

Office of the President

TO MEMBERS OF THE ACADEMIC AND STUDENT AFFAIRS COMMITTEE:

DISCUSSION ITEM

For Meeting of March 17, 2021

USING CURRICULAR INNOVATIONS AND ENHANCEMENTS TO ADDRESS EQUITY GAPS

EXECUTIVE SUMMARY

This item is the third in a series examining undergraduate teaching and learning efforts that began with a November 2020 item on 21st century skills development, followed by a January 2021 item on the future of UC instruction and how innovation promotes equitable classrooms. This item focuses on how UC campuses are using curricular innovations and enhancements to address equity gaps, an especially critical component to diversifying Science, Technology, Engineering, and Mathematics disciplines and to achieving UC 2030 goals to eliminate gaps in timely graduation.

BACKGROUND

As a research university, the University of California is committed to advancing knowledge through its teaching, research, and public service mission. The process of discovery and disseminating results is part of UC's DNA, which infuses how faculty approach teaching. It is not limited to conveying what is known today, but includes sharing discoveries and raising questions of relevance and importance to tomorrow's challenges. It is an inquisitive process which seeks to engage students in content and inspire them to want to learn more—a process of continuous learning that supports student research and advances career development in a changing workforce.

The majority of California public high school students are either Pell-eligible, first-generation, and/or from historically underrepresented groups (URG). These students represent the new generation of California and their success is critical to the California of the future. When UC admits these students to the University, the goal is to provide them every opportunity to succeed. UC's 2030 goals, especially the goal to eliminate equity gaps for timely graduation, are grounded in the recognition that:

- The freshman four-year graduation rate for Pell, first-generation, and underrepresented students is 11, 13, and 17 percentage points different than their peers.

| UC Systemwide Freshmen | Pell | Non-Pell | Equity Gap | First-Gen | Not First-Gen | Equity Gap | URG | Non-URG | Equity Gap |
|--------------------------------|-------|----------|--------------|-----------|---------------|--------------|-------|---------|--------------|
| 1st year Retention rate (2018) | 90.8% | 93.8% | 2.9% | 90.5% | 94.3% | 3.8% | 89.1% | 94.2% | 5.1% |
| 4 year Grad rate (2015) | 62.9% | 73.9% | 11.0% | 62.1% | 74.6% | 12.5% | 57.3% | 74.1% | 16.8% |
| 5 year Grad rate (2014) | 79.9% | 85.6% | 5.7% | 78.2% | 86.6% | 8.4% | 75.3% | 86.2% | 10.9% |
| 6 year Grad rate (2013) | 82.8% | 87.4% | 4.6% | 81.3% | 88.5% | 7.2% | 78.6% | 87.9% | 9.3% |
| Time to Degree (2012) in yrs | 4.26 | 4.09 | 0.17 | 4.24 | 4.11 | 0.13 | 4.30 | 4.12 | 0.18 |

- The transfer two-year graduation rate for Pell, first-generation, and underrepresented students is nine, four, and six percentage points different than their peers.

| UC Systemwide Transfer | Pell | Non-Pell | Equity Gap | First-Gen | Not First-Gen | Equity Gap | URG | Non-URG | Equity Gap |
|--------------------------------|-------|----------|-------------|-----------|---------------|-------------|-------|---------|-------------|
| 1st year Retention rate (2018) | 92.6% | 92.6% | 0.0% | 92.4% | 93.0% | 0.5% | 80.7% | 84.4% | 3.7% |
| 2 year Grad rate (2017) | 54.8% | 63.9% | 9.1% | 57.2% | 61.4% | 4.2% | 54.9% | 61.1% | 6.2% |
| 3 year Grad rate (2016) | 81.0% | 85.9% | 5.0% | 82.6% | 84.5% | 1.9% | 80.7% | 84.4% | 3.7% |
| 4 year Grad rate (2015) | 87.9% | 89.7% | 1.8% | 88.1% | 89.5% | 1.4% | 86.2% | 89.6% | 3.4% |
| Time to Degree (2012) in yrs | 2.48 | 2.29 | 0.19 | 2.39 | 2.39 | 0.00 | 2.45 | 2.38 | 0.07 |

These equity gaps begin with differences in first-year retention, which are largely influenced by students' success in entry-level courses. Some students who do not succeed in first-year courses may go on academic probation and not return to the University, while others may repeat classes, thereby extending time to degree.

UC research, including work being conducted within campus Teaching and Learning Centers, is informing efforts to redesign, enhance, and improve UC curriculum to eliminate equity gaps.

This process includes:

- understanding the data, including identifying courses and student populations with the greatest equity gaps
- identifying social and systemic factors associated with equity gaps
- reviewing existing research and best practices to identify areas of focus for interventions
- creating innovations and enhancements to address equity gaps
- engaging faculty in discussions about shifts in pedagogy and supporting instructional improvement
- identifying strategies to implement changes and ways to compare to the status quo
- assessing the impact of these efforts through feedback, peer review, and student outcomes
- disseminating results for broader implementation through department, college, support units and University leadership

This item shares multiple campus examples of programs that are seeking to address equity gaps. As part of UC 2030 efforts to eliminate equity gaps, multiple campuses prioritized funding to scale up existing efforts to redesign curriculum as a means to achieve these goals. Eliminating

these gaps requires a long-term commitment to students who have been disadvantaged by K–12 inequality and other structural inequalities. Programs need to be adaptable given the fact that the student population is ever-changing. None of these efforts will be fully achieved without stable additional funding. In the absence of this funding, campuses are relying on a patchwork of grants and campus funds to continue this work on a limited scale. Campuses are also looking at ways to share innovations and enhancements with a broader audience, disseminating lessons learned and sharing best practices, which can help instructors implement them in existing courses.

USING CURRICULAR INNOVATIONS AND ENHANCEMENTS TO ADDRESS EQUITY GAPS

A March 2019 UC Santa Cruz news brief reported that a “Veteran teacher shows how achievement gaps in STEM classes can be eliminated.”¹ The article described how after five quarters of steady improvements and constant experimentation with closing equity gaps, the gap between the grades of first-generation and underrepresented students and the rest of the students in the Applied Discrete Mathematics class vanished.

Course faculty, guided by the Center for Innovative Teaching and Learning’s (CITL) Science, Technology, Engineering, and Mathematics (STEM) equity coordinator, conducted research applying backward design² to explore elements of the course that explained the reduction of achievement gaps, publishing these results in an academic research paper, “Successful Interventions to Eliminate Achievement Gaps in STEM Courses.”

Both of the faculty authors of the paper had taken advantage of faculty development opportunities at UC Santa Cruz by participating in the systemwide National Science Foundation-funded STEM Faculty Learning Program in 2017–18, spending a year as Faculty Fellows at CITL and actively participating in the STEM Teaching and Learning Community that started at UC Santa Cruz in 2018. Guided by the literature and grounded in theory on student-centered teaching practices and growth mindset³ to which they had been exposed in these learning communities, the authors identified a three-pronged approach that contributed to the elimination of equity gaps:

- Role modeling: having a diverse teaching staff (i.e., professors, instructors, and tutors) to better reflect the students and support student engagement, sense of belonging,⁴ and achievement

¹ <https://news.ucsc.edu/2019/03/larrabee-equity.html>

² “Backward design” is a description of a way to design courses that starts by identifying learning outcomes and works back to structure the course activities to systematically lead to those outcomes.

³ “Growth Mindset” is a term coined by Psychology Professor Carol Dweck. A “mindset,” according to Dweck, is a self-perception or “self-theory” that people hold about themselves. Believing that you are either “intelligent” or “unintelligent” is a simple example of a mindset. Alternatively, in a “growth mindset,” people believe that their most basic abilities can be developed through dedication and hard work.

⁴ “Sense of belonging” has been identified by multiple researchers as integral to persistence, especially through challenge. Students feel belonging when they feel supported and connected, that their ideas matter and are respected and valued, and that they have a contribution to make. Students can feel social and/or academic belonging.

- Productive failure: incorporating the notion that failure in the learning process is an appropriate path to learning, reinforcing a growth mindset, and implementing a homework policy based on effort, not taking points off on homework for wrong answers but using that feedback to identify supplemental materials to understand mistakes
- Modeling self-compassion: explicitly discussing stereotype threat—that is, the risk of students who perform poorly believing the failure is confirmation that they do not belong, instead of becoming more engaged in the course (e.g., putting in more study time)

The authors also claimed “not to have a recipe for all-inclusive teaching or that eliminating equity gaps is as easy as following a recipe,” but their research showed that the approach was a way to share promising practices across teaching and learning communities.

UC Santa Cruz is building on this work through a pilot project launched in fall 2020 with three years of initial funding support from the UCSC Provost’s office.⁵ **PROJECT REAL, Redesign for Equity and Advancing Learning**, provides faculty with a research-based program to engage in comprehensive equity-oriented course redesign to improve teaching and learning and contribute to a more equitable institution.

Through a collaborative, cohort-supported model and facilitated by faculty teaching leaders, participants are provided with the research-based tools and time they need to enact the changes they collectively want to see as a campus. The program is organized around a series of modules that highlight the equity dimensions of teaching and learning and cover foundational course design elements, such as aligning learning outcomes, assessments, and in-class activities. It will also include a module with a “getting to know your students” dashboard providing course level data on enrollees that can inform (re)design.

UC Santa Cruz aims to launch the first cohort in summer 2021, targeting STEM “gateway” courses known to be barriers to student persistence in STEM majors and eventually expanding to support courses from all disciplines to close equity gaps campus-wide. They plan to redesign fifteen courses deemed critical to the curriculum with leadership from faculty peer facilitators. That number will increase over time as they learn what best meets faculty and curricular needs.

UC Santa Barbara’s Center for Innovative Teaching, Research and Learning (CITRAL) has identified gateway courses with the largest and most persistent equity gaps and is partnering with faculty to employ innovative pedagogies to close those gaps, implementing strategies that increase students’:

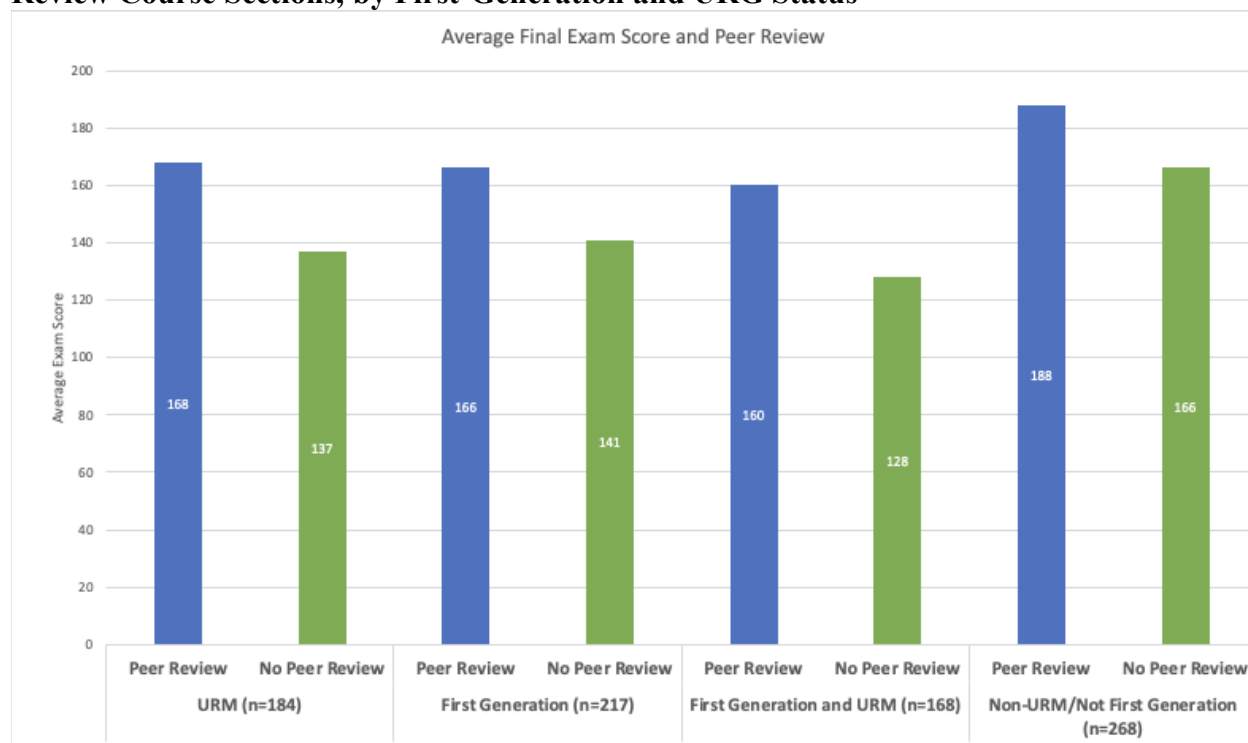
- Disciplinary knowledge: their understanding of how knowledge functions and is applied within courses
- Self-efficacy: beliefs in their ability to understand and apply knowledge
- Sense of belonging: the feeling that they are connected to the course and feel cared about

⁵ While initial funding was set for three years, CITL administrators anticipate that when they present data on improved student outcomes for courses redesigned in Project REAL, there will be a strong chance of continued funding.

For Introductory Biology, which enrolls anywhere from 240 to 800 students per section, faculty used a technological platform called **Eli Review** to develop writing assignments focused on difficult course concepts. After completing the assignments, students then use the platform to review the work of other students, a process known as peer review. Research shows that each stage of this process—writing, receiving feedback, and providing feedback—reduces equity gaps. CITRAL learning experts work closely with faculty at every stage of the process—creating assignments, including identifying key course concepts, designing short writing activities, creating structured peer review rubrics, and using data gathered from students’ writing/review to improve instruction. To date, more than 6,000 students have completed writing/review activities using learning review, showing promising results.

Figure 1 shows the average final exam scores for students increase in Introductory Biology courses that complete writing and peer review activities (using Eli Review) compared with those that do not. In particular, the gaps in grades decreases for URM and first-generation students.

Figure 1. UCSB Introductory Biology Final Exam Scores for Peer Review and No Peer Review Course Sections, by First-Generation and URM Status



In spring 2019, UCLA’s **Center for the Advancement of Teaching (CAT)** launched the **Provost’s Grants to Increase Access and Reduce Disparities**. Four departments were awarded grants and are currently revising aspects of their curricula to address inequitable outcomes for underrepresented or transfer students.

As one example, the Chemistry and Biochemistry department has implemented an enhanced general chemistry course sequence to decrease achievement gaps in STEM major persistence and

time-to-degree. Faculty had observed a significant grade disparity of 0.5 to one grade point between URG and non-URG students in general chemistry courses, with 13 percent of URG students not passing Chemistry 14A or 14B (General Chemistry for Life Scientists), compared to three percent of non-URG students. To address these disparities, faculty proposed the creation of enhanced courses in which students would receive additional support primarily through extra hours of discussion in which students would undertake highly structured activities designed to support at-risk students.

The first step to identifying students who may benefit from the extra support provided in Chemistry & Biochemistry 14AE is having students complete a chemistry diagnostic. The chemistry diagnostic tests one's basic chemistry knowledge, math skills, and logical thinking skills, and it also collects data about which high school courses were taken and performance in those courses. The key point here is that the extra sessions are embedded in the course; supplemental sessions can trigger stereotype threat. Students receive a recommendation to take the course in a carefully worded email that highlights the fact that the course has the same learning objectives and level of rigor as Chemistry & Biochemistry 14A but is an enhanced version that will help them succeed. Since all the students take the supplemental sections together, the instructors believe that these students are unlikely to feel singled out.

This effort was influenced by the literature showing that remedial courses are typically not effective for reducing performance disparities. It is preferable to implement courses that hold students to rigorous standards while providing sufficient support for them to achieve those standards.

In another example, after recognizing that UCLA transfer students were struggling in their first economics courses, the Economics department undertook an analysis of its transfer student population, paying particular attention to success in their first quarter and obstacles to completing their degrees. Based on their findings, faculty are now developing supportive instructional materials in the form of videos, practice problems, and self-tests that cover the mathematical concepts required for the microeconomics theory course; these materials can be used by transfer students, in particular, to ensure they have a sound foundation for the course.

Another approach is to engage students as partners in enhancing teaching and student learning outcomes. UC Merced's **Center for Engaged Teaching and Learning (CETL)** developed the **Students Assessing Teaching and Learning (SATAL)** program as a vehicle to support faculty and staff working to enhance teaching and improve student learning outcomes. Faculty, teaching assistants, and/or academic program leads partner with SATAL student interns to assess the teaching and learning experiences of students in their classes.

The "Students as Partners" (SaPs) movement in higher education places students, faculty, and staff together as valued collaborators in the teaching and learning process. SaPs provide an invaluable opportunity to engage students in efforts to improve pedagogical practices. As one SATAL intern stated, "It's more relatable for a student to talk to another student or give their feedback to a student when they're having trouble or don't necessarily feel comfortable telling a professor that the professor is not doing well or how they'd like to be taught." As a SaPs

program, SATAL prioritizes students' voices, as they engage as collaborators in the student journey. This student, staff, and faculty partnership is founded on the "principles of good practices: respect, responsibility, and reciprocity."⁶

Assessments support provided by SATAL includes:

- Small Group Instructional Feedback: an efficient way to inform faculty what is working and/or what is less successful so that adjustments can be made to improve the learning experience
- Class Observation: observers record what takes place in the classroom—time spent questioning, board work, group discussions etc.
- Videotaping: a thorough method to evaluate pedagogical techniques
- Mid/End-Course Feedback: proctors distribute and collect a faculty-designed questionnaire and then draft a report of findings

An additional value of the SATAL program is that students evaluating teaching also receive valuable experience and professional development in data collection, analysis, and reporting. This helps create a meaningful learning experience for the students that results in the development of professional skills that will complement their degree completion and transfer to their future careers.⁷

OTHER STRATEGIES TO ADDRESS EQUITY GAPS

Curricular redesign efforts are resource intensive, so some campuses are sharing promising strategies, innovations, and enhancements to broaden efforts to help instructors eliminate equity gaps in courses.

Student demographics and relevant teaching and student support

UC campuses are creating tools that provide insight into course participants to help instructors in delivering courses, along with identifying relevant services that could support student outcomes. The UC Davis Center for Educational Effectiveness (CEE) supports faculty use of their 'Know Your Students'⁸ tool that provides data about the student class profile, including aggregate measures like the number of course repeaters or percent of first-generation or low-income students. Along with this data, CEE provides faculty access to 'Just in Time Teaching' resources, related workshops and consultation that can help them with course planning and ways

⁶ Cook-Sather, Alison "Introduction: Respect, Reciprocity, and Responsibility in Developing Participatory Cultures and Practices," *Teaching and Learning Together in Higher Education*: Iss. 10 (2013), <http://repository.brynmawr.edu/tlthe/vol1/iss10/1>

⁷ Cook-Sather, Alison, Bovill, Catherine., and Felten, Peter. (2014). *Engaging students as partners in learning and teaching: a guide for faculty*. San Francisco: Jossey-Bass.
Matthews, Kelly E. 2017. "Five Propositions for Genuine Students As Partners Practice". *International Journal for Students As Partners* 1 (2). <https://doi.org/10.15173/ijsap.v1i2.3315>.

⁸ Know Your Students was developed by CEE and is part of the Howard Hughes Medical Institute (HHMI) MIDAS project.

to support the student populations they serve. Additionally, faculty teams teaching the courses deemed most relevant for addressing equity gaps are eligible for multi-year course improvement support through their new Pathways Course Initiative (PCI).

Table 1: Just in Time Teaching Modules (all framed towards improving equity/inclusion)

| | |
|---|--|
| <p>Creating an Engaging & Inclusive Environment</p> <ul style="list-style-type: none"> • Anti-racism • Charged discussions as learning opportunities • Encouraging student motivation • Implicit bias • Inclusive practice • Microaggressions and microaffirmations • Student wellbeing • Supporting first-generation students • Supporting transfer students <p>Designing & Organizing the Course</p> <ul style="list-style-type: none"> • Active learning classrooms • Course design • Hybrid and online learning | <p>Planning Instruction & Learning Activities</p> <ul style="list-style-type: none"> • Activating your lecture • Strategies for covering content • Designing effective writing assignments • Engaged reading • Facilitating laboratory activities • Library anxiety • Reflection and metacognition • Strategies for teaching international students • Strategies for teaching multilingual learners <p>Assessing Student Learning</p> <ul style="list-style-type: none"> • Addressing plagiarism • Effective feedback • Grading and assessment <p>Dimensions of Teaching Effectiveness</p> <ul style="list-style-type: none"> • Effective teaching |
|---|--|

Table 2 provides some of the strategies CEE recommends via multiple resources and tools to support underrepresented, first-generation, and transfer students.

Table 2. Examples of strategies for populations identified by the Know Your Students Tool

| Student type | Examples of Strategies |
|----------------------------------|--|
| Underrepresented (Implicit Bias) | <ul style="list-style-type: none"> • Emphasize the range of identities and backgrounds of experts who have contributed to your discipline. • Structure class interactions in a way that does not reinforce existing patterns of privilege. |
| First-generation | <ul style="list-style-type: none"> • Communicate high expectations for all students and that all students belong and are capable of achieving at the highest levels. • Provide structured or scaffolded learning • Tap into all students' prior experiences and knowledge and help them explore how they can apply it to the new content. |
| Transfers | <ul style="list-style-type: none"> • Implement active and collaborative activities that allow for students to form new connections and networks with peers • Create authentic assignments with emphasis on how the content will apply to work in the future • Vary approach when working with veterans or nontraditionally aged students by honoring their life experiences and age |

UC Irvine's Division of Teaching Excellence and Innovation (DTEI) uses a similar tool called COMPASS to display data for instructors on class demographics, such as the percentage of first-generation and low-income students, majors, and prior course performance. DTEI also offers faculty resources on research-based recommendations for helping first-generation and low-income students, as well as for students who are underprepared in academic writing.

Table 3. Examples of recommended strategies by student type identified in COMPASS

| Student type | Examples of Strategies |
|------------------|---|
| First-Generation | <ul style="list-style-type: none"> • Practice transparency about what students are asked to do, why it is important and how they will be evaluated • Teach study skills and organize study groups. • Promote resilience; give students the opportunity to improve on their work and understand what needs to be improved. |
| Low-Income | <ul style="list-style-type: none"> • Put copies of textbooks on reserve at the library or use open source textbooks. • Make sure students are aware that laptops and other technological devices can be checked out from the library. • Be transparent about course fees and also provide information about assistance with food and housing on course syllabi. • Help students see learning as a process, give them opportunities to reflect on what they learned and how they learned it. |

UC Irvine also uses a major migration tool to share information with academic departments on completion rates by each major, migration into other majors, or non-completion by first-generation, underrepresented, and low-income statuses. Departments are advised to review this information and discuss next steps in addressing inequities in student outcomes.

Sense of belonging and inclusion

Sense of belonging can mean different things to different students, including the presence of pervasive negative stereotypes and common social and environmental cues that signal to students that they do not belong, reducing a student's motivation to succeed. Promoting a student's sense of belonging at UC and within their discipline of study is not just a "feel-good" thing to do, there are educational reasons to do so. Sense of belonging is correlated with motivation to achieve, completion of academic tasks, and persistence in college. Technological enhancements in courses may help or become a barrier to faculty-student and student-student engagement that facilitate a sense of belonging. Effective teaching does not consist of solely disseminating information; it also utilizes technology and pedagogy to increase student engagement and sense of belonging.

UC Riverside's Campus Collective is a mentoring program targeted at freshman and transfer students in order to help them foster a better sense of belonging, empowerment, and self-efficacy. Students are matched with mentors who offer guidance as students adjust to university life and campus culture. Mentors assist mentees in navigating the many challenges that students grapple with when attending college for the first time. Areas of support include:

- Access to campus support services
- The purpose and benefits of utilizing a professor's office hours
- Finding meaningful social outlets
- Finding ways to become engaged on campus (research, internships, etc.)
- How to best manage your time
- Maximizing your college experience so that you develop both academically and socially

Mentors are invested in the success of their students and are there for support, inspiration, and as a resource. They provide guidance and insight on such things as academic expectations, career pathways, networking opportunities, and others. The Mentor Collective's online platform offers training and resources for mentors and makes connections with their mentees easy. Campus Collective Mentoring helps new students find an increased sense of belonging and self-efficacy.

UC San Diego's Teaching and Learning Commons, Engaged Teaching Hub has launched an initiative titled "Unpacking Anti-Blackness/Dismantling Systemic Racism in Educational Practices." The initiative is an action-oriented learning community for UC San Diego educators and encourages UC San Diego faculty to critically examine their own teaching practices in the context of anti-racism. UC San Diego faculty adopt anti-racist teaching practices to support the well-being and learning of Black, Latinx, Indigenous, and minoritized students. The inaugural learning community for UC San Diego educators engaging on the topic of anti-racism, held in fall 2020, was grounded in the established literature on anti-racist pedagogy informed by the

work of scholars of color. They engaged in readings, reflection exercises, and discussions designed to deepen their understanding and take action concerning the following topics:

- **Unpacking the historical roots of educational inequity.** What is the historical context of anti-Black racism locally and in U.S. education? How does systemic racism contribute to educational outcomes we see today, particularly at UC San Diego?
- **Understanding our personal relationships to anti-Black racism and white supremacy.** How has our socialization in a racist society contributed (in conscious and unconscious ways) to our identities as people and our choices as educators?
- **Enacting anti-racist pedagogy in our classes and roles as educators.** How can we create classroom experiences that challenge racist ideologies and begin to dismantle existing structures of oppression? What actions will we take to support the well-being of Black, Latinx, Indigenous, and minoritized students at UC San Diego?

UC Berkeley’s Creative Discovery Fellow (CDF) Program was launched in 2018 in order to help instructors incorporate creative assignments into the campus American Cultures requirement.⁹ The CDF program was initiated in order to get at core issues such as anti-racism and social justice education and to facilitate a space for faculty and students to consider these issues as part of course content.

A January 2021 “**Winter Institute**” engaged with the principles of anti-racism pedagogy¹⁰ through community-building practices and activities to support instructors’ ability to implement these pedagogical approaches into spring courses. In the context of remote instruction due to the Covid-19 pandemic, participants also set out to answer questions regarding how to purposefully structure the classroom, its subject matter, relationship dynamics, communication constructs, and approaches to assignment design in order to mobilize the classroom as a place of anti-racism learning.

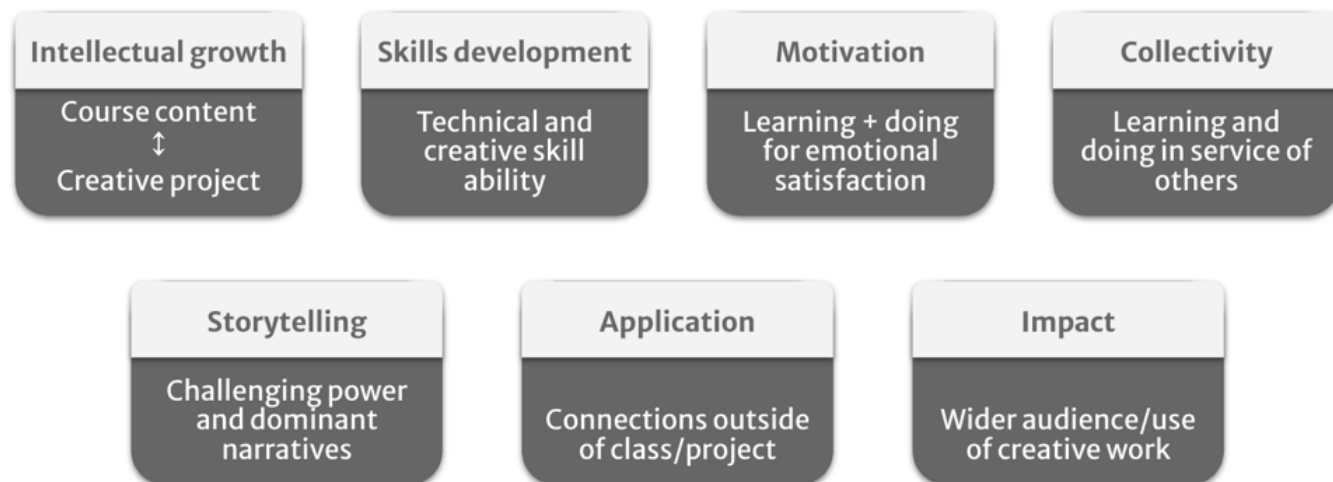
The CDF program helps faculty develop course assignments that leverage creative tools to deepen and enhance student learning by assisting students, particularly from historically marginalized and underrepresented groups, to become “empowered producers and storytellers,” as well as effective change-makers. The CDF learning community is meant to provide space for reflection and improvisation at the intersection of anti-racism, social justice, pedagogy, and digital tools.

⁹ Funding for CDF comes from Adobe, Incorporated and by the Berkeley Student Technology Fund.

¹⁰ Anti-racist pedagogy is not about simply incorporating racial content into courses, curriculum, and discipline. It is also about how one teaches, even in courses where race is not the subject matter.

Elements of impactful creative work:

UC Berkeley Creative Discovery Fellows



The CDF pedagogical approach also offers a creative and safe space that fosters an enhanced sense of purpose, belonging, and agency, thereby providing students better opportunities and higher motivation to succeed in these courses.

COLLABORATIVE EFFORTS TO ADDRESS EQUITY GAPS

Campus Vice Provosts and Deans of Undergraduate Education and Teaching and Learning Directors regularly share best practices to support efforts to eliminate equity gaps. In addition, a number of UC campuses are participating in collaborations with both UC and external partners.

One example is **SEISMIC** (Sloan Equity and Inclusion in STEM Introductory Courses), a multi-university project focused on equity and inclusion in large introductory science, technology, engineering, and mathematics (STEM) courses that are funded by grants from the Alfred P. Sloan Foundation. SEISMIC participating institutions include **UC Davis, UC Irvine, and UC Santa Barbara**, along with Arizona State University, Indiana University, University of Michigan, Michigan State University, University of Minnesota, University of Pittsburgh, and Purdue University. Together, these institutions enroll more than 350,000 students, with over 75,000 enrolling in introductory STEM courses each year.

SEISMIC uses access to and analysis of institutional data as the launching point for their multi-institutional, multi-disciplinary STEM education research and practice collaboration. This collaboration supports participating institutions in efforts to gather local data and put it to work in a broader research-based framework. In this way, SEISMIC ensures that the evidence being used to motivate change is local and hence clearly relevant in context. SEISMIC also aims to motivate changes to long-established practice with something more than the possibility of marginal improvements in learning. By focusing on equity and inclusion as its central metric for

success, institutions seek to harness a higher level of commitment and engagement from the students, faculty, staff, and administrators who participate.

SEISMIC participants currently work together through four Working Groups:

- Measurement: using institutional data sets and parallel data to identify inequities in STEM classrooms related to performance, representation, and persistence
- Experiment: working with STEM instructors to try classroom innovations and interventions to address inequities and problems of inclusion
- Implementing Change: looking at programs and tools influencing student experiences in STEM to identify strategies that best support reform in STEM education and practices that harm these efforts
- Construct: studying the diversity of ideas that undergird efforts to promote diversity, equity, and inclusion in foundational STEM courses, helping participants to be explicit about what they mean when they aim for equity and inclusion in STEM education

SEISMIC institutions experiment with ways of ensuring students succeed and assess the impact of those efforts. One example, tested with chemistry students at UC Irvine, provides short online instructional support for students who think they need it. Another example of a tool designed to increase equity in large courses is University of Michigan's **ECoach**. UC Santa Barbara's CITRAL experts use ECoach to provide tailored, student-specific coaching messages to students in large gateway STEM courses. The coaching is designed to encourage course-specific study habits and bolster students' self-efficacy. ECoach messages take into account data from the campus learning management systems, course grades, student survey results, and students' use of the platform. These data become variables upon which messages to students are tailored. CITRAL learning experts then draw on their knowledge of learning and motivational theory to create different versions of the messages for students based on the variables.

A study of UC Santa Barbara's use of ECoach in Molecular, Cellular & Developmental Biology courses from 2016–2021 showed that students' use of the platform had a positive impact on their exam scores in traditional and active learning courses. Analysis from a smaller version of the course (103 students, these courses traditionally enroll as many as 800 students), taught remotely in Spring 2020, showed similar effects. Specifically, students who have a first-year science GPA below 2.9 and review ECoach content receive ten points more on the exam total. Overall, students who review ECoach content related to exam preparation and reflection have higher total exam scores.

CONCLUSION

The innovative efforts to close equity gaps by UC campuses highlighted in this item are multi-layered and time and resource-intensive. Given the paucity of new resources, unfunded enrollment growth, unavoidable cost increases and persistent State under-funding, the campuses commitment to its instructional mission has been demonstrated by the fact that they are finding short-term ways to fund many of the efforts described in this item. Campuses are often relying on a patchwork of grant funding to support curricular redesign efforts to eliminate equity gaps.

As part of the University’s 2030 goals to close equity gaps, the University requested 240 million dollars over four years to support these efforts. Some of this funding was to be used to scale up efforts to redesign curriculum to address equity gaps, such as:

- UC Berkeley intended to expand Center for Teaching and Learning support and new digital learning resources to support faculty in curricular redesign to increase student engagement, develop inclusive classrooms, and improve student outcomes
- UC Davis intended to expand a Course Gap project to remove achievement gaps in their largest, highest-impact courses
- UC Irvine planned to increase Engaged Learning Course Redesign, which supports faculty in making changes to large courses (i.e., those with 100 or more students) using evidence-based teaching methods and assignments and expand an Enriched Departments Initiative that includes a teaching academy for three faculty (chair, vice chair, junior faculty member) to spearhead a funded project to enrich departmental teaching
- UCLA planned to fund proposals for teaching innovation and curricular advancements that directly impact student outcomes and reduce graduation gaps
- UC San Diego was going to extend its Teaching + Learning Commons’ Supplemental Instruction to all “gateway” courses and complete the Student Activity Hub underpinning data analytics to inform advising, coaching, curricular design, supplemental instruction, and bridge program strategies
- UC Santa Cruz intended to expand curricular capacity and improve quality of core curriculum through staffing and investment in pedagogical improvements with bottleneck courses

To date, UC has not received any funds to support UC 2030 goals, including these areas of investment.

Key to Acronyms

| | |
|---------|---|
| CAT | Center for the Advancement of Teaching |
| CDF | Creative Discovery Fellow Program |
| CEE | Center for Educational Effectiveness |
| CETL | Center for Engaged Teaching and Learning |
| CITL | Center for Innovative Teaching, Research and Learning |
| DTEI | Division of Teaching Excellence and Innovation |
| REAL | Redesign for Equity and Advancing Learning |
| SaPs | Students as Partners |
| SATAL | Students Assessing Teaching and Learning |
| SEISMIC | Sloan Equity and Inclusion in STEM Introductory Courses |
| STEM | Science, Technology, Engineering, Mathematics |
| URG | Underrepresented groups |