Our team collected data each semester, analyzed it, and reported back to faculty in each course, creating a feedback loop that faculty found valuable. This feedback allowed them to better understand their students' needs. At the end of our grant, this feedback loop has remained a successful bottom-up approach to changing classroom practices that directly impact students. By allowing instructors to see changes in course inclusion ratings and positive reactions of students to their course structure, resources, environment, teaching practices, etc., over time, faculty had clear evidence that the changes being made were making a difference in students' experiences in these courses. Many instructors with whom we've worked have become more receptive to incorporating inclusive practices, given the data suggesting that these practices are effective.

Because of the success of this work, Jen Smith, vice provost for educational initiatives and co-PI of our grant, has institutionalized this data collection and feedback loop process in the Office of the Provost as part of the university's new strategic plan. The classroom inclusion and student perception data will be one part of a formalized data collection process in courses across all units to better understand equity in student outcomes. All departments will have access to data relevant to making programmatic decisions aimed at fostering more equitable student outcomes in the classroom. Importantly, this work is now housed in an expanded institutional research office, now called the Office of Institutional Effectiveness. The centralization of data collection allows us to get a better understanding of “the student experience” and ensure that equity and inclusion remain a top priority. In the near future, collecting and sharing data with faculty about their courses will become a widespread and routine practice that will ultimately contribute to improving inclusion and equity for all students at WashU.

## Reflections

**A key aspect of our work with faculty was and remains collecting data on student perceptions of inclusion in their classes and students' reactions to and perceived effectiveness of various strategies that faculty use in their classrooms – including classroom teaching, assessment, accessibility of resources, etc.**

## Grant-Derived Dissemination Products

York, A.M., Fink, A., Stoen, S.M., Walck-Shannon, E.M., Wally, C.M., Luo, J., Young, J.D., and Frey, R.F. (2021). “Gender inequity in individual participation within physics and science, technology, engineering, and math courses,” *Physical Review Physics Education Research*, 17, 020140. <https://pubs.acs.org/doi/pdf/10.1021/acs.jchemed.2c01068>

Wally, C.M., Miller, K.G., and Frey, R.F. (2023). “Student Support-Seeking Behaviors in General Chemistry and Introductory Physics Courses: An Exploratory Study Using Simple Ego-Network Analysis Methodology,” *Journal of Chemical Education*, 100, 2105-2115. <https://pubs.acs.org/doi/pdf/10.1021/acs.jchemed.2c01068>

York, A.M., Miller, K.M., Cahill, M.J., Barber, A.M, Bernstein, M.A., Blomgren, H.E., and Frey, R.F. (2023). “What factors contribute to students' perceptions of inclusion in introductory STEM courses: a mixed-methods exploratory study,” submitted to *CBE – Life Sciences Education* in April 2023.



# Wellesley College

## Wellesley, Massachusetts

### Background

In 2016, one of our faculty members worked with our Office of Institutional Research to analyze 15 years of outcomes for our STEM students, including GPA, time to graduation, and course-taking and major-declaration patterns. The analysis revealed large disparities in all these factors between students of color and white students, despite the college's more than 20 years of prior initiatives and programming to address such disparities. Faculty and staff were shocked. Soon thereafter, Wellesley welcomed its first Black president, Paula Johnson, MD, who charged science departments with enacting dramatic institutional change to improve the experiences and outcomes of all our students. HHMI's injunction to seek the deep-rooted institutional barriers to success for underrepresented students in STEM therefore resonated deeply with us, and in 2017 we submitted our HHMI Inclusive Excellence proposal.

### Inception and initiatives

We spent the summer of 2017 brainstorming ideas for our proposal with science departments and faculty. These conversations coalesced into a fourfold approach to addressing the institutional barriers to inclusive excellence in STEM at Wellesley. With support from President Johnson, the Provost's Office, and our Office of Institutional Research, we submitted our HHMI proposal, with the overarching goal being to directly address the deep-rooted institutional barriers that are preventing our underrepresented students from persisting and succeeding in STEM at Wellesley at the same rate as their peers. Below, we describe those four approaches and the major initiatives and outcomes related to each one.

#### Education of the community

This was the most successful component of our grant. It sought to educate the community about evidence-based research on equity, inclusive pedagogy, and cultural competency.

- Working with the Inclusion, Diversity, Equity, Access, Leadership (IDEAL) Center at the Science Museum of Minnesota, we designed and executed an intensive seven-day [STEM Equity Institute](#), in which over 100 faculty and staff participated across four cohorts. More than 40 departments were represented at the institute.
- We also ran a college-wide all-day retreat on inclusive excellence in 2019 that was attended by over 150 faculty and staff and featured 16 breakout modules and a keynote by Dr. Anthony Abraham Jack of Harvard.
- Together with the Knapp Social Science Center, we co-organized the 2021 Betsy Wood Knapp '64 [Lecture by Dr. Beverly Tatum](#). Dr. Tatum spoke to faculty and staff about racial identity, education, the path toward racial equality, and what Wellesley can do to foster inclusive excellence.

#### Intensive redesign of courses and curricula

This component funded faculty teams to undertake intensive redesign of courses and curricula to respond to gaps within and pathways through our curricula.

- We funded seven projects from seven different departments, with 20 faculty participating.
- Notable projects included running [wintersession biochemistry boot camps](#); using storytelling by students to foster belonging in STEM; and overhauling first-year neuroscience and mathematics courses to promote inclusive excellence.

#### Creation of on-campus internships

This component created on-campus, academic-year student internships in STEM and pedagogy to enhance student learning and elevate the value of paid work. Faculty

collaborated with [HHMI student advisers](#) (all work-study eligible students) to develop programs and practices that enhanced the inclusiveness of their respective communities.

- The program grew from just nine interns working across five departments and mentored by seven faculty in 2018-19, to 35 interns working across 10 departments and mentored by 26 faculty in 2022-23.
- Interns created a variety of initiatives with their faculty mentors, including creating new social events (such as Math Tea), developing and administering equity climate surveys and bringing the results to departments for discussion, creating curricular modules promoting inclusion and belonging in STEM, crafting departmental DEI values statements, writing and beta-testing new biology lab experiments, and curating resources for introductory math courses.

### **Strengthening our advising system**

This component sought to strengthen our advising system through collaboration with our Division of Student Life.

- The HHMI IE Initiative cosponsored a day-long, in-person, campus-wide faculty-staff advising retreat on June 1, 2022. Over 140 faculty and staff explored the many different ways that we each support students, building new connections and resources to improve our advising.

## **Reflections on our work and sustaining its impacts**

Five years into our grant, the STEM Equity Institute has proven to be by far our most impactful effort. The over 100 faculty and staff who participated have since infused nearly every aspect of college life with the IDEAL strategies and skills they learned at the institute. From small changes to guarantee that all voices are heard – like using talking circles in department meetings – to medium changes to improve belonging and inclusion – like overhauling how peer educators (e.g., graders and tutors) are selected and trained – to large, systems-level changes – like revamping introductory course sequences in a science department – the institute’s impact continues to be felt throughout the college. The phrase “change agent” has now become a respected accolade and an aspiration for us all.

Our HHMI Student Interns program is another initiative that has had an outsized impact on science at Wellesley. Nearly a dozen science departments – almost all of our science departments – now have one to two interns working with departmental faculty every year on a variety of IDEAL-related projects. Combining the student and faculty perspectives has turned out to yield insights, ideas, and initiatives that had not occurred to either group before. The results have included departmental DEI statements, overhauls of lab curricula, new social events that foster community, and new training modules for tutors and other peer educators.

Going forward, we are working with departments to institutionalize the HHMI Student Interns program. We are also looking at working with our Pforzheimer Learning and Teaching Center to institutionalize some of the most successful aspects of the STEM Institute program. During our grant period, the college also launched the [Office of Student Success](#), geared to supporting our first-generation students, and hired an associate provost for equity and inclusion, who has since joined the HHMI steering committee. These centers, offices, and colleagues are just a few of the partners we are working with to continue and expand the grant’s activities. We are fortunate to also be supported by the tailwinds of our recent college-wide strategic plan, which set inclusive excellence as an institutional priority that touches all aspects of the college.

## **Reflections**

The phrase “change agent” has now become a respected accolade and an aspiration for us all.

# Western Washington University

## Bellingham, Washington

### When we began our journey

We wanted to address departmental climates at Western Washington University (WWU) that were unwelcoming and unsupportive of BIPOC and female students interested in science careers. At the beginning of our project, we were lucky to already have a culture of faculty development from other projects, and consequently we had many faculty who espoused inclusive principles of teaching and learning. However, departments as a whole had not yet transformed to espousing and communicating the mindset that all students are capable of learning their discipline. Some of the discussions and policies instead betrayed student-deficit mindsets – the assumption that if students didn’t succeed, they either were not working hard enough, were “underprepared,” or were not meant for the field.

We sought to change this mindset among STEM faculty, including ourselves, through a two-year faculty development program focused on inclusive teaching and learning. We collaboratively learned to recognize and build upon students’ assets and to increase transparency so students would not have to depend on social capital to succeed. We also developed two new courses: First, a two-quarter seminar was created to build community among first-year and transfer science-interested students. Second, a one-quarter Math for the Natural Sciences class helped students apply math principles to science topics. We also built systems for peer- and faculty-led mentoring for these students during their first two quarters at WWU. In order to highlight our emphasis on excellence, and the point that inclusion does not mean lowering standards, we named our overall program Advancing Excellence and Equity in Science (AEES). The logic model for the AEES program is depicted in Figure 1.

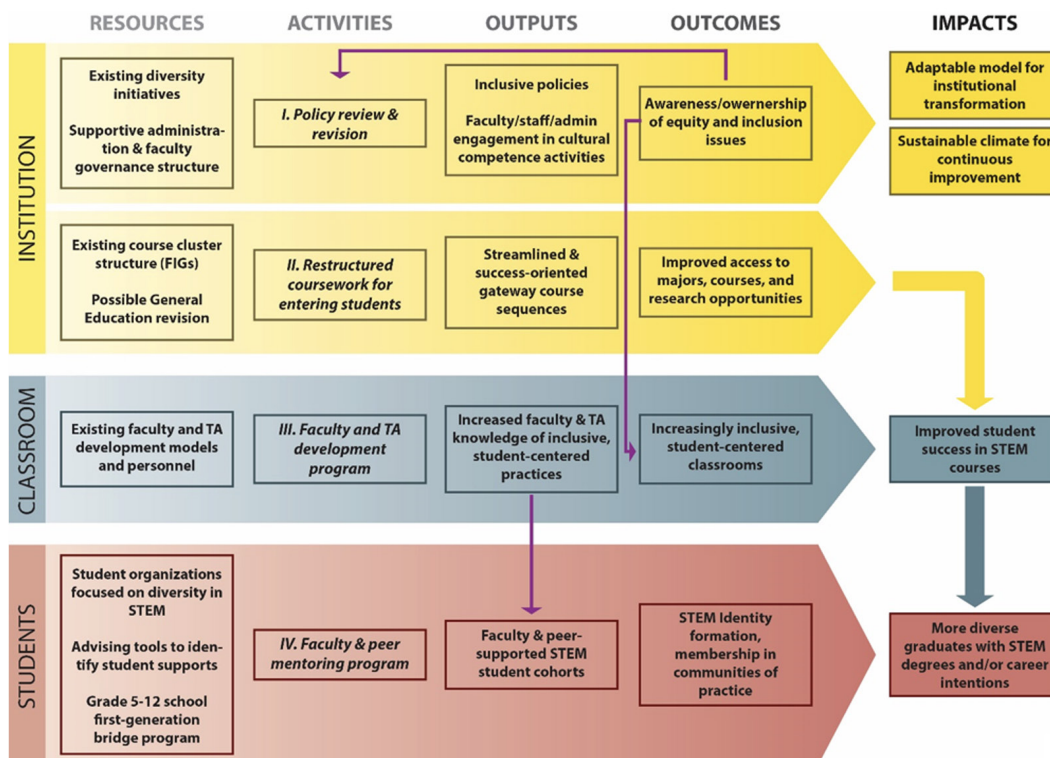


FIGURE 1. Logic model for AEES program.

## During our journey

We saw mindset shifts among faculty members in our science departments. These are difficult to quantify and to fully attribute to AEES, as there were other DEI-focused initiatives going on in some departments. DEI work became more of a priority in making hiring and review, tenure, and promotion (RTP) decisions, and more science faculty members incorporated DEI work into their research projects. Faculty members who participated in the professional development program changed their curricula and pedagogy to help all students succeed.

One significant obstacle that slowed (and continues to slow) this change in mindset is the traditional idea of “rigor” – the sense that higher grades show leniency in grading instead of greater learning by students and more successful teaching by faculty members. We have not fully overcome this obstacle but continue to engage in conversations about how to hold ourselves accountable for high-quality, inclusive teaching. Another obstacle to change has been the slow pace of changes in policy. WWU has department, college, and university-level shared governance structures that slow the pace of meaningful changes like inclusion of strong accountability structures for DEI work in RTP decisions. While some progress has been made, it is still possible for a faculty member to pass review with minimal DEI-related work. We have tried to address this by encouraging faculty who have participated in our faculty development program to join some of these governance groups. Finally, the fact that WWU is a primarily white institution continues to make it difficult for faculty and students of color to feel a sense of belonging. While we have seen positive outcomes for students in our seminar courses for first-year and transfer science-interested students in terms of their feeling a greater sense of belonging, this program is only two quarters long, and we are concerned that students’ sense of community may fade at the end of their first year when they no longer have seminar courses. During year six, we piloted a peer mentor program to help strengthen and sustain the sense of community for students. We hope this will help students, especially BIPOC students, feel a greater sense of belonging in the future.



We have seen positive outcomes for students in our seminar courses for first-year and transfer science-interested students in terms of their feeling a greater sense of belonging.

## Sustaining our journey beyond the HHMI grant

Because of the mindset shift away from deficit thinking and toward development and implementation of equitable, high-quality instruction, we believe many more faculty and staff members at WWU are invested in working toward equity in science teaching and learning than when we began this project. The faculty development program has enabled more equitable pedagogical and curriculum revisions across the College of Science and Engineering (CSE) so that student-centered, research-based practices are becoming the norm. At this point, between two-thirds and three-quarters of CSE faculty members, as well as almost all current department chairs and the current dean, have participated in these faculty development projects. There are also stronger, clearer guidelines and requirements for considering DEI qualifications in hiring processes than when we started.



Thus we have reason to believe the value of equitable, student-centered teaching will be propagated and sustained even with faculty turnover and new faculty hiring. Structurally, the seminars for first-year and transfer students are now embedded in the college's teaching schedule and workload, and the accompanying peer mentor program will be continued with support from a private donor. We also now have permanent, state-funded positions for a faculty development director in CSE, as well as a vice presidential-level chief diversity officer position. We believe these structural changes will help us address persistent barriers. Finally, we have a National Science Foundation-funded project to develop and test a framework for equitable STEM instruction that will build on, and operationalize, the learnings that we achieved through our participation in the HHMI IE Initiative.

## Reflections

**Our thinking about inclusive excellence evolved toward having a more asset-based rather than deficit-based mindset** about students and faculty. Although we thought we had an asset-based mindset coming into the project, we designed our student seminar with somewhat of a deficit approach, assuming we knew what the students needed to succeed and not probing for what assets they would bring to the experience. This realization came from some student feedback that we received at the end of Year 2, which motivated us to make changes to the seminar to bring in more discussions about equity issues in STEM. We also evolved toward a more asset-based approach with faculty, helping them build from what they were already doing and preparing them to be leaders in their departments. These examples speak to the importance of gathering data about knowledge and experience from a wide array of stakeholders before beginning a project.

## Grant-Derived Dissemination Products

Borda, E., Van Orman, D., and Hanley, D. "A two-quarter seminar program increases underrepresented STEM students' sense of belonging," AAC&U Transforming STEM conference, Arlington, VA, November 2023.

Borda, E. "Advancing Excellence and Equity in Science: A curriculum to build community and belonging in STEM," Accelerating Systemic Change Network/Network of STEM Education Centers international conference, Minneapolis, Minn., June 2023.

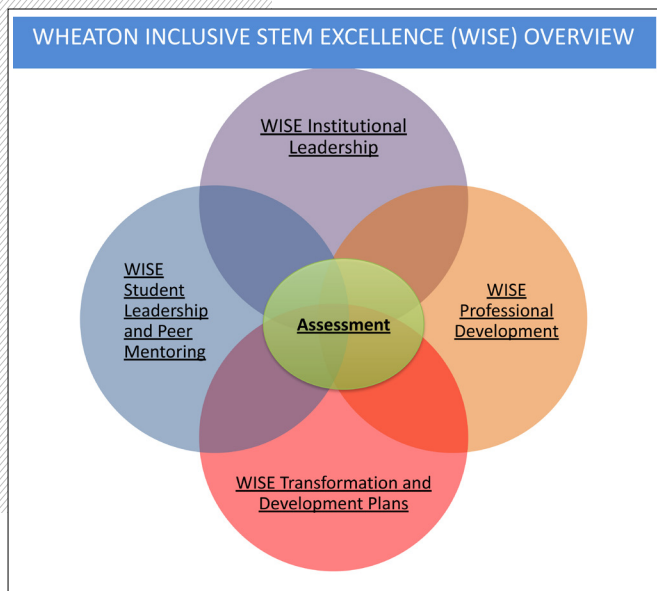
Connell, G. "A College-Wide, Iterative Approach to GTA Professional Development," Scholarship of Teaching and Learning conference, University of California - Davis, Davis, Calif., December 2022.

Van Orman, D., Hanley, D., and Borda, E. "Examining the effects of an inclusive, student-centered initiative on undergraduate first-year and transfer students' identity, motivations, and belongingness in STEM," Scholarship of Teaching and Learning conference, University of California-Davis, Davis, Calif., December 2022.

Borda, E., and Otto, J. "Equipping faculty for inclusive, student-centered teaching in STEM," American Association of Colleges and Universities (AAC&U) Network for Academic Renewal: Transforming STEM Education, Chicago, Ill., November 2019.

Borda, E., Donovan, D., and Otto, J. "Equipping freshmen and transfer students for success in science: A two-quarter seminar sequence," AAC&U Network for Academic Renewal: Transforming STEM Education, Atlanta, Ga, November 2018.

# Wheaton College Massachusetts Norton, Massachusetts



When we began our IE journey, institutional data suggested that performance and persistence in STEM courses was significantly lower for new majority (NM) students than for white, Asian, and non-first-generation students. We approached this concern with a two-pronged approach that included both faculty-facing and student-facing initiatives (see Figure 1). On the faculty side, our strategies included departmental self-studies to identify barriers to NM student success and department-level transformation plans to improve diversity, equity, inclusion, and belonging (DEIB), with the intent of achieving greater success for NM students specifically and for all students generally. Professional development opportunities – such as STEM division meetings, remote and on-campus workshops, and travel to conferences – allowed STEM faculty to learn best practices associated with equity and inclusion in and out of the classroom.

Another component of our proposal was to develop and offer a STEM leadership course for NM students. This course was open to all students but was aimed specifically at students from traditionally underrepresented groups. As an outcome of the course, students developed campus improvement projects aimed at addressing barriers to student success and/or at developing novel ways of addressing student concerns or of improving communication among underrepresented students and between faculty and students. One student project, called MUSES (Mentoring Underserved Students for Excellence in STEM), brought a STEM-specific, peer-on-peer mentoring program to the college for the first time (see Figure 2).

**Want to Join a Community in STEM?**

Join MUSES! We are a peer mentoring group for underserved students in STEM. We seek to create a more diverse and welcoming community in the STEM field here at Wheaton!

Need personalized 1 on 1 help? Want someone to guide and support you? Sign-up to be a mentee today!

Want to help someone on their college journey? Apply to be a mentor today!

Have questions? Please email: [prince@wheatoncollege.edu](mailto:prince@wheatoncollege.edu) / [taylor\\_jada@wheatoncollege.edu](mailto:taylor_jada@wheatoncollege.edu) / [AND/OR/cttus\\_mikayla@wheatoncollege.edu](mailto:AND/OR/cttus_mikayla@wheatoncollege.edu)

As we proceeded to the implementation phase of the project, faculty buy-in was an initial challenge but was improved through STEM division meetings. These forums brought faculty and staff together to exchange concerns, DEIB strategies, etc. Events included presentations by faculty and staff who were first-generation college students, reports by faculty on takeaways from DEIB-centered conferences, sharing of inclusive teaching strategies, alternative assessment strategies, and conversations on what it means to be a scientist, among other topics. Cosponsorship of a visit by Dr. Anthony Jack, coupled with a faculty book discussion about the hidden curriculum, helped spread our reach across campus.

Restrictions due to the COVID pandemic set back many of our planned activities. One effective response was to offer a virtual summer public health and social justice seminar series open to all, with post-seminar discussion sessions led by trained student facilitators. Media services staff, as well as research and instruction personnel in the library, provided support. Collaborations with the Marshall Center for Intercultural Learning and with the diversity, equity, and access leadership were invaluable, as there were multiple efforts on campus aimed at working with departments on the development of anti-racism plans. We also held a five-week faculty exchange during winter break of 2021 to encourage faculty to share strategies for teaching in a remote or hybrid mode.

Personnel shortages at the institutional research office severely limited that office's ability to meet the needs of the STEM Division, so some data analysis work was farmed out to our consultant. Even so, we experienced challenges in getting data analyzed in a timely manner.

We now feel well positioned to continue our journey toward inclusive excellence. Students in the STEM Leadership course identified barriers and opportunities to improve access to STEM, and they have implemented innovative approaches to build community and STEM identity. For example, the students created the MUSES club, which focuses on partnering new STEM students with peer mentors who can help them navigate the hidden curriculum.

Faculty across the STEM Division have established a set of shared values, as well as a common language relating to DEIB, which did not visibly exist prior to the implementation of this grant; they are now more engaged in sharing ideas with other STEM faculty. All proposals for departmental transformation plans were evaluated with an eye toward building meaningful, lasting change. For example, key introductory courses were a particular focus, and we required department-wide efforts to make changes across all sections based on insights gained from a shared self-study.

One goal embedded in all transformations was to habituate STEM departments to obtaining and analyzing data regularly and to including that information in their decision-making processes. A second goal was to enhance equity and inclusion regarding which students are selected to work alongside faculty in their research labs. A recent initiative to sponsor NM students doing research with faculty is meant not only to support the students, but also to open the eyes of the faculty members, so that they will be more equitable in choosing student research partners in the future.

One of the lessons we have learned on our journey so far is that STEM reform needs a flexible implementation process. Each department has its own culture and is at a different stage of readiness to begin this work. Also, even faculty who would like to become involved don't always have the bandwidth to do so. We have learned that a multipronged approach is required, providing faculty with a variety of opportunities to engage with the work, such as attending a training session, participating in a conference, or working within their department on transformation plans. We have also learned that it is important to celebrate successes, and gathering together to do that has been important to continued faculty engagement.

Building capacity for the future necessitates an awareness of the goals surrounding inclusion across campus and requires that different stakeholders on campus work together. Thus far, we have sought to raise awareness among STEM faculty and have helped to create an environment where they share a vision for the full inclusion of NM students. Also, a culture of sharing strategies for transforming classes and departmental structures has been established. Further, we have partnered with other campus groups working on DEI to amplify our message and extend our reach.

We have also learned that the accumulation and consideration of data to assess progress and implement change needs to become a practice among all faculty. This could be on a small scale, such as getting feedback from students through midsemester class surveys, or on a larger scale, which would require support from the institutional research office or others on campus to obtain data and to assess what is happening in a department, a division, or campus-wide. Access to data should be insisted upon by every department annually, and procedures should be put in place to make the best use of that data.

## Reflections

One of the lessons we have learned on our journey so far is that STEM reform needs a flexible implementation process.

# Primary IE Strategies

Institution Name	Carnegie Classification	Professional development, any	Departmental groups	Faculty workshops, in-house	Faculty workshops, external facilitators	Administrators/ staff included in workshops	Faculty learning communities
Arizona State University	Doctoral University: Very High Research Activity	X	X	X	X	X	
Bates College	Baccalaureate College: Arts & Sciences Focus	X	X	X	X	X	X
Brandeis University	Doctoral University: Very High Research Activity			X	X	X	X
California State Polytechnic University Humboldt	Master's Colleges and University: Larger Programs						
California State University Los Angeles	Master's Colleges and University: Larger Programs	X		X	X	X	X
California State University San Marcos	Master's Colleges and University: Larger Programs	X					X
Chaminade University of Honolulu	Master's Colleges and University: Medium Programs		X	X	X	X	X
Davidson College	Baccalaureate College: Arts & Sciences Focus	X	X	X	X	X	X
Delaware State University	Master's Colleges and University: Medium Programs		X	X	X	X	X
DePauw University	Baccalaureate College: Arts & Sciences Focus		X			X	X
Framingham State University	Master's Colleges and University: Larger Programs	X	X	X	X	X	X
James Madison University	Doctoral University: High Research Activity	X		X	X	X	X
Kalamazoo College	Baccalaureate College: Arts & Sciences Focus		X	X	X	X	X
Kennesaw State University	Doctoral University: High Research Activity		X	X	X	X	X
Kenyon College	Baccalaureate College: Arts & Sciences Focus	X			X	X	X
Lawrence Technological University	Master's Colleges and University: Larger Programs	X	X	X	X	X	X
Lawrence University	Baccalaureate College: Arts & Sciences Focus		X	X	X	X	X
Mercy College	Master's Colleges and University: Larger Programs		X	X	X	X	X
Mount Mary University	Master's Colleges and University: Larger Programs		X	X	X	X	
Norfolk State University	Master's Colleges and University: Medium Programs		X	X	X	X	X
North Carolina State University Raleigh	Doctoral University: Very High Research Activity		X	X	X	X	X
Northeastern University	Doctoral University: Very High Research Activity	X	X	X	X	X	X
Oberlin College	Baccalaureate College: Arts & Sciences Focus		X	X	X	X	X
Oregon State University	Doctoral University: Very High Research Activity	X	X	X	X	X	X
Radford University	Doctoral University: Doctoral/Professional University	X	X	X	X	X	X
Rochester Institute of Technology	Doctoral University: High Research Activity	X	X	X	X	X	X
Roosevelt University	Doctoral University: Doctoral/Professional University	X	X	X	X	X	X
San Francisco State University	Doctoral University: High Research Activity						
Stony Brook University	Doctoral University: Very High Research Activity		X				X



Institution Name	Student resource development, any	Learning communities/cohorts	Peer mentors/learning assistants	Staff positions (with intent to institutionalize)	Faculty/staff advising	Inclusive spaces	Curriculum development, any	CREs	Digital courses	Intro STEM courses
Arizona State University						X	X		X	X
Bates College	X	X	X		X	X	X	X		X
Brandeis University			X							X
California State Polytechnic University Humboldt		X	X	X	X		X	X		X
California State University Los Angeles	X	X				X	X			
California State University San Marcos	X		X		X		X			X
Chaminade University of Honolulu		X	X	X				X		X
Davidson College	X			X			X			X
Delaware State University		X	X		X	X			X	X
DePauw University			X	X		X				X
Framingham State University										
James Madison University	X	X	X		X	X	X	X		
Kalamazoo College			X	X						
Kennesaw State University		X	X		X			X		X
Kenyon College	X		X				X			X
Lawrence Technological University	X		X	X		X	X	X		X
Lawrence University			X		X	X				X
Mercy College			X	X	X			X		
Mount Mary University				X	X	X			X	X
Norfolk State University					X			X		
North Carolina State University Raleigh			X	X		X		X	X	
Northeastern University	X	X	X				X	X		X
Oberlin College				X		X				X
Oregon State University										
Radford University	X		X	X			X	X		X
Rochester Institute of Technology	X				X	X				
Roosevelt University	X		X	X		X	X			
San Francisco State University			X				X		X	
Stony Brook University			X						X	X

Institution Name	NonSTEM majors courses	Institutional development, any	Faculty evaluation, tenure, and promotion policies and procedures	Other policies and procedures	Infrastructure (e.g., new structures such as data dashboards, etc.)
Arizona State University	X	X	X	X	X
Bates College		X	X	X	X
Brandeis University			X	X	
California State Polytechnic University Humboldt	X		X		X
California State University Los Angeles		X			X
California State University San Marcos					
Chaminade University of Honolulu			X	X	X
Davidson College	X	X	X		
Delaware State University	X		X	X	X
DePauw University	X		X	X	
Framingham State University					
James Madison University		X	X	X	X
Kalamazoo College			X		
Kennesaw State University			X	X	X
Kenyon College		X	X	X	
Lawrence Technological University	X	X		X	X
Lawrence University					X
Mercy College	X			X	X
Mount Mary University	X				
Norfolk State University			X	X	X
North Carolina State University Raleigh			X	X	
Northeastern University	X	X	X	X	
Oberlin College	X		X		X
Oregon State University		X	X	X	
Radford University	X	X	X	X	
Rochester Institute of Technology		X	X	X	
Roosevelt University		X		X	
San Francisco State University					
Stony Brook University					X

Institution Name	Community college resource development, any	Articulation policies/practices	Curriculum development	Faculty development	Inclusive spaces
Arizona State University					
Bates College					
Brandeis University					
California State Polytechnic University Humboldt					
California State University Los Angeles					
California State University San Marcos					
Chaminade University of Honolulu					
Davidson College					
Delaware State University					
DePauw University					
Framingham State University					
James Madison University					
Kalamazoo College					
Kennesaw State University					
Kenyon College					
Lawrence Technological University					
Lawrence University					
Mercy College					
Mount Mary University					
Norfolk State University					
North Carolina State University Raleigh				X	
Northeastern University					
Oberlin College					
Oregon State University	X			X	
Radford University					
Rochester Institute of Technology					
Roosevelt University	X	X			
San Francisco State University					
Stony Brook University					

# Primary IE Strategies (continued)

Institution Name	Carnegie Classification	Professional development, any	Departmental groups	Faculty workshops, in-house	Faculty workshops, external facilitators	Administrators/ staff included in workshops	Faculty learning communities
Syracuse University	Doctoral University: Very High Research Activity	X	X	X	X	X	X
The College of New Jersey	Doctoral University: Very High Research Activity	X	X	X	X		X
Towson University	Master's Colleges and University: Larger Programs	X		X	X		X
Trinity Washington University	Master's Colleges and University: Medium Programs	X	X	X	X	X	X
Tufts University	Doctoral University: Very High Research Activity	X		X			X
University of California Davis	Doctoral University: Very High Research Activity						
University of California Los Angeles	Doctoral University: Very High Research Activity	X	X	X	X	X	X
University of California Merced	Doctoral University: High Research Activity			X	X		X
University of Colorado Denver	Doctoral University: Very High Research Activity		X	X	X	X	X
University of Houston Downtown	Master's Colleges and University: Larger Programs		X	X	X	X	X
University of Illinois Chicago	Doctoral University: Very High Research Activity	X	X	X	X	X	X
University of Massachusetts Amherst	Doctoral University: Very High Research Activity		X	X	X	X	X
University of Missouri Columbia	Doctoral University: Very High Research Activity					X	X
University of Northern Colorado	Doctoral University: Doctoral/Professional University	X		X	X	X	X
University of Puerto Rico Humacao	Baccalaureate College - Diverse Fields		X	X	X	X	X
University of South Dakota	Doctoral University: Doctoral/Professional University	X		X	X		
University of St. Thomas	Doctoral University: Doctoral/Professional University	X	X	X	X	X	X
University of Texas Rio Grande Valley	Doctoral University: High Research Activity	X		X	X	X	X
University of Utah	Doctoral University: Very High Research Activity		X			X	X
University of Wisconsin Madison	Doctoral University: Very High Research Activity			X		X	X
Utah State University	Doctoral University: Very High Research Activity			X		X	
Vassar College	Baccalaureate College: Arts & Sciences Focus	X		X	X	X	X
Virginia Commonwealth University	Doctoral University: Very High Research Activity		X	X	X	X	X
Virginia Polytechnic Institute & State University	Doctoral University: Very High Research Activity	X	X	X	X	X	X
Washington University St Louis	Doctoral University: Very High Research Activity			X		X	X
Wellesley College	Baccalaureate College: Arts & Sciences Focus	X			X	X	
Western Washington University	Baccalaureate College: Arts & Sciences Focus			X		X	
Wheaton College Massachusetts	Baccalaureate College: Arts & Sciences Focus	X	X	X	X	X	X



Institution Name	Student resource development, any	Learning communities/cohorts	Peer mentors/learning assistants	Staff positions (with intent to institutionalize)	Faculty/staff advising	Inclusive spaces	Curriculum development, any	CREs	Digital courses	Intro STEM courses
Syracuse University	X		X				X	X	X	X
The College of New Jersey	X		X		X	X	X	X		X
Towson University	X	X	X	X			X	X		
Trinity Washington University	X	X	X		X		X	X		X
Tufts University	X	X					X			X
University of California Davis										X
University of California Los Angeles	X	X	X	X	X	X	X	X	X	X
University of California Merced		X	X	X				X		X
University of Colorado Denver			X	X	X			X		X
University of Houston Downtown									X	X
University of Illinois Chicago			X			X	X			X
University of Massachusetts Amherst	X	X	X	X	X			X		
University of Missouri Columbia		X	X		X					
University of Northern Colorado	X					X				
University of Puerto Rico Humacao		X	X		X	X		X	X	X
University of South Dakota	X	X	X		X		X			
University of St. Thomas	X	X	X	X	X		X		X	X
University of Texas Rio Grande Valley		X	X	X	X					X
University of Utah					X	X				X
University of Wisconsin Madison		X	X	X	X				X	
Utah State University		X	X	X	X	X		X		
Vassar College	X	X	X		X	X	X			X
Virginia Commonwealth University			X	X		X				
Virginia Polytechnic Institute & State University	X		X				X	X		X
Washington University St Louis			X		X					
Wellesley College	X	X	X	Y	X	X	X	X		X
Western Washington University		X	X	X						X
Wheaton College Massachusetts	X	X	X		X		X	X		X

Institution Name	NonSTEM majors courses	Institutional development, any	Faculty evaluation, tenure, and promotion policies and procedures	Other policies and procedures	Infrastructure (e.g., new structures such as data dashboards, etc.)
Syracuse University	X	X			X
The College of New Jersey		X		X	X
Towson University					
Trinity Washington University				X	X
Tufts University					
University of California Davis			X		X
University of California Los Angeles	X	X	X		
University of California Merced					
University of Colorado Denver				X	X
University of Houston Downtown	X		X		
University of Illinois Chicago		X	X	X	X
University of Massachusetts Amherst	X		X		
University of Missouri Columbia				X	
University of Northern Colorado		X		X	X
University of Puerto Rico Humacao	X		X	X	X
University of South Dakota	X	X	X		
University of St Thomas					
University of Texas Rio Grande Valley			X		
University of Utah			X		X
University of Wisconsin Madison				X	X
Utah State University	X		X	X	
Vassar College	X			X	
Virginia Commonwealth University			X	X	
Virginia Polytechnic Institute & State University		X	X		X
Washington University St Louis					X
Wellesley College		X	X	X	
Western Washington University					
Wheaton College Massachusetts					

Institution Name	Community college resource development, any	Articulation policies/practices	Curriculum development	Faculty development	Inclusive spaces
Syracuse University					
The College of New Jersey	X	X			
Towson University					
Trinity Washington University					
Tufts University					
University of California Davis					
University of California Los Angeles	X	X	X	X	X
University of California Merced					
University of Colorado Denver					
University of Houston Downtown				X	
University of Illinois Chicago					
University of Massachusetts Amherst	X				
University of Missouri Columbia		X		X	
University of Northern Colorado					
University of Puerto Rico Humacao				X	
University of South Dakota					
University of St Thomas					
University of Texas Rio Grande Valley		X			
University of Utah		X		X	
University of Wisconsin Madison		X	X	X	X
Utah State University					
Vassar College	X		X	X	X
Virginia Commonwealth University				X	
Virginia Polytechnic Institute & State University	X			X	
Washington University St Louis					
Wellesley College					
Western Washington University					
Wheaton College Massachusetts					