CREATE STEM Success Initiative
Year 4
2016-2017

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What is the CREATE STEM Success Initiative?

What would happen if every university leveraged its resources to benefit public education on and off its campus, finding innovative ways to link research, teaching and service to support education from kindergarten through graduate school (K-20)? Four years ago, an ambitious collective proposal for campus and community partners to together improve K-20 efforts in science, technology, engineering and mathematics (STEM) sparked the University of California San Diego’s CREATE STEM Success Initiative (CSSI). The CSSI is now a collective, visionary, and sustained effort that connects faculty, staff and students with the San Diego education community in a shared effort to support K-20 STEM education in the region.

We’re designing new ways to leverage a university as a creator of K-20 opportunities to learn.

Launched by UC San Diego Chancellor Pradeep Khosla in July 2013, the CSSI supports core staff at the Center for Research on Educational Equity, Assessment, and Teaching Excellence (CREATE) to work with campus and community partners to design outreach and education projects that help meet local needs. Specifically, our goal in the CSSI is to leverage research and outreach design efforts to collectively plug critical “leaks” in the regional pipeline to STEM skills, degrees, and jobs. We’re pinpointing learning opportunities our region’s students and educators most want and need, and networking university resources with local partners’ to create those opportunities.

In its first four years, the CREATE CSSI team has supported nearly 461 distinct projects helping campus and community partners to co-design, deliver, and assess crucial K-20 STEM education efforts. Many projects begun in years 1-3 of the CSSI also continue. Each project leverages campus resources to support underrepresented and low-income students particularly to acquire STEM skills now essential for college and career. For a multiplier effect, our deepest projects partner with K-12 districts and regional teacher networks to invest in the development of educators, reaching many more young people over time. We use research and evaluation tools to discover critical ways to leverage resources.

CREATE staff have helped colleagues publicly realize UC San Diego’s mission as a student-centered, research-focused, service-oriented public institution that provides opportunity for young people both on campus and off,

How Does the CREATE STEM Success Initiative Work?

The CSSI seeks to forge a sustainable and replicable model for how universities could be tapped for local educational benefit. The campus funds core staff that a) already know K-20 partners in the region, b) deeply understand the region’s educational needs, and c) have skills in program and professional development, education research, and evaluation. In turn, these core staff support university faculty, staff and students to make deep local impact with their research, expertise, energy, and grants, in partnership with local educators and community leaders.
CSSI staff are helping partners across campus and community to:

- Study pipeline leaks and innovations;
- Network and leverage UC San Diego's resources to help meet local educational needs;
- In partnership, create and shape UC San Diego STEM efforts supporting underrepresented students (K-20), educators, and community programs;
- Assess efforts; build on lessons learned.

Crucially, the CSSI seeks to support campus partners not just to do “more” education outreach, but to design education activities with local partners that actually address local education challenges hindering crucial STEM skills, course completion and degrees.

In Year 4 (2016-17), the CSSI catalyzed and sustained hundreds of outreach and education efforts designed to shore up the local education pipeline, while deepening work on major project models addressing priority STEM education needs. CSSI staff continue to meet near-daily requests to CREATE to help partners expand and develop new ways to leverage UC San Diego STEM resources for equity efforts in public education.

Several key CSSI project models prioritize investing university resources in groups of educators in partner districts, so they can “spread” resources to teachers and students throughout our region.

- As one example, this year we deepened a CSSI focus on math as the “Achilles Heel in STEM,” through work on a $1.9M grant from the Bill and Melinda Gates Foundation to launch the San Diego Math Network (linking four major local school districts in supporting math teachers). Researchers on this project are studying best practices for building regional networks of mathematics educators, including by linking university and K-12 expertise in regional “learning events.” A key SDMN focus is supporting the region’s teachers to ensure that students successfully transition from elementary to middle school math. A summer 2017 conference hosting community college, university, and K12 partners across our region will collectively tackle a precollege transition issue: the pipeline “leak” of mastering Algebra II.

- We deepened our work on a nearly half-million dollar grant from the Office of Naval Research (ONR), pairing UC San Diego scientists from the Scripps Institution of Oceanography (SIO) with local K-12 master teachers in lesson study, to support the implementation of the Next Generation Science Standards. This project exemplifies our Year 4 efforts to multiply the local benefit of university and community resources through deep investments in local educators. Traditional “outreach” efforts could have leveraged university professors simply through...
single lectures in their own children’s classes. CREATE’s grant instead links 80 teachers from four large school districts that serve 44% of the region’s low-income youth with over 18 researchers across UC San Diego and San Diego industry. This work aims to develop research-derived science lessons that can be used by high school teachers and thousands of low-income students for years to come. Most importantly, the work invests in teacher leadership and skill sets for engaging the region’s science students in real-world, inquiry-based science.

- CSSI staff served as key supporters to three major districts in expanding AP Computer Science with UC San Diego’s San Diego Supercomputer Center and the Jacobs School of Engineering, through the final year of a NSF “Computer Science: Creating a Village for Educators (CS CaVE)” grant. This nearly $1M project boosts computer science skills and coursework in underrepresented school districts. To date, the project has helped combine the Supercomputer Center’s expertise with CREATE’s knowledge of district change, to train 71 teachers and launch 27 completely new AP Computer Science Principles courses into 19 schools. In addition, CSSI staff researchers are working with the CS CaVE team to explore how districts add and sustain cutting-edge and rapidly changing Computer Science curricula.

- UC San Diego faculty and the San Diego Science Project in CREATE are CSSI partners in a $600,000 grant awarded by the California Mathematics and Science Partnership (CaMSP) to the three South Bay school districts. In its final year, this grant, “Power: Solving Problems through Engineering in the Physical Sciences,” helped teachers tap UC San Diego science and engineering faculty to develop cohesive, integrated physical sciences and engineering instructional units aligned with the Next Generation Science Standards (NGSS), for transitional kindergarten (TK) through 8th grade. Professors’ content knowledge in Engineering and Physics were at the core of this work. Relatedly, a $410,000 grant linked CREATE and Scripps Institution of Oceanography staff with the county and rural districts to focus on collaborative lesson development using “authentic practices” in science and mathematics, new areas of emphasis in the NGSS and Common Core State Standards.

- Among many additional CSSI projects catalyzing new opportunities for thousands of underrepresented students and educators this year, CSSI staff:
  - Helped campus partners and local educators design an education plan for a $583,000 NIH grant in Oncofertility, connecting teachers to an existing summer academy experience for high-achieving girls.
  - Executed an education plan for a $5.5M UCSD-Nanotechnology Coordinated Infrastructure (U-NNCI) grant supporting NanoEngineering colleagues.
  - Supported bilingual learning events where UC San Diego students introduced approximately 1,500 young people and families in underserved communities to STEM careers and local professionals.
  - Launched day-long intensive conferences where hundreds of educators shared insights about implementing the Common Core State Standards.
  - Supported 14 multi-day events where hundreds of educators learned about the Next Generation Science Standards (NGSS).
- Helped the Early Academic Outreach Program and UC San Diego Admissions design and host a “High School to STEM” conference, where more than 100 high school students from the South Bay and Imperial Valley came to campus for STEM activities and precollege planning.
- Supported Equitas, a UC San Diego student run organization, to continue to offer free SAT prep courses for high school students from southeast San Diego schools, and supported graduate and undergraduate students to offer SPLASH UCSD, an on-campus learning event attracting high school students from across the county.
- Helped an ongoing stream of UC San Diego colleagues design and execute new outreach efforts for San Diego teachers and students, pro bono and as part of successful grant applications (see Highlights later in this report).

- Finally, CSSI staff researchers completed a substantial roster of consultations, projects, and studies to support both K-12 and higher education work directly connected to UC San Diego. Staff evaluated programs inviting K-12 students to experience campus resources, such as the Birch Aquarium’s Beach Science Program, funded by a sizable endowment from Price Philanthropies. CSSI research staff also worked to learn more about how teachers can benefit from working directly with STEM-based researchers and faculty to bring more authentic, real-world, and hands-on lessons into the K-12 classroom. CREATE-based CSSI researchers also continue to help university partners craft the K-12 outreach and education components (and related evaluations) of federally funded projects. They also are active members of the evaluation workgroup at the Teaching + Learning Commons, which is currently helping to develop appropriate assessments of UC San Diego summer programs designed to support incoming freshmen and transfer students.

Put together, these and other efforts, catalyzed and managed by a small core CSSI staff at CREATE, network opportunity to thousands of young people in our region’s schools, particularly through investments in the development of hundreds of teachers—in partnership with district leaders who can push structural and sustainable changes not possible in work with single schools alone.

**Years 1-4: What Have We Accomplished in Total?**

In four years, CSSI staff based at CREATE have **helped expand the participation of hundreds of UC San Diego faculty, students and staff** in new efforts to help K-20 partners plug the most troubling “leaks” in the region’s STEM pipeline, catalyzing new opportunities for many thousands of underrepresented students and educators. Each of our projects leverages campus resources **for equity**: that is, programming focuses on students and teachers who wouldn’t otherwise access UC San Diego resources. **We’ve helped colleagues write, submit, evaluate, and/or execute 129 grants, contracts, and funded projects with campus and community partners** to support K-20 STEM education efforts serving the region’s highest-need populations. In this, we’ve aided successful grant applications via well-constructed outreach and evaluation plans now demanded by funders. **As codesigners, program partners, and evaluators, we’ve supported 332 additional “pro bono” or “seed” outreach and education projects**, leveraging student energy, faculty energy, and community partnerships. Our work helps people across UC San Diego meet their own needs as researchers and students, while supporting the local K-12 community simultaneously.
Deepest projects also partner university stakeholders—education experts and campus scientists, professors, graduate students, and undergraduates—with teacher leaders and district leaders, to invest collectively in educators and their students long-term.

As Year 4 concludes, CSSI staff – funded by an initial investment of $330,000/year – have helped UC San Diego colleagues bring more than $26.7M to campus to-date ($7M in indirect costs) with $6.5M in pending grant applications. Grants include basic science grants with outreach/education components, and direct grants/contracts to improve STEM education in our region. Funding supports critical education projects with K-12 and campus partners; with our involvement, an additional $1.7M went to community partners for new STEM education projects forged in collaboration with UC San Diego faculty, staff and students.

The CSSI continues to deepen relationships with philanthropy and industry organizations and federal agencies now funding collective projects between UC San Diego and partners. Many CSSI projects include lead partners from industry, community non-profits, school districts, county offices of education, and informal education organizations (e.g., the RH Fleet Science Center’s 52 Weeks of Science in Barrio Logan/Logan Heights; CREATE STEM Outreach events at local libraries and community centers; Vista Unified School District’s now annual STEM FEST; community college mathematics projects with City College), who increasingly see UC San Diego as a key partner in supporting local education.

In sum, as our fourth year draws to a close, the CSSI is now a cutting-edge model for leveraging a public university for public good.

- CSSI staff receive almost daily requests from UC San Diego faculty, staff, students, K-14 partners, and community groups to help design outreach and/or design and evaluate education projects with the most benefits to both university and community.

- CSSI staff help colleagues secure grants through funder-required education plans in basic science grants, as well as through grants devoted to education research. This work enables the creation of countless education programs that otherwise would not exist and fosters tremendous goodwill for the university.

- Through CSSI-linked efforts, UC San Diego is strengthening formerly fragile relationships with regional low-income and underrepresented communities, in both the K-12 and community college sectors.

- The CSSI has forged new relationships with philanthropy and industry organizations and federal agencies now funding collective projects between UC San Diego and K-16 partners.

- CSSI projects increasingly focus on service learning and time-to-degree for UC San Diego students, key campus foci.

- Experiential learning programs designed and launched over the past four years of the CSSI now connect hundreds of UC San Diego students to the highest-need K-12 schools and organizations, to offer the most-needed supports while learning about the local community.
• CSSI has sparked excitement among faculty, staff and students who have always wanted to enact impactful education efforts in local communities, and now have the support to do so. Such effort has a priceless payoff: transforming the campus role in our region.

Who Have We Served on Campus and in the Community?

CREATE now serves as an education outreach design and assessment support center for UC San Diego. CSSI staff housed at CREATE work with all UC San Diego entities, including all Academic Divisions, the Scripps Institution of Oceanography, the School of Medicine, the Jacobs School of Engineering, Qualcomm Institute/CalIT2, the San Diego Supercomputer Center, Student Affairs, the Chancellor’s Office, Development, the six UC San Diego Colleges, and Organized Research Units.

We link UC San Diego faculty, staff, and students to colleagues in the regional education community (e.g., educators across the region’s most diverse school districts; the San Diego County Office of Education), local industry (e.g., Qualcomm, SPAWAR), philanthropic agencies (e.g., Price Philanthropies, Gates Foundation, Yankelovich Center, Weil Family Foundation), community organizations (e.g., Groundwork Chollas Creek, San Diego Rotary, regional libraries, Boys and Girls Club, PIQE, United Way Children’s Initiative, EarthLab, BEST, Girl Scouts), informal science institutions (e.g., Balboa Park Museums, including RH Fleet Science Center; Elementary Institute of Science) and state/national education organizations. A number of projects include partners from the UC Office of the President. In Year 4, we connected with many new programs, like the San Diego Youth Symphony, FABLAB, Partnership for Progress on the Digital Divide, and Oceanside Unified School District’s Transitional Youth Academy.
CSSI staff are encouraging colleagues to include low income students in opportunities that previously have focused on high-income students, and to include students’ teachers in opportunities that previously have focused on students alone. These efforts create new entry-point outreach opportunities for UC San Diego students, faculty and staff, and encourage partners to leverage their work toward deep benefits for local youth and teachers. CSSI work thus is moving university “outreach” toward supporting equity-oriented teaching and learning locally, through ongoing consultation, grant writing, research, and mutual project design with K16 partners.

**Continuing Support for K-20 STEM Learning**

Before CSSI, UC San Diego PIs and students typically figured out outreach efforts, “broader impact” or education plans for grants, and K-12 service efforts on their own. The tremendous campus and community response to the CREATE STEM Success Initiative has proved that campuses need support organizations to help university stakeholders figure out how to do outreach, and design education/broader impact plans for grants in limited time with the most benefits to both university and community. Faculty and program leaders also need help evaluating how the work is going.
We’re acting as UC San Diego’s support organization helping campus colleagues work toward truly broad, K-20 and community impact. CREATE has longstanding expertise in education program design, research/evaluation, grant application, teacher development, and student college assistance. CREATE is a center composed of sub-organizations and individuals linked to thousands of the region’s educators, underrepresented students and community organizations. We also have a staff of experienced, equity-focused researchers (see create.ucsd.edu).

In sum, CSSI efforts continue to unleash the energies of UC San Diego faculty, students and staff to catalyze new learning opportunities for thousands of underrepresented students and educators. CSSI staff are supporting professors in broader impact design, grant application, and evaluation, bringing research dollars and findings to campus and community partners. And CSSI work is helping UCSD faculty, students, and staff ensure that their “outreach” efforts address critical gaps in K-20 education that prevent low-income, first-generation students from entering and completing higher education—while outreach efforts also support the learning, teaching and research of UCSD faculty and students. That’s making the most of university resources in a university’s backyard.

Highlights of our Year 4 work are detailed in the remainder of this report.

All our best,

Mica Pollock
Director, CREATE (Center for Research on Educational Equity, Assessment, and Teaching Excellence)
Professor, Department of Education Studies
CREATE STEM Success Initiative Highlights, Year 4

CSSI Grant Design, Outreach and Research

As a group of locally connected researchers and practitioners, CSSI staff support colleagues on and off campus to design, research and assess strategic programs to support low-income, underrepresented students particularly through STEM skills and courses. In four years, we’ve worked with thousands of local teachers and administrators (including many UC San Diego graduates) and more than 100 UC San Diego faculty and postdocs to help conceptualize and submit outreach/education and broader impact plans for more competitive grants, matching outreach design to local education needs. Our work over four years has particularly deepened UC San Diego-wide efforts to support local teachers. In Year 4, CREATE staff expanded from solely supporting funders’ visits, writing letters supporting new initiatives and grants, linking colleagues to schools and districts for broader impact work, and serving in key PI and support roles on grants to diving deeper into ground-breaking models for leveraging the resources of a large university for local educator development as well as student development, particularly in service of low-income communities.

CREATE STEM Success Initiative K-12 Efforts

Pipeline Focus: High School Computer Science

CSSI supports "Computer Science: Creating a Village for Educators (CS: CaVE)"

Computer science (CS) skills are perhaps today’s most coveted STEM skills – but CS courses too rarely serve low-income students. In 2015, CREATE helped the San Diego Supercomputer Center (SDSC) and a faculty member who was formerly from the Department of Computer Science and Engineering (CSE) and who now has an appointment in the Department of Education Studies, secure a nearly $1M NSF STEM-C grant (CS-CaVE) from the National Science Foundation. The grant funds the design, support, and sustainability of district-based teacher professional development supporting teachers in teaching the new Advanced Placement (AP) Computer Science Principles course, designed in part by UC San Diego faculty, and studies, in real time, how districts can scale up and sustain CS courses in low-income, underserved schools. In the first two years of the grant, 80 middle and high school teachers from Sweetwater Union High School District (SUHSD), the Vista Unified School District (VUSD), and the San Diego Unified School District (SDUSD) have engaged in CS-CaVE-supported CS Principles training. Half of the trained teachers were women, and a significant number were Latino/a.

Four years ago, there was only one teacher in SUHSD for CS Principles instruction; since this grant, with careful support from UC San Diego and much effort by the district, there were 18 CS courses offered last year in SUHSD alone (offered by 11 teachers in 11 different high schools), with 36 courses taught by 22 teachers in 20 schools across the 3 participating districts. All classes were the AP CSP version offered by the College Board. Of the approximately 1,200 students enrolled in these classes, 27% are girls and 47%
self-identify as Hispanic. Trained teachers are followed back into the classroom to learn more about how teachers implement CS Principles classes, how and where they go for support, and what their students take away from these classes. As part of this grant, CSSI staff are also supporting program/partner efforts to spread computer science regionally as well as inside their districts, while concurrently studying how these local districts address the rapidly changing challenge of teaching computer science to all students. This way, the rest of the nation, via NSF networks, might learn from their efforts.

Pipeline Focus: Grade 6-12 Scientific Inquiry

**CSSI leads “Creating, Scaling and Sustaining NGSS-Aligned, ONR-Informed Research in High School Science”**

Year 4 accomplished the second year of “Creating, Scaling and Sustaining NGSS-Aligned, ONR-Informed Research in High School Science,” a three year, half-million dollar grant awarded by the Office of Naval Research to CREATE. One of only two education focused grants funded by ONR last year, this project is jointly led by staff from the CSSI, the Scripps Institution of Oceanography (SIO), and the San Diego Science Project in CREATE, with local support from staff from the Space and Naval Warfare Systems Center (SPAWAR). The project involves Escondido Union High School District, San Diego Unified School District, Sweetwater Union High School District, and Vista Unified School District teachers and teacher leaders; it provides innovative science education professional development for more than 80 San Diego area high school teachers. In a “lesson study cycle” for lesson design, district-level teacher teams work with professional scientists to develop Next Generation Science Standards (NGSS) curriculum based on ONR-funded researchers’ work. Teachers then craft, practice and hone instruction of the lessons. In the 2016-17 school year, 44 teachers participated in the project at the high school level. In 2016-17, the ONR team also folded into efforts several SIO doctoral students and post-docs, to enrich these researchers’ experiences in communicating their science. 2016-17 efforts also sparked additional connections between researchers and district leaders in science teacher professional development. Post interviews with researchers from UC San Diego, the National Marine Mammal Foundation, and SPAWAR suggest that researchers value learning how to communicate their science to teachers; they also gain valuable outreach experiences they can fold into subsequent grant proposals. The teachers effusively assert the value of the work for increasing their excitement about teaching science, their content knowledge development, and their ability to implement the NGSS.
Pipeline Focus: K-12 Mathematics

CSSI heads the Bill and Melinda Gates Foundation-funded “San Diego Math Network”

Mathematics remains the “Achilles Heel” of our region’s college preparation efforts and is the focus of the collective San Diego Math Network (SDMN), funded by a $1.9M grant from the Bill and Melinda Gates Foundation. Awarded last fall, the SDMN links four major local school districts with UC San Diego to support K-12 math teachers in the Chula Vista Elementary School District, San Diego Unified School District, Sweetwater Union High School District, and Vista Unified School District, with partnership schools Gompers Preparatory Academy and The Preuss School UCSD. More than half of grant funding goes directly to districts to help them address math pipeline leaks with UC San Diego as a full partner. With other SDMN leaders and colleagues in UCSD Education Studies, CREATE researchers are asking an essential question: how can a regional network of educators tap local talent and build local relationships to improve math teaching?

Early on, CSSI efforts had pinpointed math teacher professional development as a key cross-sector effort requiring unprecedented regional attention. K-12 educators were increasingly concerned with how early cracks in the K-16 STEM pipeline gush later, as more students—particularly low-income students and others underrepresented in college—move on with superficial math understanding. Student-level data and several recent regional studies of district-level patterns suggest that mathematics is the subject that disproportionally keeps students from successful K-12 matriculation, high school graduation, and successful two- and four-year college admissions and completion. All participating districts agreed that given the dire need for a mathematics focus, additional development of mathematics teachers was potentially the highest-impact K-12 investment in our region. The result: the SDMN!

In partnership with local education leaders (some UC San Diego graduates themselves), CSSI staff and CREATE-affiliated faculty spent a busy year in 2016-17 deepening the SDMN’s effort to develop a collaborative regional network to support teacher and student math learning across the region’s largest districts. This year’s work, led in collaboration with district leaders and teachers on special assignment, focused on designing and executing “learning events” exploring issues of critical regional importance in mathematics. Many such events have tapped the local talents of UCSD math education faculty, as well as experts from local districts and math professional development organizations. A crucial focus of the SDMN is strengthening the regional elementary to middle school transition, a key pipeline moment when gaps in mathematics progress jeopardize students’
future prospects. The SDMN is also convening conversations and efforts related to other “transitions”—like the transition to and from Algebra II, a critical challenge of college preparation efforts in our region and nationally. The SDMN reached over 300 teacher/administrator participants across more than 30 learning events hosted during the 2016-2017 school year.

Pipeline Focus: K-8 Physical Science and Engineering

**CSSI supports “Power: Solving Problems through Engineering in the Physical Sciences”**

In 2016-17, a $600,000 CSSI-supported grant awarded to the National School District (partnered with CREATE) from the California Mathematics and Science Partnership (CaMSP), spent a final year helping educators in San Diego South Bay school districts develop cohesive, integrated physical sciences and engineering instructional units aligned with California’s Next Generation Science Standards (NGSS), for transitional kindergarten (TK) through 8th grade teachers. The grant, “Power: Solving Problems through Engineering in the Physical Sciences,” provided 81 South Bay school district teachers with 63 hours of intensive professional development learning and onsite classroom coaching for multiple years. A team including CSSI staff and professors from UC San Diego Physics and Engineering delivered professional development to K-8 teachers from National School District, Chula Vista Elementary School District, and Sweetwater Union High School District to increase teacher understanding of NGSS Physical Science and Engineering. In summer 2016, teachers completed their NGSS physical science, grade-level specific units of study and experienced adult-level content lessons provided by UC San Diego Physics faculty. Through teachers, this professional development grant is introducing hundreds of low-income students to engineering and the physical sciences.

Pipeline Focus: The Need for Smart Tech Use, K-12

**CSSI leads “Smart Tech Use for Equity” Initiative**

A CREATE-led initiative called “Smart Tech Use for Equity” continues to engage a diverse group of K-12 teachers in trying tech uses and documenting their effects for students through an equity lens. Launched with local educators in spring 2015, the “Smart Tech Use for Equity” initiative, spearheaded by the San Diego Area Writing Project and CREATE, explores tech use in classrooms serving low-income students. Teachers identify an example of tech use with equity in mind, document the effects for students, and
create a product to share their learning with next teachers. In 2016-17, the “Smart Tech” team partnered with leaders of Sweetwater Union High School District's Teacher Induction program to plan efforts to engage new teachers and mentors in the Smart Tech Use inquiry process; efforts will launch in August 2017.

Pipeline Focus: K-8 Scientific Inquiry

CSSI supports “Elementary Science Academy”

Because thinking like a scientist starts early, CSSI projects often invest strategically in elementary and middle school science teaching. The Elementary Science Academy (ESA) is a yearlong professional development program reaching San Diego area kindergarten through fifth grade (K-5) teachers. The program, led by the San Diego County Office of Education (SDCOE) and supported by the San Diego Science Project (SDSP, in CREATE); has to date supported more than 300 K-8 science teachers from across San Diego County (particularly Chula Vista) as they explore new approaches for teaching science. This summer, dozens of K-8 San Diego science teachers are attending “Elementary STEM Transformation to NGSS,” a three-day program in K-5 NGSS Engineering. Professional development follow up sessions occur throughout the school year.

CSSI supports “Summer Academy at Groundwork San Diego Chollas-Creek EarthLab”

To help bridge the elementary to middle school gap in science, the CREATE-based San Diego Science Project (SDSP) -- a teacher development network and CSSI partner -- is providing curriculum and teacher professional development for this year’s Summer Academy at Groundwork San Diego Chollas-Creek EarthLab. Sixty incoming sixth graders from San Diego Unified School District’s Lincoln Cluster schools will attend the summer academy. The Summer Academy’s interdisciplinary curriculum, funded by a $91,000 grant from the Environmental Protection Agency to Groundwork San Diego-Chollas Creek and developed by a team of local educators led by the SDSP, focuses on water quality and water conservation in San Diego County. EarthLab Summer Academy students will benefit from a rich learning environment that strengthens literacy and critical thinking skills across science, math and language arts disciplines. Dynamic, hands-on science activities will take place at the outside EarthLab, and indoor instruction will be held at nearby Millennial Tech Middle School. Sixteen teachers from Millennial Tech and Knox middle schools, Gompers Preparatory Academy,
and Balboa, Chollas-Mead, Horton and Johnson elementary schools will teach at the summer academy this year.

In a series of pre-academy professional development training days, Summer Academy teachers learned to integrate new California State Common Core Standards (in English Language Arts and mathematics) and Next Generation Science Standards (NGSS) into their instruction, and learned to design and implement inquiry-based, interactive activities for a variety of educational settings. Learning science by incorporating literature, mathematics and hands-on activities leads to a much deeper conceptual understanding of science!

Pipeline Focus: Secondary Mathematics and Science Inquiry

CSSI supports “STEM Learning in San Diego County”

The San Diego County Office of Education, Scripps Institution of Oceanography (SIO), and CREATE worked together on leading a California Math-Science Partnership (CaMSP) grant entitled “STEM Learning in San Diego.” Goals focused on collaborative lesson development using “authentic practices” in science and mathematics, new areas of emphasis in the Next Generation Science Standards and Common Core State Standards. SIO scientists worked directly with teachers, sharing their newest research that deeply integrates math and science. Both teachers and scientists learned through their interactions. As a result, one SIO professor redesigned his courses to incorporate more inquiry-based, active learning strategies. CREATE staff assessed teacher workshops and lesson development. The work contributes to ongoing CSSI research into scientist-teacher interactions aimed at improving teaching and learning in classrooms – what we call “How to Work With a Scientist”!

Pipeline Focus: K-16 Teacher Professional Development

CSSI supported “Breakthrough Teaching for Student Success”

“Breakthrough Teaching for Student Success” was a fourth annual one-day conference developed and hosted by UC San Diego’s Department of Education Studies (EDS) and CREATE. This year’s event, on March 11, 2017, attracted close to 300 TK-16 (Transition Kindergarten through college) educators. The conference featured 21 sessions on new practices in teaching and focused on learning approaches for grades TK-16 in science, math, English language arts, engineering, robotics, computer science, English language development
and technology integration. Additional sessions this year addressed student social and academic supports, personalized learning, and techniques for critical conversations within K-12 classrooms. The conference, developed in Year 1 of the CSSI, is an innovative model to provide regional educators with teacher-to-teacher learning opportunities in a wide range of sessions. Now a campus tradition, the annual conference continues to strengthen UC San Diego efforts in regional teacher networking.

Pipeline Focus: Algebra II

Algebra II efforts – working on the “Achilles Heel”

CSSI staff have been busy planning an August 2017 conference called “Zeroing in on Intermediate Algebra/Integrated III: A Problem-Solving Symposium.” This effort will link university, community college, and K-12 partners across our region to collectively tackle a critical pre-college transition issue: mastering Intermediate Algebra and moving successfully to college level mathematics. Hundreds of K-20 educators from throughout the San Diego/Imperial County region as well as representatives from the Bill and Melinda Gates Foundation, the California Department of Education, and K-16 math leaders throughout the state are expected to attend the catalytic, one-day event to learn across and with other educational “systems,” and to discuss exciting policy and practice efforts in our region.

Other CSSI work on Algebra II sustained through Year 4, including a University of California Office of the President (UCOP)-funded collaboration with UC San Diego’s Early Academic Outreach Program (EAOP) to offer credit-bearing, college-prep (A-G), UC-designed online Algebra II courses in “blended” (human-supported) summer school classrooms to fill transcript gaps for low-income students. CSSI research staff continue to evaluate the work, and a forthcoming research article by CREATE researchers in Teachers College Record focuses on teacher roles in supporting EAOP's blended model in shared classrooms with in-person supports from teachers and tutors. Based in part on CSSI researcher reporting, UCOP has funded a statewide scale-up for four years running (SummerUP) with EAOP programs on several UC campuses, offering blended Algebra II courses to approximately 500 students statewide in 2014-2016 combined. SummerUp 2017 should reach approximately 150 participants via Intermediate Algebra course offerings statewide, at five UC campuses and locally in the Imperial Valley.
Pipeline Focus: STEM College Preparation

**CSSI supports “High School 2 STEM” conference on campus**

The “High School 2 STEM Equity Conference” was a one-day conference at UC San Diego developed and hosted in spring 2017 by UC San Diego’s Early Academic Outreach Program (EAOP) in partnership with the Office of Admissions, as part of the CREATE STEM Success Initiative. The inaugural conference focused on encouraging and equipping college-bound, first-generation youth to pursue dreams of STEM careers. More than 100 9th and 10th graders from Morse High School in the San Diego Unified School District, Mar Vista High in the Sweetwater Union High School District, and Calexico High School in the Imperial Valley attended the conference. Students attended workshops, panel discussions, and a resource fair, where UC San Diego undergraduate/graduate STEM students, student organizations, college/department representatives, resource centers, and staff from campus organizations exposed the students to STEM activities and the resources available on campus.

Pipeline Focus: STEM Career Preparation

**CSSI supports “CREATE STEM Outreach” to children and families**

In 2016-17, CREATE STEM Outreach (CSO), a sustained CSSI effort focused on student and family engagement, reached more than 1,500 regional students and families via a series of highly accessible, hands-on, Spanish-bilingual events designed to spark interest in education and careers in the STEM fields. The events provide an opportunity for students and their families to see, interact with, and become inspired by Latino/a young men and women who are pursuing an education in engineering and other STEM fields. In four years, this collaborative CSSI outreach program, which incorporates undergraduates from UCSD’s Jacobs School of Engineering as well as from SDSU and local community colleges, has developed into a successful channel for reaching high-need schools, educators, students, and community programs in our region. It also has provided a vehicle for supporting UC San Diego faculty, staff, and students at well-attended community STEM events to expand the university’s relationships across the San Diego region.

CSO collaborates with community organizations to bring STEM learning to underserved populations. In 2016-17, CSO expos were held across the county, including in the Logan Heights Branch Library in Barrio Logan; Oceanside Unified School District’s El Camino High School; Nestor Language Academy, hosted by SACNAS (UC San Diego Chicano/Hispanic and Native American science undergraduates/graduates); Glendale Community College; and a bilingual STEM workshop for parents at the Latina Youth STEM Conference. CSO also continued participation in the RH Fleet Science Center’s 52 Weeks of Science, a science-in-the-community effort serving schools, libraries and community centers in Barrio Logan and Logan Heights.
Pipeline Focus: Community College Transitions and Supports

CSSI, with Price Philanthropies / UC San Diego Yankelovich Center, supports San Diego City College

CREATE-based CSSI staff have formed a strong partnership with colleagues from Price Philanthropies, who hired them, in fall 2016, to help study the Price Scholars program at San Diego City College. With colleagues from the UC San Diego Department of Sociology/Yankelovich Center as well as Communication Studies, CSSI researchers have led a robust mixed method study of the impact of the Price Scholars program at SDCC. This long-funded Price program has supported underrepresented, low-income, first generation two-year college students over the past two decades, but had never been robustly studied for its impact, qualitatively or quantitatively. This effort is one example of a service CSSI provides: to partner talented UC San Diego researchers from social science departments with important non-profit agencies and philanthropists in our region, to provide thoughtful, informed feedback to their efforts over time.

CSSI Additional Campus Outreach and Education Partnerships: Examples

CSSI staff design and execute outreach in large UC San Diego science grants

In 2016-17, CSSI staff helped execute the education plan for a five-year $5.5M UC San Diego Nanotechnology Coordinated Infrastructure (U-NNCI) grant from the National Science Foundation to support NanoEngineering colleagues. Activities included lab tours of the Nano3 Cleanroom facilities for 25 high school students enrolled in the UC San Diego COSMOS program and 50 middle school students from the Johns Hopkins Center for Talented Youth. In addition to research experiences for K-12 and undergraduate students, the grant funded research experiences for teachers (RET) from the San Diego Unified School District, Sweetwater Union High School District and Integrity Charter School, supporting local secondary science teachers to bring cutting-edge UC San Diego science into their classrooms. This summer, UC San Diego Nanotechnology faculty will share findings from their areas of interest with high school science teachers to help teachers design lessons for their classrooms. Lab tours and creation of a nanoscience workshop for students are also underway, plus work with the RH Fleet Science Center’s 52 Weeks of Science to hold interactive, hands-on Nanoscience activities for K-12 students and parents in the Logan Heights community via the CREATE STEM Outreach program.

In related work this year, CSSI staff also led outreach efforts for the Center for Integrated Access Networks (CIAN), an Engineering Research Center at UC San Diego. In that capacity, staff linked entities in STEM outreach efforts, through seismic earthquake “shake” table presentations and several Nanotechnology outreach events with the Boys and Girls Club in Barrio Logan.
CSSI staff also helped UC San Diego colleagues propose and secure funding to provide a new professional development component for secondary science teachers, as part of the UC San Diego Oncofertility Science Academy (ROSA), a Department of Reproductive Medicine summer program. Under the direction of CSSI staff, four middle school teachers from San Diego Unified School District, Santee Unified School District and Lemon Grove School District will work alongside high school girls in this year’s academy to develop an NGSS (Next Generation Science Standards) lesson on reproductive science. Teachers will use the lesson study model to design and teach the new lesson in their own classrooms. CREATE evaluators will follow these teachers throughout the process and back into their classrooms to provide a pilot study of student outcomes. The study will compare students taught the new unit to similar students taught in the traditional manner, using such measures as academic performance, attitudes toward science and learning science, and interest in STEM.

CSSI connects UC San Diego faculty to the region’s schools

In the CSSI, staff work daily to link UC San Diego faculty, staff and students to education partners in the region. As just one example of our Year 4 work, this year Dr. Oscar Vazquez-Mena, Professor in the Department of NanoEngineering at the Jacobs School of Engineering, visited Imperial Valley’s Dool Elementary School in Calexico after meeting students and their counselor at “Comienza con un Sueño” (It Begins with a Dream), a one-day college preparation conference hosted by the Early Academic Outreach Program and TRiO, housed in CREATE. More than 1,000 students and families from San Diego and Imperial Valley region attend the conference each year, participating in college preparation workshops and interactive presentations and learning activities. Inspired by Professor Mena at “Comienza,” Dool students invited him to their school, where he has visited twice this year to talk about Nanotechnology and to conduct hands-on science experiments with students. “This connection was made thanks to Comienza. I really hope to keep these students engaged, and in the future, see them enrolled at UC San Diego or other higher education schools,” Vazquez said.
As another example of Year 4 “connection” work, CSSI staff introduced Project Scientist Victor Minces of the Department of Cognitive Science to educators in the Sweetwater Union High School District, to partner in his successful NSF grant “Strategies: Listening to Waves.”

“The help from CREATE and the connection to Sweetwater Union High School District were fundamental to our success. CREATE helped us get the contact and trust of Sweetwater Union High School district that not only helped us write a very competitive grant, but gave us access to a very large population of students we look forward to working with. We have already held our program in the district’s Southwest Middle School teaching six hours of hands on STEAM to 300 students and exposing them to the world of UC San Diego. We are currently in talks with district authorities to expand the experience to other district schools and to offer professional development for teachers. The collaboration with the Sweetwater Union High School district been fantastic! Thanks again to CREATE.” – Victor Minces

CSSI promotes STEM empowerment for local families

CSSI staff are often asked by campus to help facilitate broader K-12 STEM outreach projects in local low-income, underrepresented communities and schools. This year, campus asked CSSI staff to work with PIQE (Parent Institute for Quality of Education) to implement a STEM learning component into PIQE’s parent education program. With CSSI guidance, two STEM workshops, funded by the Chancellor’s Office, were included in PIQE’s parent education program at two CSSI-identified, high-need elementary and middle schools in the Escondido Union School District and Fallbrook Union School District.

CSSI supports colleagues in Strategic Outreach and Education Planning

In Year 4, CSSI staff were active participants in strategic planning for Birch Aquarium and Scripps Institution of Oceanography (SIO) outreach and education; likewise, SIO and Birch leaders served as key leadership in the CSSI. A CREATE CSSI staff member now has a joint appointment with SIO’s Birch Aquarium, as Director of Science Translation and Outreach Innovation; ongoing collaboration will enhance collective efforts in regional schools and informal learning environments. In Year 4 of the CSSI, just one example of this strategic partnership linked computer science teachers with SIO researchers and data scientists, to develop meaningful lessons incorporating SIO datasets. Together, CSSI and SIO leadership aim to build and expand programs in areas of critical STEM need, like data and computing, engineering, mathematical reasoning, and inquiry-based science learning – all with a critical focus on the UC San Diego research priority to better understand and protect our planet.
CSSI Researchers Evaluate and Assess K-20 STEM education efforts

In the CSSI's first four years, CSSI researchers have led critical research and evaluation of STEM-based education-related work, with an eye to leveraging UC San Diego resources and maximizing opportunities for K-20 students to learn.

In Year 4, CSSI research and evaluation staff continued to collaborate with colleagues on and off campus to plan and execute dozens of CSSI evaluation and assessment projects. These projects span K-20 education grants, evaluation of broader impact/outreach/education plans in basic STEM research grants, and evaluations of on-campus student retention and enrichment programs. CREATE-based CSSI research and evaluation co-coordinators, staff, and graduate students have worked with K12 schools, districts, and informal education entities as well as UC San Diego-based faculty and staff to help plan for, design, and implement research and evaluation projects as well as conduct complete independent evaluations and self-funded research projects relating to STEM outcomes.

As just a few 2016-17 examples, CSSI researchers performed a multi-year evaluation of UC San Diego's NSF-Bioengineering REU (research experience for undergraduates) grant, specifically studying how undergraduate STEM educational experiences affect goals, attitudes and beliefs towards STEM education and careers. They are also currently involved in multi-year evaluations of the UC San Diego Engineers for Exploration (E4E) REU, which is designed to immerse undergraduate engineering students in group-run, applied engineering projects to effect real-world solutions to multidisciplinary problems. In continued work with the Qualcomm Institute at Calit2, CSSI researchers are evaluating the value added of a Summer Research Communications Program to a large and varied group of summer research-based programs for undergraduate students.

Recent postsecondary evaluation work also includes evaluation of three campus grants addressing UC San Diego’s Computer Science Engineering program, and evaluation of the campus Summer Bridge Program for incoming transfer students, along with several other campus programs for incoming freshmen and transfer students. The team is evaluating a Natural Hazards Engineering Research Infrastructure (NHERI) grant for the Structural Engineering program in the Jacobs School of Engineering (JSOE), including assisting with SEISMIC outreach activities and studying how researchers use the NHERI facility. After working closely on several projects with JSOE, CSSI Research and Evaluation co-coordinators were also asked by faculty at UC Riverside to evaluate the outreach and educational components of a large NSF engineering-based PIRE grant involving collaboration between US and Mexican universities.

Lastly, the Research and Evaluation Team is also involved in a series of K-12 collaborations, including evaluating projects pairing STEM faculty, researchers, and medical doctors with middle and high school teachers to bring real-world and authentic science into the classroom via co-designed lessons; projects bringing students and their teachers to real-world science and research operations to supplement learning in the classroom; and projects involving the creation and implementation of new STEM-based curricula.
CSSI Communications

Supporting four years of collective impact also has required designing communication infrastructure showcasing efforts publicly, and circulating opportunity information regionally. CSSI staff have created public communications sharing UC San Diego’s community efforts with the community and world. Sign up for our blog, CREATE at UC San Diego, Facebook, and Twitter account, and help us CREATEequity!