UC San Diego

CREaTe
Center for Research on Educational
Equity, Assessment & Teaching Excellence

CREATE
STEM Success
Initiative (CSSI)

Year 9
2021-2022

UC San Diego CREATE STEM Success Initiative Year 9

We're designing new ways to leverage a university to create K-20 local opportunities to learn.

Through CSSI, we're building a national model for universities' community impact.

Executive Summary: The CSSI's Collective Impact Innovation

The University of California San Diego's CREATE STEM Success Initiative (CSSI) is a collective, visionary, and sustained effort to leverage a university to create K-20 local opportunities to learn, supporting education on campus and in the community.

Launched by UC San Diego Chancellor Pradeep Khosla in July 2013, the CSSI supports expert staff at the Center for Research on Educational Equity, Assessment, and Teaching Excellence (CREATE) to proactively help campus partners work with community partners to design new grants, outreach & education projects, broader impact plans, and research/evaluation projects meeting crucial education needs on our campus and across the San Diego region.

On campus, CSSI staff support not-yet-funded partners to design, plan to assess, and (when funded) execute and study education projects addressing key opportunity gaps hindering K-20 students' – including our own UC San Diego students – progress toward skills, degrees, and careers. CSSI staff work with campus faculty, staff, student organizations, and community partners as they write grants and envision projects, to together target equity-oriented opportunity creation in STEM (Science, Technology, Engineering, and Math). We target STEM opportunity because many students experience particular opportunity gaps in STEM, blocking degrees and careers in many fields. CREATE personnel support education projects in all disciplines.

As we enter Year 10, we celebrate institutional level investment by our campus in CSSI's broader impact infrastructure – the visionary move by UC San Diego to fund a support team to help not-yet-funded colleagues to leverage their work in local K12 communities as well as in higher education. This small staffing investment has had enormous benefits for campus partners; many have written stronger proposals and been awarded at an exceedingly high rate when working with CSSI. CSSI work also has made a major equity impact in our community and on campus, fulfilling the university's mission of research, education, and public service.

CSSI brings concrete mutual benefit to campus and community. Over the past 9 years of the CSSI, we've supported UC San Diego faculty, staff, and student contributions benefiting many thousands of young lives throughout the region. We have positioned UC San Diego as an engine of equity-minded opportunity creation for children, youth and teachers across San Diego and Imperial Counties, while helping UC San Diego students and faculty build toward skills, degrees, research, service, and grants of their own. **We help campus partners win grants for research and make real social impact, putting their work to use locally to bolster student pathways regionally and on our campus.** (Indeed, one in five UC San Diego undergraduates are themselves prepared in local schools; CSSI projects also support UC San Diego student progress and success once on our campus.) **In doing all this, we fund UC San Diego faculty, staff, graduate students, and undergraduate students as well.** Broader impact colleagues from universities across the country plan a campus visit in fall 2022.

The CSSI is highlighted in <u>UC San Diego's Strategic Plan</u> as a key campus effort to increase and coordinate "the impact, type, and number of community engagement efforts across the campus." We work with partners to design and spread desired K20 opportunities to learn with equity in mind, toward access and success for students underrepresented on campuses like ours.

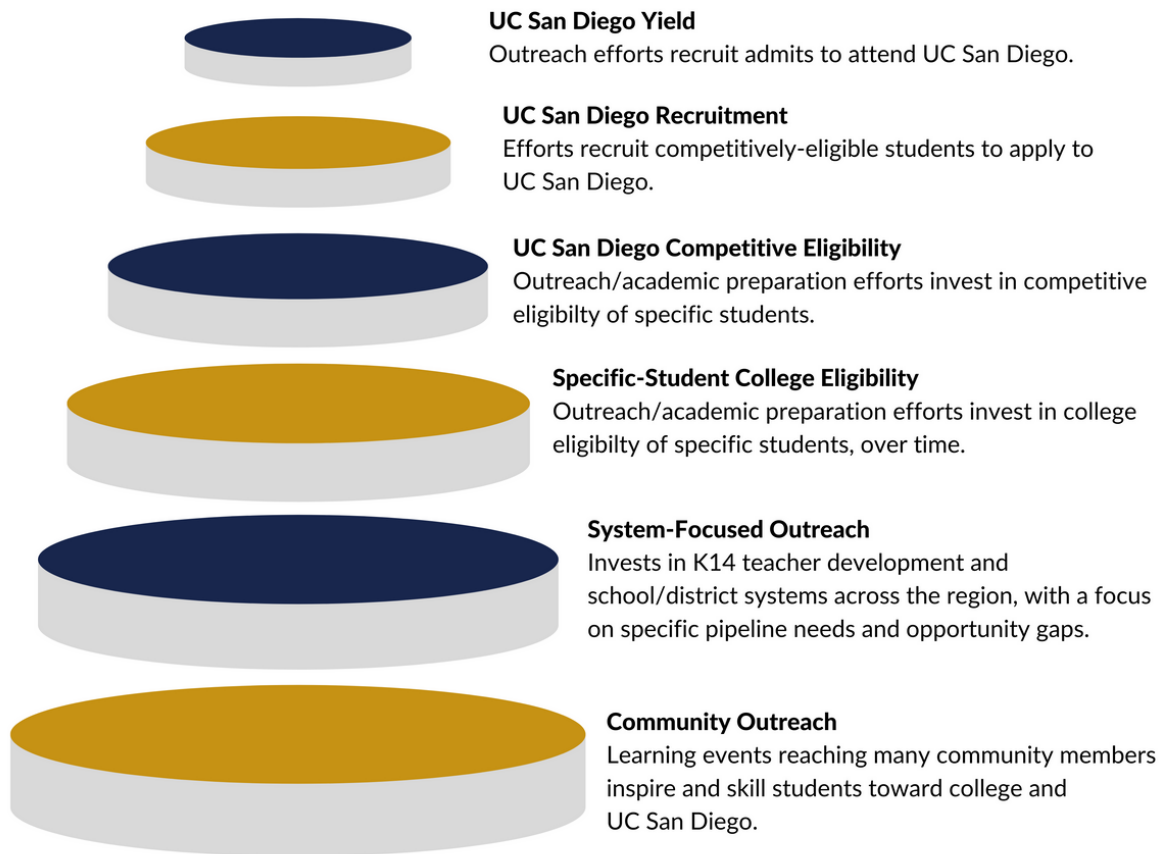**Powering Collective Impact: CSSI's broader impact support team at CREATE**

The CSSI is powered by expert staff based at UC San Diego's Center for Research on Educational Equity, Assessment, and Teaching Excellence (CREATE). CREATE personnel have strong networks of K-20 partners in the region, deep understanding of the region's and campus' educational needs, and longstanding expertise in education programming and research/evaluation. **CSSI-funded team members and the full team at CREATE provide a range of services to UC San Diego faculty, staff and students and community partners:**

- **CSSI experts offer free consultations on program/grant/evaluation design**, helping not-yet-funded partners seeking to win grants and design projects. CREATE houses experienced, equity-focused practitioners, researchers, and evaluators with extensive expertise in grant preparation, data analysis, and writing (see create.ucsd.edu). **We often write and shape the education and evaluation sections of UC San Diego partners' grant proposals to meet real local and campus needs.** In Year 9, we've supported grants to funders including NSF, ONR, NIH, Gates Foundation, U.S. Department of Defense, Spencer Foundation, and the U.S. Department of Education.
- **CSSI personnel offer free support linking partners to** philanthropy, industry, community non-profits, districts, schools, and county offices of education, community colleges, teacher professional development opportunities, and informal education organizations. CREATE's sub-organizations link to thousands of the region's K14 educators, underrepresented students, and community organizations.
- CSSI staff **help execute and evaluate education programming** when project-specific funding is secured.

Before CSSI, UC San Diego faculty, staff, and student organizations typically tried on their own to design and implement "broader impact" and education plans for grants, to shape outreach/service efforts that might be welcomed locally, and to find evaluation partners for K12 and education-focused projects. Now, CSSI staff support campus and community partners to design, create, and study necessary and locally desired supports for low-income and first-generation college-going students underrepresented on campuses like ours. **The tremendous campus and community response to the CSSI has shown that campuses need broader impact support teams to help stakeholders design, execute, and evaluate their education programming with the most benefits to both university and community.**

As Image 1 shows, CSSI-supported community projects range from large UC San Diego outreach events inspiring the San Diego community in STEM to sustained projects supporting local teachers' professional development, and direct efforts preparing local students for the rigor of our own campus and college overall. CSSI projects also support 12-20 student success on our own campus.

Image 1: CSSI Supports all "Levels" of UC San Diego Outreach

UC San Diego Yield
Outreach efforts recruit admits to attend UC San Diego.

UC San Diego Recruitment
Efforts recruit competitively-eligible students to apply to UC San Diego.

UC San Diego Competitive Eligibility
Outreach/academic preparation efforts invest in competitive eligibilty of specific students.

Specific-Student College Eligibility
Outreach/academic preparation efforts invest in college eligibilty of specific students, over time.

System-Focused Outreach
Invests in K14 teacher development and school/district systems across the region, with a focus on specific pipeline needs and opportunity gaps.

Community Outreach
Learning events reaching many community members inspire and skill students toward college and UC San Diego.
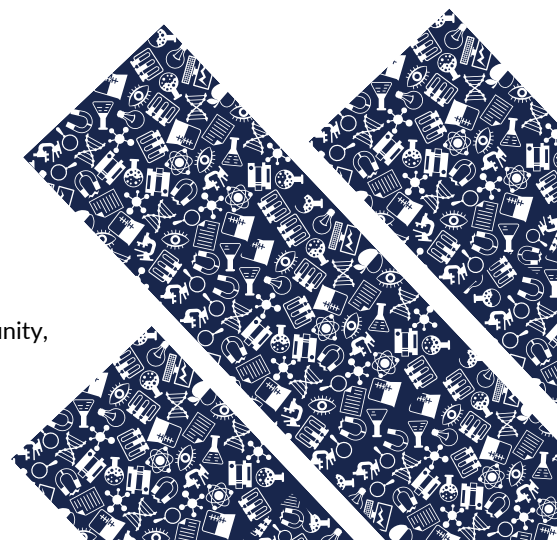
Years 1-9: What We've Accomplished

In our first nine years, UC San Diego's CREATE STEM Success Initiative has become a leading-edge model for how a public university can leverage its resources for public good.

Here are our outcomes at a glance.

From July 1, 2013 to May 31, 2022, CSSI staff at CREATE have worked with hundreds of UC San Diego faculty, staff, students, and K-12 community partners on **1,662 CSSI projects**[1]**, reflecting staff's work on 331 awarded, pending and submitted grants & contracts and 1,331 additional service or outreach and education projects.**

- **164 CSSI-supported grants and contracts have been awarded to campus and community partners**, including STEM education research grants and STEM research grants with K-20 education components.
- **$95.7M** brought to UC San Diego with **$16.5M** in indirect costs. ($29.8M awarded in Year 9 alone.)
  - **$40+M** brought to community education partners.
  - **$34M** in pending grant applications.

- CSSI staff at CREATE have supported an estimated **286+ UC San Diego faculty and postdocs** (along with student organizations) to consider, conceptualize, expand, evaluate, or execute education equity projects including, outreach/education, broader impact, and evaluation plans for more competitive grants. See list here.
- We've offered **105** National Science Foundation (NSF) supports specifically to UC San Diego faculty.
- CSSI researchers have conducted **102 evaluations** on projects supporting K-20 students and educators (12 of those evaluations were completed in Year 9).
- CSSI personnel have supported **284+ teacher professional development efforts** with immediate impact on hundreds of local precollege students each year and thousands more over time. For this multiplier effect, we often partner UC San Diego with local K12 educators and district leaders.
- CSSI outreach events led by CREATE CSSI staff have reached **more than 28,100** K-20 students and families directly, in addition to the many thousands more students reached in CSSI partners' projects.

1. A "project" tallied reflects focused CSSI staff support to others from campus/community, ranging from consultation to design to evaluation to execution.

CREATE STEM SUCCESS INITIATIVE (CSSI)

UC San Diego
CREaTe
Center for Research on Educational
Equity, Assessment & Teaching Excellence

July 2013-May 2022

>28,100

K-20 students and families reached via CSSI outreach events.

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286+

UC San Diego faculty, staff, postdocs, and student organizations supported to consider, conceptualize, expand, evaluate, or execute education equity projects including, outreach/education, broader impact, and evaluation plans for more competitive grants.

See list here.

102 **evaluations conducted** on projects supporting K-20 students and educators.

105 National Science Foundation (NSF) Supports to UC San Diego Faculty.

UC San Diego Entities Supported by CSSI in Year 9 (sample)

- Advancement
- Faculty across Academic Schools/Divisions
- Birch Aquarium at Scripps
- Campus/student organizations (e.g., CS forEach)
- Chancellor's Associates Scholarship Program
- (e.g.) partners from the Department of Physics
- Department of Education Studies
- Department of Mathematics
- School of Biological Sciences
- School of Social Sciences
- School of Physical Sciences
- Early Academic Outreach Program
- Enrollment Management
- School of Extended Studies
- Halıcıoğlu Data Science Institute
- Institute of Neural Computation
- Intertribal Resource Center
- Jacobs School of Engineering
- OASIS-SSSP
- Office for Equity, Diversity, and Inclusion
- Office of Operational Strategic Initiatives
- Organized Research Units
- Qualcomm Institute/CalIT2
- San Diego Nanotechnology Infrastructure
- School of Medicine
- Scripps Institution of Oceanography
- Skaggs School of Pharmacy and Pharmaceutical Sciences
- Student Affairs
- Teaching + Learning Commons
- UC San Diego Chancellor's Office
- San Diego Supercomputer Center
- TRiO Outreach Programs
- UC San Diego Alumni
- UC San Diego Latinx/Chicanx Academic Excellence Initiative
- UC San Diego Black Academic Excellence Initiative
- UC San Diego Colleges
- UC San Diego Materials Research Science and Engineering Center
- Yankelovich Center, UC San Diego

Community Entities Supported by CSSI in Year 9 (sample)

- Educators across the region's most diverse schools and districts; the San Diego County Office of Education; High Tech High Graduate School of Education
- National/Local industry (e.g., Qualcomm, NIWC [formerly SPAWAR], City & County of San Diego, Department of Defense)
- National/Local philanthropic agencies (e.g., Gates Foundation, San Diego Foundation)
- Community organizations (e.g., Groundwork Chollas Creek, EarthLab, San Diego Rotary, regional libraries, Boys and Girls Club, PIQE, La Maestra Center for Youth Advancement, United Service Organization (USO) Camp Pendleton, Malcolm X Library)
- National societies and organizations (e.g., the Society for the Advancement of Chicanos and Native Americans in Science; SACNAS, Institute of Electrical and Electronics Engineers; IEEE, Partnership for Progress on the Digital Divide; Citizen Schools, TGR Foundation)
- Informal science institutions (e.g., Balboa Park museums, RH Fleet Science Center, Elementary Institute of Science, FabLab, San Diego Botanic Garden) and nonprofits (Scripps Research)
- State/national education organizations (e.g., the California Subject Matter Projects and statewide Early Academic Outreach Programs, Code.org, Computer Science Teachers Association, National Center for Women in Computing, California Environmental Literacy Initiative, the California NGSS Collaborative)
- Several projects include partners from the UC Office of the President.

CSSI staff are helping partners across campus and community to:
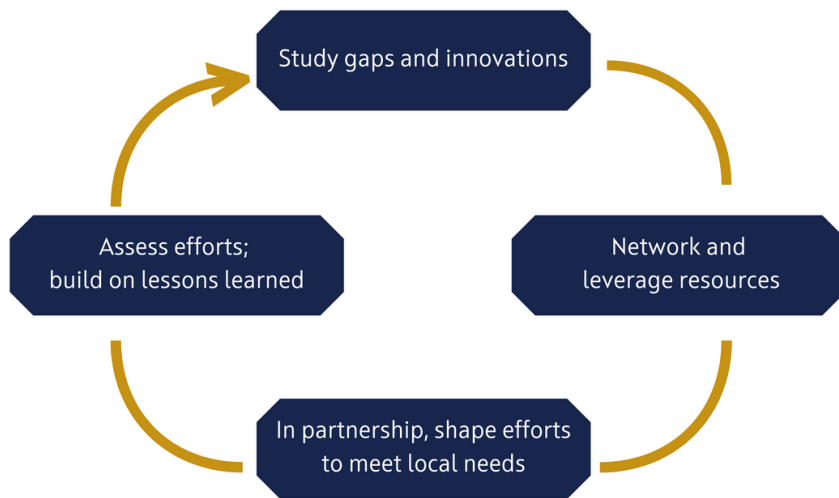
Study K-20 opportunity gaps, pipeline "leaks," and innovations;

Network and leverage UC San Diego's resources to help meet community and campus educational needs;

Collaboratively create and shape UC San Diego STEM education efforts, particularly those supporting underrepresented students (K-20), educators, and community programs;

Assess efforts; build on lessons learned.

Year 9 Testimonials

Year 9 had us pursuing our third renewal of central campus funding for the CSSI support team at CREATE. So, we asked campus and community partners if they might like to speak to their own experiences with our team. **Here is what they said!**

Campus partners (a sample)

CREATE is a tremendous resource to the university community (faculty, students and staff), as well as the greater San Diego community. As a faculty member, CREATE has been instrumental in supporting my research program, particularly supporting the development of my extramural grants, with CREATE staff serving as external evaluators for my Gates Foundation and National Science Foundation proposals, and helping me to draft strong prose on evaluation that went straight into my bids for funding. These efforts have led to being awarded 3.5 million dollars in extramural grants. In addition, CREATE has been instrumental in supporting the development of relationships with school districts, helping to match-make researchers and communities so that research can be responsive to community stakeholders, and potentially have the greatest (sustainable!) impact for educational equity. - **Sherice Clarke, Assistant Professor, Department of Education Studies, UC San Diego**

CREATE plays a very important and valuable campus role in strengthening extramural funding proposals, making them more competitive for funding from major sponsors, particularly those, like NSF, that require or encourage activities to broaden the participation of members of groups historically excluded from STEM fields. Research Development (RD) frequently encourages faculty who are preparing proposals to explore and include in their proposals collaboration with CREATE. CREATE's capabilities in connecting investigators with diversity-promoting community organizations and programs, designing and implementing evaluation plans, and developing key components of proposals are tremendous assets to UC San Diego's faculty and researchers. **- Sharon Franks, Senior Director, Research Development (RD), UC San Diego**

In 2013, CREATE designed an innovative education component for my NSF CAREER grant which led to funding support for two years. NSF program officers were impressed with this approach to Broader Impacts and recommended similar strategies in subsequent grants. This year, NSF funded another research grant for my lab focused on synthetic biology, in part due to my work with CREATE [with CSSI team member Nan Renner]. - **Neal Devaraj, Professor, UC San Diego, Chemistry and Biochemistry**

CREATE has been instrumental in a cross-discipline, cross-institute effort to create a new Center for Science and Technology. As a UCSD faculty, it was incredibly helpful to learn from the experts at CREATE, brainstorm new educational programs, and initiate efforts to engage the broader community. I look forward to continuing this work and joining CREATE in new efforts in the future! **- Jazz Dickinson, Asst. Professor, UC San Diego, Cell and Developmental Biology**

For the newly commissioned Scripps Ocean-Atmosphere Research Simulator (SOARS) with grand plans for Outreach, Education, and EDI, we envision leveraging CREATE STEM Success Initiative staff, knowledge, and K12 networks to have the greatest positive impact. Many research groups, including the Center for Aerosol Impacts on Chemistry of the Environment (CAICE), will use SOARS to advance science and EDI through strategic outreach and education. We know that grant funding is highly competitive and strong plans for Broader Impacts through outreach and education can make the difference, resulting in successful proposals. Nan Renner (Birch Aquarium, CSSI staff) and Cheryl Peach (Scripps, CSSI advisor and Internal Board member) have been instrumental in helping to create our strategic plan for EDI at SOARS. We rely on their expertise to advance our goals for bringing benefit to society through both science and education. **- Grant Deane and Dale Stokes, Scripps Institution of Oceanography, SOARS PIs; Kim Prather, Distinguished Chair in Atmospheric Chemistry and Distinguished Professor at Scripps Institution of Oceanography and the Department of Chemistry and Biochemistry, CAICE PI**

Federal funding agencies increasingly are grappling with how to diversify STEM college and career pathways, including through broader impacts (NSF) and "Inclusion" sections (NASA pilot) in research awards. The CREATE STEM Success Initiative (CSSI) at UCSD is a national leader among R1 universities in proactively developing capacity to address this growing demand. In its proposal services (e.g., broader impacts and evaluation) CSSI connects researchers to its exemplary externally funded projects and, via its extensive networks, to the STEM ecosystem in San Diego, California, and beyond. This cannot be accomplished without the intellectual and human infrastructure that CSSI has built at CREATE to address this important University service. CSSI is a capacity building investment that supports both the research and community service enterprises at UCSD, as well as UCSD efforts to diversify its student population, particularly in STEM fields. The model for CSSI is one in which researchers have access to these services as they write their proposals. These services are necessarily pro bono as the funds for the time spent on proposal writing cannot be drawn from existing awards. For a largely self-supporting entity like CREATE, making the CSSI activities self-supporting as well is not a workable model. Moreover, to my knowledge no funding agency is issuing solicitations for universities to engage in this work with federal support, rather they view the responsibility as lying within the institutions supported through research awards. I write this to emphasize the importance, especially now, of continuing to support CSSI and specifically CSSI staff at CREATE. They have become an integral part of the University's capacity to write compelling and successful proposals that fund not only excellent research, but exemplary education, outreach and EDI work. -**Cheryl Peach, Ph.D., UC San Diego, Director, Scripps Educational Alliances, Scripps Institution of Oceanography**

Dr. Joel Brown and Dr. Monica Sweet from CREATE have been instrumental in the preparation of our large multi-institutional proposal to the NSF program to support low-income transfer students from community colleges into UC San Diego's Engineering program. The NSF Program Director has recommended the proposal for funding, so we are cautiously optimistic that our proposal to this highly competitive program will be funded soon. We could not have gotten this far without Dr. Brown and Dr. Sweet specifically, and CREATE more broadly! - **Bill Lin, Professor and Chair, UC San Diego Electrical & Computer Engineering**

I am an assistant professor of bioengineering. CREATE worked with me to develop and execute a lesson study and evaluation plan in order to introduce nanotechnology concepts into high school classrooms near the U.S.-Mexico border. The support CREATE offered was crucial for successful funding of my NSF CAREER application. **- Ester Kwon, Assistant Professor, UC San Diego Bioengineering**

CREATE is a critical office on campus that allows UCSD researchers to connect with outreach and education activities in our community. Beyond broadening our research impact, these efforts are important for securing research funding from agencies that support education activities as part of awards. I collaborated with CREATE on the application for a 5-year project that was awarded by NSF. Many of my colleagues have had similar experiences with CREATE over the past 5-10 years. **- Itay Budin, Assistant Professor, Chemistry & Biochemistry, UC San Diego**

I am a research scientist at the department of cognitive science. I am PI in two NSF grants totaling 2.75 million dollars, with the goal of increasing the participation of underrepresented groups in science. My work is reaching tens of thousands of children across the county and hundreds of thousands across the nation, and increasing the visibility of UCSD and its researchers. Getting my grants would not have been possible without the help of CREATE staff, who connected me with education institutions across the county and allowed me to collect experience and pilot data to make strong applications. My current work reaching underrepresented students and securing more funding would be made very difficult without the participation of CREATE staff, their valuable network, and their knowledge of the education system. CREATE is a big reason for me to be at UCSD. I think that if UCSD is serious about reaching the community it should give CREATE full support. **- Victor Minces, Asst. Research Scientist, UC San Diego, Cognitive Science**

The CREATE team has been instrumental in the successful development and design of my broader outreach program. The program was well-received by the NSF CAREER reviewers where I was able to secure the grant in my first attempt! I would like to particularly thank Monica Sweet for taking the time in working with me on the evaluation and education component of the grant. I could honestly say that without her assistance, my proposed educational plan [involving Miramar community college] wouldn't have been as impactful. I'm extremely grateful for the CREATE team! **-Sonya Neal, Asst. Professor, UC San Diego, Biological Sciences**

As a Computer Science PhD, I had no knowledge of developing and sustaining long-term relationships in the K-12 space such that I could MAKE A DIFFERENCE in Computer Science education in our local schools. CREATE has provided me that entree and street cred with districts, schools, and teachers. Now, I have trained hundreds of K-12 CS teachers, I have created CS curriculum being used in San Diego Unified to bring CS to ALL students in 3rd, 4th, and 5th grade, and I have (due to CREATE's staffing and skills) a reputation for getting projects done and making an impact that make grant officers reach out to us. In my personal move from the CSE department to EDS, it was my experience with CREATE and knowing how far they would take my work in ways I could not alone, that kept me at UCSD. **- Elizabeth "Beth" Simon, Teaching Professor, Education Studies**

I have been teaching engineering at UCSD for over 20 years, and have had a strong desire to share my passion for STEM beyond the scope of the university and especially in the K-12 community. However, honestly, I do not have the pedagogical background and expertise required for effective curriculum development for younger students. Together with another engineering faculty member, we created a software tool to teach K-12 students how to improve their spatial visualization ability which has been shown to increase success in STEM. We partnered with CREATE so that they could assess our success in a trial in a local high school. During this trial Monica Sweet from CREATE observed the classroom as well as our material. She gave us an honest assessment that indicated areas where both students and the teacher had a lack of engagement. This was hard to hear, but led us to improve our material. Since then our new software package has been much more widely received, and over 4000 K-12 students have successfully used the material this past year, and we have seen significant growth in interest. Without CREATE our ability to create effective educational content that could have a significant educational impact would be significantly limited. If UCSD is to encourage its faculty to engage in K-12 outreach, then CREATE is a vital component of successful educational content development**. -Nate Delson, Assoc. Teaching Professor, UC San Diego, Mechanical and Aerospace Engineering**

I'm writing to provide my strongest possible endorsement for continued financial support of core staff at CREATE. Over the past two years, I have worked closely with CREATE staff to launch a new cross-disciplinary initiative called Pathways2AI, which aims to broaden participation in artificial intelligence (AI) and promote AI literacy among members of the general public. To pursue this goal, Pathways2AI connects UCSD faculty/staff/researchers with several community partners across San Diego County, including K-12 teachers and administrators. We simply cannot have forged these connections without the broad expertise, tireless dedication, and bottomless ingenuity of the entire CREATE staff. I cannot imagine a path forward for Pathways2AI without their sustained contributions. If there is any other way I can express my support for CREATE, please do not hesitate to let me know. **- Judith Fan, Asst. Professor, UC San Diego, Psychology**

The CREATE staff have been an essential resource in developing funding proposals for major agencies, including NSF and NASA grants, helping me in particular to develop appropriate broader impact plans, plan for IRB proposals, and to identify partners in the community for student and teacher research engagement. This is a unique capability we have at UCSD and one that has greatly enriched our research and training mission. **- Adam Burgasser, Professor, UC San Diego, Physics**

The UCSD CREATE staff have been an invaluable resource for my grant writing, specifically Susan Yonezawa and Joel Brown helped me improve my broader impacts statement for my NSF CAREER award (which I won) significantly. It has been a pleasure to work with them and I would have not gotten the award without their help. Moreover, Beto Vasquez has been working with me on outreach opportunities for low-income/underserved communities, and it's been super nice as a new faculty member to get "plugged in" to the local community and do science events. We participated in two CREATE events, and will do more in the future. I think CREATE is doing a fantastic job. **- Boris Kramer, Asst. Professor, UC San Diego, Mechanical and Aerospace Engineering**

The CREATE staff have been instrumental supporting my research as a faculty member at UCSD. As an incoming faculty member in mid-2020 I met with Associate Director Susan Yonezawa and told her about a middle school science classroom intervention-based project I was working on in collaboration with science educators at Cabrillo National Monument. She connected me with Monica Sweet, co-Director of Research and Evaluation at CREATE, who provided me with invaluable advice for obtaining IRB approval and planning an assessment of our intervention. I currently have a manuscript in submission from these efforts. Alec Barron is a key partner on a level II NSF DRK-12 Grant - he has contributed heavily to the proposal planning, writing, and if funded will lead one aim of the grant. We received a "highly competitive" ranking for an initial submission of this proposal this year, and plan to resubmit in the fall. For an initial submission this is incredibly promising, and a lot of credit has to go to Alec for his guidance and connecting us with additional partners. Alec's expertise has helped shape and strengthen the proposal, and our other collaborator and I are incredibly grateful to have him on our team, to have access to educator networks through CREATE overall, and to have the support of the CREATE staff. **- Claire Meaders, Asst. Professor, UC San Diego, Cell & Developmental Biology**

I am an Assistant Professor in the Mechanical and Aerospace Engineering Department. I have worked with the staff at the CREATE center to put together educational components of multiple grants, and I have nothing but great things to say about the staff and the overall experience. They are always extremely responsive, enthusiastic, and creative in helping me craft this component of the grants. Susan and Beto helped me put together the educational components of multiple grants. They spent a significant amount of time and effort brainstorming potential ideas with me. They were extremely passionate about the work, and they also made sure that there was interest from the communities that we were hoping to partner with. I am very happy with the final plans we came up with and am excited to implement them this year. For my NSF CAREER proposal, I worked closely with Monica to develop an evaluation plan for the educational component. Not only did she help me create the overall structure, but she then provided extremely helpful edits and feedback on my draft. I really enjoyed the overall experience of working with Monica, and I learned a lot in the process. Now that the grant has been funded, I am looking forward to the opportunity to work with Monica to execute the evaluation plan. **- Tania Morimoto, Asst. Professor, UC San Diego, Mechanical and Aerospace Engineering**

I am an Associate Professor in the Department of Chemistry and Biochemistry. CREATE has been instrumental for the development of the outreach component of my NSF CAREER grant. In particular, Alec Barron and Susan Yonezawa were tremendously resourceful to link me with teachers and administrators of Orange Glen High School in Escondido to organize an outreach activity with high school students in April 2022. This activity intended to illustrate to a broad audience how topological insulators work. Alec was not only the link, but he thought deeply about all the mechanics and the bureaucracy involved in making our project successful, and helped us carry out the activity at the school. I believe that CREATE is a crucial entity at UCSD that helps UCSD faculty establish meaningful educational connections with the broader communities in San Diego. **- Joel Yuen Zhou, Assoc. Professor, UC San Diego, Chemistry & Biochemistry**

I just finished my third year in the Department of Education Studies at UCSD. Looking back on the past three years, from day one, I have received numerous support from the members of CREATE. CREATE has been one of the critical support systems I found since I started at UCSD, from the grant-writing support, project and evaluation design, to outreach efforts involving K-12 populations in San Diego. Through my own work as well as the work of Pathway to AI, a collaborative effort of UCSD faculty members to promote AI literacy in K-12 classrooms, multiple collaborative opportunities have emerged involving or sometimes initiated by the members of CREATE. Moreover, as a CS educator, CREATE's support for the Computer Science Teachers Association's San Diego Chapter has been invaluable for the success of the organization. I don't think any of such efforts could have been successful without CREATE's support. **- Amy Eguchi, Assoc. Teaching Professor, UC San Diego, Education Studies/ Computer Science Education**

I have been working with CREATE and Monica on evaluations for my NSF REU and CAREER projects. Even before these projects were awarded, CREATE has helped me shape my education, outreach, and evaluation plan and helped make my proposal stronger. CREATE has provided a critical and unique service for these projects by tailoring their evaluation methods and criteria according to my project needs and within budgetary constraints. It has been a pleasure working with CREATE and Monica, and I strongly support the continuation of their wonderful and much needed work at UC San Diego and beyond. **- Kenneth Loh, Professor and Vice-Chair, UC San Diego, Structural Engineering; Director, Center for Extreme Events Research**

I am a professor and outgoing chair of the Department of Sociology. I write in support of continued or enhanced funding for CREATE staff. My research, and especially my courses, have long benefited from the support I have received from the research scientists and other staff who work at CREATE. They have connected me with scores of local educators, who have welcomed my undergraduate and graduate students into their classrooms for research purposes. CREATE staff's knowledge and connections with local school leaders and practitioners have been fundamental to my community-oriented, "changemaker" courses. I know that several graduate students and faculty colleagues have similar experiences to my own. Thank you for your continued commitment to this outstanding campus center. **- Amy J. Binder, Professor and Chair, UC San Diego, Sociology**

CREATE plays a vital role in supporting campus research and evaluation activities in the realm of K-12 and postsecondary education. My most recent interaction with CREATE came through Susan Yonezawa. Susan's extensive work with the K-12 STEM community led the Computer Science Teachers Association (CSTA) to approach her about becoming involved in what became a successful multimillion dollar bid for a grant. The grant involves professional development for high school teachers who teach AP Computer Science Principles, to help teachers recruit, and then support, English Learners into this course. My team in the Department of Economics, the San Diego Education Research Alliance, became involved and is running the quantitative side of an evaluation, with Susan Yonezawa leading the qualitative evaluation. She and her team have exhibited professionalism throughout. Her extensive contacts in the STEM K-12 community have also assisted the CSTA to recruit many of the schools in California that are now participating in the project. In short, I have the highest regard for the contributions that Susan and her team are making to STEM education and research on STEM. **- Julian Betts, Professor, UC San Diego, Economics; Executive Director, San Diego Education Research Alliance (sandera.ucsd.edu); Research Associate, NBER**

I have been very lucky to be able to get nearly instant help, and sometimes from my last-minute requests for proposal development and due diligence. In particular, Joel Brown has been giving me lots of great ideas and great advice to improve my proposal. He helped polish and improve my proposal to much better quality, which is critical for the grant's success. I will definitely need continuous help and support from the CREATE team in the future. **- Zheng Chen, Asst. Professor, UC San Diego, NanoEngineering**

CREATE is a key partner to our NSF-funded Materials Research Science and Engineering Center. Through their surveys, assessments, and analyses, they provide an independent voice that allows us to continually improve our extensive education and outreach programs. **- Michael Sailor, Professor, UC San Diego, Nanotechnology & Chemistry/Biochemistry**

I am the HPC/CI Training Lead at the San Diego Supercomputer Center. I am deeply appreciative of the support provided to me from the CREATE program. I worked with Monica Sweet to help develop the evaluation components on two recent NSF CyberTraining proposals. In both cases Monica's input provided valuable insight and helped guide program deliverables. In the case of the multi-institutional proposal, her responsiveness and guidance helped me to define clear deliverables, including BPC/EDI goals, for the program. **- Mary Thomas, HPC/CI Training Lead, UC San Diego, San Diego Supercomputer Center**

The CREATE program staff members (including Osvaldo Soto, Monica Sweet, Christina Gonzalez, Laura Santos, and Alec Barron) were extremely helpful to polish my proposal for the NSF CAREER grant. They especially helped make the educational part in the proposal more convincing and appealing. **- Ming Xiao, Asst. Professor, UC San Diego, Mathematics**

My interaction with CREATE in general and Monica Sweet, in particular, are quite positive. She was integral in an NSF IRES proposal we submitted in 2020 where she co-designed our proposed evaluation plan. Unfortunately the proposal wasn't funded, but the evaluation plan scored well and we plan on resubmitting in the Fall with Monica's contributions. **- Eric Fullerton, Professor, UC San Diego, Electrical & Computer Engineering; Director, Center for Memory & Recording Research**

I'm the Director of Education and Training at the San Diego Supercomputer Center. I'm extremely grateful for the support I received from CREATE. Working with Ovie Soto, I was able to create a DoD-funded summer program for high school math teachers that enabled them to integrate computing and technology into their classrooms. More recently, I engaged with Monica Sweet to develop the evaluation component of two proposals that are currently under review by the NSF's CyberTraining program. **- Robert Sinkovits, Director of Education and Training, UC San Diego, San Diego Supercomputer Center**

CREATE has been absolutely critical for the strong positive evaluation of the cross-campus NSF Biointegration proposal that we submitted in Jan 2021. Even though we did not win the award, the reviewers were very positive about the assessments we provided. Monica and her colleagues were able to work with us on very short notice to provide a strong formative and summative assessment program. Without this, our proposal would have been quite weak. I look forward to working with the amazing staff at CREATE again in the near future. **- Padmini Rangamani, Professor, UC San Diego, Mechanical and Aerospace Engineering**

I am a Teaching Professor in Structural Engineering who became passionate about improving the way we teach engineering at the K-12 and undergraduate levels. However, I was never formally trained in conducting pedagogical research. Specifically, I was unfamiliar with the need for independent assessment/evaluation for research projects until I was introduced to CREATE early in my teaching career. Over the years I have worked closely with Larry McClure and Monica Sweet on a number of educational grant proposals. CREATE has provided guidance on the research and assessment plan and has served as independent evaluators on some of my internal/local research projects. While none of the NSF grants have been funded, many have made it to final review stages (one is currently far in the review process). Both Larry and Monica taught me the importance of developing research methods and analysis techniques based on the latest pedagogy.

Monica especially guided me in learning how to develop evaluative processes that not only ensure that our project benefits from appropriate, rigorous, external input as part of a continuous improvement process, but the evaluation plan promotes accountability and addresses the quality of our research. CREATE has been invaluable in my ability to succeed as an educational researcher at UC San Diego. Furthermore, I have worked closely with Susan Yonezawa on a number of outreach efforts to the local K-12 community. She provides invaluable connections to San Diego school districts and educators and helps facilitate introductions to support all of my community outreach endeavors. CREATE is a very unusual entity on campus that makes connections between the cutting-edge research and outreach that is occurring internally at UC San Diego with the broader San Diego community. **- Lelli Van Den Einde, Teaching Professor, UC San Diego, Structural Engineering**

Working with Monica Sweet and CREATE on campus has been a significant component to the success of the Scripps-GEO proposal and award at the Scripps Institution of Oceanography. We are also planning for a resubmission of the NSF REU site at Scripps and Dr. Monica Sweet and the CREATE team would be important partners on that proposal. Together, these projects are critical in our efforts to recruit and retain diverse students in the geosciences, and the quality and detail in the evaluations provided by Dr. Sweet directly support and improve our efforts. **- Jane Teranes, Teaching Professor, UC San Diego, Scripps Institution of Oceanography**

CREATE has been continuously one of UCSD's critical centers for enhancing participation in STEM. In our program "Design for Launch", we work to improve STEM representation by demonstrating exciting aspects of space-based science and engineering. Alec Barron and our other colleagues in CREATE have significantly helped us to (i) identify community partners and implement Community Engaged Learning and (ii) develop educational modules about engineering and Space Science for teachers and students. I wholeheartedly support CREATE and recommend them as an invaluable resource to other faculty in their outreach efforts. **- Maziar Ghazinejad, Asst. Teaching Professor, UC San Diego, Mechanical and Aerospace Engineering**

CREATE has a long history of collaboration and support with EDS faculty, researchers, and students. We have worked with the staff and research professionals of CREATE as an outside evaluator on large National Science Foundation (NSF) STEM Teacher grant proposals. An example of this effort resulted in more than $6 million in grant funding in the Noyce Teacher Scholar Program over 9 years supporting new STEM Teacher development. CREATE was responsible for the overall evaluation of the program and reporting results to NSF program officers. CREATE has also supported our doctoral students in GSR positions, giving them the opportunity to engage in authentic, community based research with highly qualified researchers. CREATE is a vital partner with the EDS Teacher Education Program through the San Diego Area Writing Project, the UC San Diego Math Project, and the San Diego Science Project. These professional development projects have proven effective learning opportunities for our Teacher Credential Program graduates as they enter the teaching profession. **- Christopher Halter, Teaching Professor (Senior LSOE), California Teach Secondary Mathematics & Technology Education Co-Director, and Chair, Education Studies (EDS), UC San Diego**

The CREATE staff truly serves an essential role at UCSD and in the larger educational community, by connecting the expertise of multiple departments and centers at UCSD with local school districts and non-profits. As the Secondary Mathematics Lecturer and Supervisor in EDS, I have partnered with Drs. Yonezawa and Soto on many initiatives, including an NSF Noyce grant proposal. I most admire how they have advocated for equity-centered, rigorous mathematics education across our region. They have leveraged large-scale grants to positively transform mathematics teaching and learning, by leading high-quality, research-based teacher professional learning, such as hosting workshops led by UCSD mathematics professors to spearheading partnerships with the San Diego Supercomputer Center to integrate coding into high school mathematics. CREATE's bold and innovative initiatives have benefited thousands of local teachers, students, and families in San Diego County. **- Erica Heinzman, Lecturer/Supervisor Secondary Education, Department of Education Studies, UC San Diego**

I want to express my gratitude to the staff of the CREATE program at UC San Diego. In the summer of 2018 and 2019, Dr. Alberto Vasquez from the CREATE program helped me organize and recruit students for the ECE Department's summer engineering outreach programs. Their contributions and support were essential for implementing the summer programs. Dr. Vasquez is currently collaborating with me in organizing the third STEM workshop in the summer of 2022. **- Saharnaz Bahgdadchi, Assistant Teaching Professor, Electrical and Computer Engineering**

CREATE has given me excellent input to design educational plans for my NSF proposals. My NSF CAREER got great input regarding the evaluation of my activities from CREATE, and I also submitted an educational grant to facilitate the access for research for transfer students in two-year graduation programs. **- Professor Oscar Vasquez Mena, Department of Nanoengineering**

SCIENCE Class (a jail outreach program) has collaborated closely with CREATE from the very beginning of our program's inception. CREATE has been instrumental in helping us design and run our program by providing valuable insight into STEM communication techniques and methods for equity-minded outreach, as well as generously lending us resources for the hands-on experiments that we conduct in our classrooms. Our program truly would not be what it is today without CREATE. **- Alana Gibson, Graduate Student, Biological Sciences**

Community partners (a sample)

Through my role as the Director of the Southern California Professional Development Federation, I have had the good fortune to collaborate with and to see the positive impact from UCSD CREATE. While serving 27 school districts, 6 charters, 2 community colleges in addition to UCSD and CSUSM, I have heard from district and university leaders on the value of the CREATE programs and how these programs made a difference to their teachers and ultimately to their students. Whether it is funding from the Gates Foundation to address the much needed area of math instruction through the San Diego Math Network, or the ongoing work of Math for America providing much needed professional development, or an opportunity to host school leaders at the UCSD Design and Innovation Building to learn about their program, or resources for much needed SEL and parent programs, UCSD CREATE delivers. In addition to the many grants that they secure and the opportunities that they help to create for the region, they also provide the research to support the understanding of the work. They are thoughtful and valued thought partners in our region who are looking to the future with school leaders. USCD CREATE has made a huge difference in their many years of service and they help to set UCSD apart by demonstrating their commitment to the K-16 community as a whole. I can say without reservation that I, along with our local school leaders, value the amazing team from UCSD CREATE and the work that they do to inform, guide, and support our local schools. **- Brenda Hall, Director, Southern California Professional Development Federation**

CREATE staff was an incredible support to PIQE STEM Family workshops. The participation of CREATE staff members in our classes with first-generation and immigrant families helped them see new STEM career opportunities for their children. **- Carmen Russian, Executive Director Parent Institute for Quality Education (PIQE)**

CREATE is a vital leader in K16 education in the San Diego region and across the state. When I was at USD, CREATE was often the first institution I would reach out to partner on grants and initiatives. In my current role at San Jose State University, I continue to look to CREATE as a model for community-engaged partnerships and equity-focused leadership. When colleagues at other CSUs have questions about partnering with UCs and K12 districts, CREATE is the first resource that I point them toward. **- Heather Lattimer, Dean and Professor Connie L. Lurie College of Education, Acting Dean, College of Social Sciences, San Jose State University**

Our CREATE partners have been integral to our 8th grade on track CARE Network, a five-year Gates funded project serving 17 schools across Southern California. They have assisted with program design, school coaching, and convening facilitation, in addition to providing critical expertise around complex instruction, incorporating student voice, and mathematics education. We look forward to our continued collaboration. **- Daisy Sharrock, Ed.D., Director, CARE Network, High Tech High Graduate School of Education**

It is my pleasure to offer my full support to the ongoing funding of the CREATE team at the University of California San Diego. For the past two years Minhtuyen Mai and the entire team have worked with me in my role at the San Diego County Office of Education to envision an Eco System for high school eSports that focuses on academics, specifically school to college and career. Our work brought together SDCOE, Sweetwater Union High School District and UCSD Triton Gaming to create a mentor program that focused on traditionally marginalized students, specifically Latinas. The mentorship lasted six months, with students from Eastlake High meeting virtually with members of Triton Gaming twice a month to learn from the curriculum that was co-created by SDCOE and CREATE. In addition to the bi-monthly meetings, students attended an end of the year event, met UCSD alumni who work in the gaming industry, and most importantly, they were exposed to the college world of gaming and careers. None of this would have been possible without CREATE. For the upcoming 2022-23 academic year, we are in the planning stages for expanding the mentor program, working in a summer experience, and pursuing grant opportunities to continue to grow eSports in all 42 districts throughout San Diego County. I cannot stress how much a partnership with an organization like CREATE means to SDCOE. **- Alicia Butters, Director of Educational Technology, San Diego County Office of Education**

The UCSD CREATE team supports the execution of the San Diego Unified School District US Department of Education, Innovation and Research grant. The Coding Our Future initiative has been integral to the continued development of Computer Science curriculum in elementary and middle school classrooms. Additionally, the CREATE team has helped successfully write and execute the CS LISTEN and CS for EL grant programs that raise awareness of the barriers and equity issues that exist and impact student access to quality computer science education programs. These programs have a direct impact on students from all backgrounds accessing computer science curriculum and career pathways. College Career and Technical Education (CCTE) looks forward to continuing the collaboration with the CREATE team during the 2022-23 school year. **- Tom Antl, College, Career and Technical Education (CCTE) Specialist, San Diego Unified School District**

CREATE is an essential partner to CSTA across multiple projects. From my first few days as Executive Director at the Computer Science Teachers Association, I saw the key role that CREATE has played in supporting our San Diego chapter. Since then I've been lucky to partner with many members of the CREATE team to write and receive over $9 million in federal grants to develop and implement high quality, equity focused, computer science professional development across the country. We're lucky to have such strong partners in our work to expand access and attainment in computer science. **- Jake Baskin, Executive Director, Computer Science Teachers Association (national)**

CREATE staff supported a team of educators from Escondido Union High School District, Vista School District, San Diego Unified School District, SDCOE, and Sweetwater School District to co-research suggestions of what works and does not work for low- income, African American and Latinx students, young women, and other historically disadvantaged subgroups in Computer Science pathways. UCSD CREATE has been supporting staff to use our students' voices to understand structural and cultural barriers within schools, in this instance participation in computer science classes. The work supported through CREATE staff has made a marked impact on the computer science programing in our district. **- Mia Funk, Director of Assessment and Special Programming, Escondido Union High School District**

UCSD CREATE has been a crucial and influential partner in San Diego Unified School District's ongoing efforts to improve the UTK-12 student outcomes and experience, and in particular for our Black youth, English Language Learners, and students receiving special education services. In our San Diego Enhanced Math (SDEM) Initiative, CREATE has collaborated and advised our leadership team to modernize mathematics, support student-centered pedagogy, and foster asset-based and equitable grading practices. **- Alexandra Martinez, Instructional Coordinator, UTK-12 Mathematics, San Diego Unified School District**

CREATE has been instrumental in making our Federal Education Innovation Research Grant a success. They have supported us with creative problem solving and connected us to needed curricular and professional learning resources when our previous partner exited the project. CREATE staff are tremendous partners; they have a wealth of knowledge and an extensive network behind them that can support a wide range of grant related needs/issues. **- Michael Goodbody, Director, STEM Innovation, San Diego Unified School District**

CREATE is a uniquely critical hub in the San Diego region connecting districts and schools with higher education and research partners. I have worked with CREATE for almost twenty years, starting when I was the Executive Director of the Cal Teach program at UCOP and now as an independent consultant working to improve mathematics teaching, learning, excellence and equity in the San Diego region. CREATE's network is invaluable in supporting ambitious and innovative projects. Susan Yonezawa in particular is absolutely the best at keeping an eye open for new opportunities and setting up strategic contacts between key individuals across the multitude of interacting education systems in the area. **- Patrick Callahan, independent consultant, San Diego**

Building and maintaining networks of cross-sector partners aligning and coordinating their work and resources to support community-expressed needs and interests through STEM education is a vital and necessary effort. That effort is positively impacted in substantial ways by the work and reputation of the UCSD CREATE STEM Success Initiative. The Initiative collaborates by bringing University resources to the table whether as a lead on a grant, or by bringing students who can advance their education through real-world efforts, or by leveraging CSSI expertise in engaging community members and organizations, elected officials, and research scientists, to name a few. The weight of the CSSI's involvement also brings partners to the table who would otherwise be very difficult to engage for the broader array of STEM education providers. Those partners are able to provide the support for smaller organizations who provide services that the CSSI cannot - whether by expertise or by bandwidth - and thus create a sum that is greater than its parts. This effort is not that of a single organization and it, and the community, are served best when we are working in collaboration - not siloed - and everyone brings their expertise to the table. As the Central Project Office Lead for the San Diego STEM Ecosystem, I wholly value the efforts and commitment of the UCSD CREATE STEM Success initiative to putting STEM education at the service of the community and recognize our collective success would be negatively impacted by losing them as a partner. **- Eric Meyer, Assistant Director of Education, Fleet Science Center**

UCSD CREATE has become an important partner of Generation STEAM and Biocom California in helping us carry out our mission to empower the next generation of STEAM visionaries through education and exploration. Our partnership with UCSD CREATE, inclusive of their Barrio Logan Science & Art Expo and, generally, their deep-rooted relationships in the community, helped us deliver a safe and impactful version of the San Diego Festival of Science & Engineering during a pandemic year, helped us fulfill sponsorship requirements, and even helped us secure funding for important community work. UCSD CREATE is an invaluable part of the community and an integral component to delivering high-quality STEAM education to underserved communities in our region. **- Silvana DelPiccolo, Director of Community Relations, Generation STEAM**

Dr. Vasquez and the UCSD CREATE STEM Success Initiative have been an invaluable resource for the students on the LMEC campus, helping to establish and facilitate our science club and creating projects for/facilitating enrichment field trips for our student body. The academic and scientific enrichment he has provided is one of the things that students and parents consistently highlight as standouts at LMEC. I feel fortunate to work with Dr. Vasquez and UCSD CREATE, and I hope we will be able to continue to collaborate with them in the future. **- Melanie Kray, Principal, Logan Memorial Education Campus**

Youth of color are historically underrepresented in STEM across the nation, but CREATE STEM Success has engaged and created opportunities for the youth of color in Council District 4 to be more involved in STEM. With the annual Southeast San Diego Science & Art Expo and hosting science clubs at our local schools, CREATE STEM is activating interest for our youth and promoting equitable experiences. These programmatic efforts have worked toward transforming our district and inspiring the future generations by exposing them to the STEM field. **- Monica Montgomery Steppe, City Council President pro Tem, City of San Diego, District Four**

I am writing on behalf of UC San Diego's CREATE STEM Success Initiative and the monumental positive impact their work has contributed to families and residents within mv district. Since 2019, the Barrio Logan Science and Art Expo has attracted thousands of Barrio Logan and Logan Heights families and residents to participate in hands-on STEAM activities. These activities, which many families would not have but for the Barrio Logan Art & Science Expo, help support the community by providing amazing, unique, and fun ways of learning about science. The Barrio Logan Science & Art Expo provides underrepresented children in communities like Barrio Logan and Logan Heights with the platform to learn that there are interesting, fun and profitable career opportunities for them in STEM fields. I believe continued funding for UC San Diego's CREATE STEM Success Initiative is valuable and necessary to bring new learning and career opportunities to the underrepresented children within my district. **- Vivian Moreno, City Council member, City of San Diego, District Eight**

We are deeply honored by these testimonials from the campus and community partners we've supported.

Highlights of our Year 9 work are detailed in the remainder of this report. These highlights are just a slice of what we've done this year.

All our best, and for the larger CSSI team,

Mica Pollock
Director, CREATE (Center for Research on Educational Equity, Assessment, and Teaching Excellence)
Professor, Department of Education Studies, UC San Diego

(CREATE CSSI team members contributing to this report and the work in it are named throughout. Report produced additionally by Laura Santos, Karla Covarrubias, and Minhtuyen Le Mai. Additional CSSI project support is provided by CREATE staff Yuka Nakanishi, Christina Gonzales, and many more.)

Highlights CSSI Year 9| Campus Grant and Project Design Support

This year, as described throughout this report and in the testimonials above, the CSSI support team helped UC San Diego faculty members, staff, and students to design grants and projects leveraging their work in education K20. **In this, we often consulted with STEM faculty and K12 educators as they put together grant proposals to advance their science and education efforts. In these proposals, we helped to shape and design their education/outreach plans and associated evaluations, and often wrote the evaluation sections**. We worked deeply with STEM faculty/departments/Divisions and K12 systems as they sought funding for STEM education specifically (e.g., via targeted NSF proposals such as REUs, S-STEM, IUSE, ITEST, IRES, etc.). We provided CSSI support to STEM faculty enacting grants and education/outreach programs. **We also supported grant design through our Research and Evaluation team. Their contributions are listed in the subsequent section.**

Here's just a sample of such supports to UC San Diego faculty in Year 9. See the rest of the report, testimonials above, and our updated List of CSSI Supports to Faculty for more examples of campus and community projects creating new K-20 opportunities to learn.

We supported faculty to envision and shape exciting new education grants and STEM grants with K-20 education components, such as:

- "CAREER: Learning to Leverage the Brilliance of BIPOC Minds: Designing Teacher Professional Learning to Embody Anti-Racist Pedagogy in Science." **PI: Sherice Clarke, UC San Diego Education Studies**
- "Community-Driven Approach to Enhance Participation in STEM Fields." **PI: Maziar Ghazinejad, Mechanical and Aerospace Engineering**
- "DTI: Increasing Students' Interest in STEM through the Science of Music." **PI: Victor Minces, UC San Diego Cognitive Science**
- "Collaborative Research: Impact of Evolutionary Changes in the Glycocalyx on Oxygen Utilization in Diving Mammals. NSF Collaborative Research proposal." **PIs: Ellen Breen, UC San Diego School of Medicine, and colleagues**
- "Microbial Culturomics Facility - Expanding microbiome research throughout marine systems and non-canonical models." **PI: Eric Allen, Marine Biology, the Scripps Institution of Oceanography**
- "Structure, function, and evolution of membrane domains in living cells." **PI: Itay Budin, UC San Diego Biochemistry**
- "The Institute for Learning-enabled Optimization at Scale (TILOS)." **PI: Andrew B. Kahng, UC San Diego Computer Science Engineering**
- "CAREER: An engineered nanosensor to measure in vivo protease activity in traumatic brain injury." **PI: Ester Kwon, UC San Diego Bioengineering**
- "Career: Geometric Function Theory in Several Complex Variables." **PI: Ming Xiao, UC San Diego Mathematics Department**
- "CAREER: Molecular polaritonics: New opportunities for spectroscopy and control of charge and energy transport." **PI: Joel Yuen Zhou, UC San Diego Chemistry**
- SOARS, at the **Scripps Institution of Oceanography**
- "Mechanism and function of condition dependent mitochondrial mRNA localization." **PI: Brian Zid, Chemistry/Biochemistry Department in the School of Physical Sciences**
- "Cooperative Institute for Marine Ecosystems and Climate (CIMEC)" **(Education support to SIO/Cheryl Peach).**

See the testimonials above and project descriptions throughout this report for many more examples — and their K20 benefits.

Highlights CSSI Year 9 | Research and Evaluation

Over the past year, the CSSI Research and Evaluation (R&E) team also offered consultations to UC San Diego STEM faculty to help them think about evaluation and research related to their education and outreach efforts. We provided CSSI support to STEM faculty enacting grants and education/outreach programs as they had questions while thinking about evaluation and assessment. We also conducted funded research on the efficacy and impacts of education programming created via CSSI. And, we conducted paid evaluation work for STEM faculty and K12 systems when proposals were funded.

Year 9 Grant Proposals with CSSI Evaluation/Research Contributions

In addition to many basic consults on methodology, design, and/or evaluation, the CSSI R&E team, Dr. Monica Sweet and Dr. Joel Brown, **supported 16 full grant proposals submitted by UC San Diego faculty in Year 9.** (Additional CSSI staff named throughout this report supported the education and outreach components of even more grant proposals, as well as related research.)

For each of the projects below, we helped partners design/plan to study a K-20 STEM education component or a STEM education-focused proposal:

Submitted July 2021:
- *CAREER: Extending Human Dexterity through Hand-Held Continuum Robots.* NSF CAREER proposal. ***PI: Tania K. Morimoto, UC San Diego Mechanical and Aerospace Engineering***. (M Sweet)
- *CAREER: Goal-Oriented Variable Transformations for Efficient Reduced-Order and Data-Driven Modeling. NSF CAREER Grant. PI:* ***Boris Kramer, Department of Mechanical and Aerospace Engineering, Jacobs School of Engineering.*** (J Brown)
- *CAREER: High Resolution Mapping of Borderzone Dysfunction with Computed Tomography.* NSF CAREER proposal. ***PI: Francisco Contijoch, UC San Diego Bioengineering & Radiology***. (M Sweet)
- *CAREER: Influence of Rheological Properties of Polymeric Fluids on Dynamics of Acoustic Field-Driven Assembly of Particles.* NSF CAREER proposal. ***PI: Jinhye Bae, UC San Diego Nanoengineering***. (M Sweet)
- *Future Manufacturing: Eco: Dry Manufacturing of Solid-State Batteries for Large Energy Storage Systems. NSF Future Manufacturing Research.* ***PI: Zheng Chen, Department of Nanoengineering, Jacobs School of Engineering, in partnership with Massachusetts Institute of Technology (MIT).*** (J Brown)
- *IUSE: Opening Research Paths in Materials and Nanoscale Engineering for Transfer Students Without Research Experience at R1 Universities. NSF IUSE.* ***PI: Oscar Vazquez-Mena, Department of Nanoengineering, Jacobs School of Engineering.*** (J Brown)
- *CAREER: Understanding and Designing Electrolytes for Wide Temperature Lithium Metal. NSF Career Grant. NSF CAREER Grant.* ***PI: Zheng Chen, Department of Nanoengineering, Jacobs School of Engineering.*** (J Brown)

Submitted November 2021:
- *Collaborative Research: Galactic Archaeology with the Lowest Mass Stars and Brown Dwarfs in Preparation for the Next Generation of Deep Surveys. NSF Collaborative Research proposal.* ***PI: Adam Burgasser, UC San Diego Physics.*** (M Sweet)
- *D-ENTERPRISE: Diversifying & Engaging the Navy through Technical Education & Recruitment Partnerships for Research Innovations in Science & Engineering. Solicited ONR (Office of Naval Research) proposal.* ***PIs: Margaret Leinen, Cheryl Peach, UC San Diego Scripps Institution of Oceanography.*** (M Sweet)

Submitted December 2021:
- *Coastlines and People: Heat Waves in the Southern California Coastal Zone: Their Oceanic and Atmospheric Drivers, Human Health Impacts, and Sustainable Adaptation.* NSF CoPE (Coastlines and People) proposal. **PI: Mark Merrifield/Scripps Center for Climate Change Impacts and Adaptation; co-PIs: Nan Renner, Birch Aquarium, and Cheryl Peach, UC San Diego Scripps Institution of Oceanography.** (M Sweet)

Submitted January 2022:
- *Teaching Fundamental Spatial Reasoning and Sketching Skills to Promote Interest and Future Retention in STEM for Elementary Aged Students.* NSF AISL (Advancing Informal STEM Learning) proposal. **PIs: Lelli van den Einde, Nate Delson (eGrove Education, Inc.) and Monica Sweet (UC San Diego CREATE).** (M Sweet)

Submitted February 2022:
- *Collaborative Research: Impact of Evolutionary Changes in the Glycocalyx on Oxygen Utilization in Diving Mammals.* NSF Collaborative Research proposal. **PIs: Ellen Breen, UC San Diego School of Medicine; Cassondra Williams, NMMF (National Marine Mammal Foundation); Michael Tift, University of North Carolina, Wilmington.** (M Sweet)
- *Enabling New Microactuation Materials Through Understanding the Influence of Shear-Dependent Viscosities on Acoustic Field-Driven Assembly of Particles.* NSF R01 proposal. **PI: Jinhye Bae, UC San Diego Nanoengineering.** (M Sweet)
- *S-STEM: From Promise to Reality: Empowering Low-Income Students Through High Impact Practices to Achieve Academic and Professional Success in Engineering.* NSF S-STEM Program. **PI: Bill Lin, Department of Electrical and Computer Engineering, Jacobs School of Engineering.** (J Brown, M Sweet)

Submitted May 2022:
- *Comprehensive Learning for End-Users to Effectively Utilize Cyberinfrastructure (COMPLECS).* NSF CyberTraining: Implementation proposal. **PIs: Robert Sinkovits, Mary Thomas, Nicole Wolter; San Diego Supercomputer Center, UC San Diego.** (M Sweet)
- *Training and Developing a Research Computing and Data (RCD) CI Professionals Community.* NSF CyberTraining: Cyberinfrastructure (CI) Professional proposal. **PIs: Mary Thomas, Andreas Goetz, Paul Rodriguez, Robert Sinkovits, Rick Wagner; San Diego Supercomputer Center, UC San Diego.** (M Sweet)

Evaluation Work We've Conducted in Year 9

CSSI R&E also executed a dozen different evaluation projects for successfully funded efforts in CSSI Year 9. These independent evaluation projects were funded by grants or contracts to support CSSI's K20 STEM education and outreach efforts. They included:

- Evaluations of **UC San Diego-based summer programs for undergraduate students** to gain more research experience and to learn more about future education and career opportunities. Year 9 exemplars include the *Engineers for Exploration REU* (E4E: https://e4e.ucsd.edu/), the *Designing for Safety and Safety by Design REU* (DSSD: https://armor.eng.ucsd.edu/apply/ceer-summer), and the *Initiative for Maximizing Student Development* summer program (IMSD: https://medschool.ucsd.edu/education/CIHED/programs/IMSD/Pages/default.aspx).
- Evaluations of **year-round student support programs for undergraduate and community college students** who identify as URM to gain more research experience and to learn more about future education and career opportunities. Year 9 exemplars include the Scripps-GEO Scholars Program (https://scripps.ucsd.edu/news/scripps-launches-new-program-support-community-college-students-geosciences) and the SIO's ONR-funded D-ENTERPRISE Program (Diversifying & Engaging the Navy through Technical Education & Recruitment Partnerships for Research Innovations in Science & Engineering).
- Evaluations of the **education components of large, multi-campus collaborative science grants**, including the UC San Diego MRSEC grant (NSF Materials Research Science and Engineering Center: https://mrsec.ucsd.edu/) and the UC Riverside/UC San Diego/CICESE/UNAM/INAOE NSF PIRE grant (Partnerships in International Research and Education; Center for the Synthesis of Advanced Materials for Biomedical Applications: https://csamba.ucr.edu/).

- Evaluations of *programs designed to bring K12 teachers and faculty researchers together* to collaboratively integrate cutting-edge research into the classroom. In Year 9 we conducted a formative evaluation and consultation on next steps of the Scripps Research Institute's K8 SMILE Program (Scientists Making Impacts in Learning Environments: https://education.scripps.edu/k-12-outreach/ca-outreach/smile/).
- Evaluations of *large, multi-state programs designed to improve child educational outcomes by working with teachers*. In Year 9 we continued to work on large, independent evaluation of two Department of Education/EIR-funded Computer Science education grants awarded to the National Computer Science Teachers' Association: CSforEL (https://www.csteachers.org/page/csforel) and Expanded Computer Science Professional Development Week (E_CSPD_Wk: https://csteachers.org/Stories/csta-awarded-10.5-million-grant-from-u.s.-department-of-education) programs.
- Evaluations of *K12 community partners' efforts to improve K12 STEM learning by working with both teachers and students*. Year 9 projects include the Birch Aquarium's Beach Science and Price Outreach Education Programming (K6) and the Chula Vista Elementary School District's DoDEA-funded STEAMing into Health Sciences Program.

CREATE STEM Success Initiative: Leveraging a University to Create Local Opportunities to Learn

Local Opportunity Creation Involving UC San Diego, Highlights Year 9

The remainder of this report describes a sample of Year 9 CSSI efforts working with faculty and others on campus to directly produce opportunities to learn for students, educators, and families across the San Diego region, *while* creating funding and learning opportunities for campus students, faculty and staff.

Each of the projects benefiting community partners below also created funding for faculty, graduate student research opportunities, undergraduate jobs and outreach opportunities, and more.

- Computer Science Opportunity

- Mathematics Opportunity

- Science Opportunity

- STEM Community Outreach

- Special Projects:

  - Department of Defense (DoD) Defense STEM Education Consortium (DSEC)

  - UC San Diego Climate Champions

Highlights CSSI Year 9 | Computer Science Opportunity

CSSI has worked with UCSD faculty, staff and student programs to increase the university's influence on K16 Computer Science equity in the region, across CA, and increasingly throughout the country.

During the 2021-22 year, the CSSI team, particularly Dr. Susan Yonezawa and Dr. Minhtuyen Mai, supported, consulted on, and led multiple ongoing Computer Science (CS) grants and projects (see our Year 8 CSSI report for projects sustained in Year 9). **In Year 9, Yonezawa, Mai, and CSSI launched four substantial new CS efforts in partnership with undergraduate UC San Diego students, national non-profits, interested donors/development, and UC San Diego faculty, as well as local K12 school districts**.

We:
- Supported "TritonHacks," an on-campus outreach effort led by UC San Diego Computer Science undergraduates. TritonHacks is a weekend-long team competition introducing high school students to computer and data science challenges and CS fundamentals, targeted at underserved students. Last May, **TritonHacks served over 100 participants across San Diego County**.
- Worked with Education Studies Teaching Professor Beth Simon and the San Diego Unified School District STEAM office to create and oversee teacher professional development and curriculum/assessment development for 3rd-8th grade computer science units and courses across the San Diego Unified School District. Partnering on the CodingOurFuture US Dept of Education grant held by SDUSD, CREATE with EDS has supported **over 50 elementary schools and 70 teachers in Year 9 alone,** who have received professional development support to use UC San Diego-branded curriculum that are now being used across the SDUSD. **Such efforts are reaching an estimated 2100 3rd and 4th grade students with completely new opportunities to learn CS**. This effort is planned to expand in Year 10.
- Partnered with **GirlsWhoCode**, a national nonprofit focused on increasing female representation in the CS field. (CSSI was recruited by GirlsWhoCode to act as their regional partner.)
- Worked with the Dean of Social Sciences Office and UC San Diego Advancement to create **new, awarded funding proposals for interested donors, e.g., improving female participation in the computer science K-12 pipeline** ($100K in awarded donor funds for the coming year.)

As a Year 9 highlight, the CSSI team is also especially proud of **a growing and robust partnership between the National Center for Women in Technology (NCWIT) and the CSSI.** During the 2020-21 academic year, NCWIT approached CSSI/CREATE to become the San Diego Affiliate for the Aspirations in Computing (AiC) award program, previously housed at Qualcomm. AiC awards 9th-12th grade women, genderqueer, and non-binary students for their accomplishments and aspirations in technology. Through these awards, NCWIT seeks to address the gender barriers that exist in computer science participation. Qualcomm stayed a foundational partner and co-sponsor. CSSI/CREATE's broad work on computer science education in San Diego enables us to achieve NCWIT's goal of expanding an AiC program that creates a community inclusive of students in underserved STEM schools and communities – **also attracting underrepresented students to UC San Diego.**

As the new AiC San Diego Affiliate, CSSI/CREATE program manager Laura Santos expanded the diversity of students who received an AiC Award. Previously, AiC recipients were centralized in more affluent regions of San Diego. This past award season, CSSI/CREATE filled in some of these AiC recipient gaps by awarding **nearly 20 more high school students from Escondido to South San Diego, through bilingual outreach targeting schools where the majority of students receive free-reduced lunch**. We partnered with the local Computer Science Teachers Association (CSTA) chapter and the regional Code.org both of which are housed at CREATE. Qualcomm sponsored a celebration for 18 Regional Awardees and 11 National Awardees at Marina Village Conference Center in May 2022. Given the gender gap in computer science course enrollment, it was rewarding to see a whole room of female students who have an aspiration to pursue a career in computing.

Student voice too is paramount to our work at CREATE, and essential to our **"CS LISTEN" grant, a collaborative, NSF-funded UC San Diego-K12 effort led out of CREATE.** Since late 2019, CS-LISTEN, led by Yonezawa and Mai with partners, has **tapped youth as co-researchers in 16 local high schools to diversify participation in CS, simultaneously attracting students to UC San Diego itself.** This second cohort consisted of **85 student co-researchers, almost half of whom were female and almost half Latinx**. In May 2022, we hosted an in-person conference with over 100 attendees, including parents and district leaders from the San Diego, Sweetwater, Escondido, and Vista school districts. To their district leaders, local educators, and community attendees, Student Co-Researchers from 7 high schools across four districts (Vista, Escondido, SDUSD, and Sweetwater UHSD) presented their research findings and recommendations on diversifying and increasing student enrollment and success in CS courses. Recommendations included informing counselors and parents about CS so they could inform and encourage diverse CS student enrollment.

The Code.org Regional Partnership Program, hosted inside CREATE as a CSSI partner, has entered its fourth year supporting **university and community partnerships to expand CS work by middle and high school teachers, sparking local students' progress through the K20 CS pipeline**. In addition, the Computer Science Teachers Association (CSTA), San Diego Chapter, is now hosted at CREATE as a CSSI partner. In Year 9, CSTA delivered both **virtual and in-person professional gatherings for 60 CS teachers in San Diego.** Noteworthy in Year 9 was a new partnership with NFINIT, an industry in San Diego that specializes in cloud computing and storage. In March, NFINIT provided opportunities for high school students to participate in their paid summer internship program. CSSI/CREATE also remains a key participant in CSforALL, a national think-tank expanding CS educational research & practice and envisioning long-term goals for CS education in our region.

Finally, CSSI efforts in Year 9 increased attention to **Esports,** or competitive video gaming. Esports has garnered local and national support as a popular after-school activity for youth and indeed, a tool for engaging in STEM in school, and a viable realm of STEM careers. In year 9, CREATE's Dr. Minhtuyen Mai, an CREATE staff member focused on supporting CS projects, partnered with the **San Diego County Office of Education (SDCOE),** Dr. Alicia Butters, Director of Educational Technology at SDCOE, and **UC San Diego's own Esports Director** Chris Griebenow to create a pilot monthly after-school mentoring program for Eastlake High School in the Sweetwater Union High School District. Speakers included industry partners from Google, Turtle Beach, and other gaming hardware industries. UC San Diego's ESports and Triton Gaming student organizations also delivered important presentations about their experiences in college. In later years, we hope to build a **university-linked community of educators and students interested in Esports.** See right for a photo of Mai with UC San Diego Chancellor Pradeep Khosla and Executive Vice Chancellor Elizabeth Simmons.

Highlights CSSI Year 9 | Mathematics Opportunity

Mathematics is a key arena of STEM opportunity affecting college degrees and careers. As an organization brought into UC San Diego CREATE as part of the CSSI and now a key CSSI partner, the UC San Diego Mathematics Project (UC San Diego MP) **seeks to increase access to and success in rigorous institutions of higher learning** for underrepresented and underserved student populations, through the design of K12 mathematics courses, programs, and teacher professional development. **During Year 9, UCSD MP project staff supported UC San Diego faculty/academics and local K12 teachers and administrators in the CSSI, while amplifying the role of math across CSSI projects, K-20.**

Support to UC San Diego Faculty and Academics

During year 9, UC San Diego MP Director Dr. Osvaldo (Ovie) Soto **supported faculty and academics from across campus**, including the Department of Education Studies, the San Diego Supercomputer Center, UC San Diego's Department of Mathematics and Statistics, and the Department of Electrical and Computer Engineering in the Jacobs School of Engineering. **CSSI work included writing letters of support for grant proposals, consulting on and writing drafts for researchers' NSF broader impacts sections, and recruiting K12 teachers and students for work described in broader impacts sections.** As an onboarding member of the CSSI support team, **Dr. Soto helped 10 UC San Diego faculty members generate grants in Year 9. Year 9 math work also supported UC San Diego-based teachers:** One support highlight involved a multi-institutional NSF-funded research project (P.I. Prof. Guershon Harel, Mathematics; Co-PI Dr. Soto) investigating impacts of NSF's Noyce Master Teaching Fellowship Programs across eight institutions, including at UC San Diego.

In the CSSI, the UC San Diego MP has urged attention to the crucial issue of mathematics within projects that otherwise could ignore this oft-"forgotten M" of STEM. New Year 9 efforts have explored the mathematics of climate science and amplified the role of math in a **Department of Defense STEM Education Consortium (DSEC) hub grant** (led by Susan Yonezawa, CSSI Network Coordinator, and Alberto Vasquez, CSSI community engagement and outreach coordinator). The DSEC project involved linking the UC San Diego Math Project and the **San Diego Supercomputer Center (SDSC);** Soto (PI) and SDSC co-PI Dr. Robert Sinkovits together won a $235,000 *Introducing Computing and Technology Through Discrete Mathematics Problem Solving (ICAT)* award to integrate math and computer science. This work supported Dr. Sinkovits' desire to bring together mathematics and computer science by creating a **two-week summer institute for teachers and two summer academies for underserved/underrepresented and military-connected students from around the county.** This "summer academy" model simultaneously supports the teachers involved to build their skills in collaboration with mentors.

CSSI mathematics work with UC San Diego faculty and academics also connected directly with local K12 school systems to shore up the pipeline to college-level math. In Year 9, CREATE-CSSI team member Susan Yonezawa particularly forged ahead with work continued on a large collective grant connected to the CSSI and CREATE: the **Bill and Melinda Gates Foundation-funded CARE Network**, **a network of schools focused on supporting students to stay on track to and through 8th grade math**. This project is a $10 million collaborative project between the High Tech High Graduate School of Education, CREATE, the UC San Diego Math Project, and the statewide CA Math Project, seeking to bring about school-wide reform in middle school mathematics education through Lesson Study across 11 middle schools. Together with Prof. Guershon Harel (Mathematics), Soto/UC San Diego MP also procured a separate $1 million dollar DoDEA grant to train teachers in Oceanside who serve military-connected students.

While helping faculty get and execute funded projects, CSSI-related math work has also involved co-planning and delivering priority teacher professional development and student-facing activities linking campus to local school district partners, **to ensure mathematics success for students heading toward college.** As an example, in a multiple year collective impact project, Math for America San Diego (housed in CREATE) has been working to help scale and sustain **a new Discrete Math course as a fourth-year high school math option in our region,** with associated curriculum and teacher professional development. This course offers students and underrepresented students particularly an alternative, rigorous pathway to university-level mathematics – something essential in this era of changing university admissions policies and **the need to ensure students arrive in college prepared in mathematics.** A third-year course in Discrete Math will be piloted by San Diego Unified School District (SDUSD) in the fall. This project, part of the California Mathematics Readiness Challenge Initiative, received $1.28 million over 23 months from the CA Dept. of Education to help stem the need for college-level remediation in mathematics, along with more than $400,000 from the College Futures Foundation, and nearly $200,000 from the CSU Chancellor's Office. The Discrete Math Project Collaborative has undergirded publishing by Soto and colleagues, including in *The Branching Out Report* (https://justequations.org/wp-content/uploads/Just-Equations-2019-Report-Branching-Out-Digital.pdf). And to make sure math success starts early, in year 9, the UCSD MP also led a professional development series on a key issue hindering many students from progressing through to college – fractions/proportional reasoning in grades 3-9.

Highlights CSSI Year 9 | Science Opportunity

A key aspect of the CSSI is engaging UC San Diego scientists and students in putting their science to work across our community. As a lead partner in the CSSI, the San Diego Science Project (SDSP) at UC San Diego CREATE seeks to inspire curiosity, confidence, and innovations for science educators in the greater San Diego region **through leveraging UC San Diego science.** Dr. Alec Barron joined CREATE in Year 9 to direct the SDSP and serves at 50% on the CSSI support team as its science lead, supporting many across campus and community to get cutting edge science in the hands of the region's students and teachers. Through CSSI, and in ongoing educational partnership with the San Diego County Office of Education, the SDSP helps grow the region's science educator networks; design and deliver engaging science programs; and **build bridges between UC San Diego faculty/researchers and the region's educators.**

During the 2021-22 school year, the SDSP's CSSI staff supported, consulted on, and led the implementation of many grants and projects linking UC San Diego to the K12 community in our region. Here's a sample:

A Community-Driven Approach to Enhance Participation in STEM Fields. The SDSP is working with UC San Diego Assistant Teaching Professor Maziar Ghazinejad (Department of Mechanical and Aerospace Engineering) to develop a 2-day Summer Engineering Institute for Physics teachers from the San Diego Unified School District and Escondido Union High School District. Supported by UC San Diego's "Changemaker" program (Faculty Fellows for Community Engaged Learning), this project **aims to leverage UC San Diego graduate students** to design and build a centrifuge capable of testing potential payloads for launches in space by various types of rockets. The summer institute will immerse 12 high school Physics teachers within a Project-Based design challenge created by the graduate students in Dr. Ghazinejad's lab. The teachers will take what they learn to plan a similar experience for their students, spreading UC San Diego science into the region's classrooms.
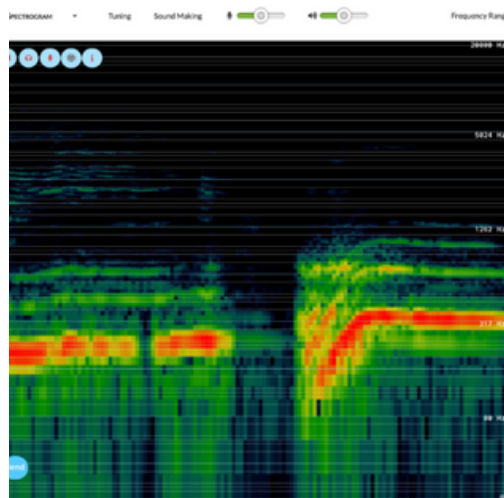
Increasing Students' Interest in STEM through the Science of Music. In collaboration with Research Scientist Victor Minces from the Department of Cognitive Science, SDSP CSSI experts implemented virtual workshops for **56 teachers from up to 20 local K12 districts** to learn technology tools for students to create sounds and visualize the waveforms and frequencies that compose those sounds as powerful ways to engage students with learning science. This is part of a 4-year grant from the National Science Foundation that provides professional development to teachers across the region, **directly reaching more than 8000 local students per year.**

Climate Champions: In a strategic effort to tap UC San Diego's vast climate science expertise, the SDSP is a partner with **the Climate Champions initiative, led by Birch Aquarium at the Scripps Institution of Oceanography.** Please see this report's special final section on Climate Champions for more information.

Word Sort Step 4: Using the words
Students use the words to make observations that compare the properties for different types of bread.

Combining Forces!
Lesson Investigative Phenomenon: Balancing a pencil on its tip. Objects on the playground move.
PS2.A: Forces and Motion: Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion.
PS2.B Types of Interactions - Objects in contact exert forces on each other.

Balance Point

Other Year 9 highlights include a STEAM TK-5 Lesson Study Project, providing the early science exposure crucial to getting our region's students ready for college and career. Work supported 20 San Diego Unified STEAM Resource Teachers to collaboratively conduct lesson study cycles to support the refinement of their TK-5 STEAM curriculum, **with over 400 students served**. During the 2021-2022 school year, the SDSP supported the planning and facilitation of **virtual professional learning events for 105 teachers, investing in their long-term supports to many thousands of students.** To amplify CSSI Science efforts, Dr. Barron also served on the Leadership Committee for the NGSS Collaborative, a state-wide science professional learning consortium, and presented on current Science Standards implementation to the Board of Science Education of the National Academies of Sciences, Engineering, and Medicine.

Highlights CSSI Year 9| STEM Community Outreach

CSSI support team member Dr. Beto Vasquez leads our efforts on designing and executing many CSSI outreach efforts where **UC San Diego partners of all ages directly reach students and community members in STEM.** During the 2021-2022 school year, our CSSI STEM Outreach team focused resolutely on increasing programming in areas of San Diego County not currently accessing key STEM opportunities. As a result, **CSSI Outreach interacted with over 8,000 people in Year 9 through UC San Diego-driven K-20 and community engagements with students, families and community members.** With UC San Diego students and faculty, w**e led Community Outreach programs** ranging from expanded school based science clubs to local science festivals and a variety of small and large community events. **Each event demonstrated our commitment to creating equitable educational opportunities for underserved and underrepresented communities, while introducing the San Diego community to UC San Diego.**

One of the best parts of conducting this community-facing work was reintroducing UC San Diego and its affiliates to the community after the pandemic. Working closely with both newer and seasoned faculty members, their labs, various student organizations and departments, we renewed campus interest and awareness about engaging community members – and specifically, the importance of lessening STEM apprehension in underrepresented communities and simultaneously inspiring awe in future generations. **Professors, undergraduate/graduate students, and postdocs from Engineering, Physics, Chemistry, and Biology reveled in the ability to connect to the community and have a sense of purpose as they gave back.** Here's just a sample of our community-facing Year 9 efforts.

OFFERS Summer Programing for San Diego Families

Since 2020, remote and virtual education had dominated the student, teacher, and family educational experience. At the beginning of Year 9, the Summer of 2021 brought forth a much needed wave of energy, care, fun, and science for San Diego Unified School District (SDUSD) students. With the support and leadership of the San Diego Foundation, SDUSD's "Level Up SD" initiative leveraged UC San Diego partners, local community members, and San Diego organizations to provide essential resources and opportunities in free summer camps for SDUSD students– a 2021 "summer of fun and joy." **CSSI/CREATE partners contributed STEM learning opportunities to a robust list of exciting programming made available for free** to over 100,000 students and families in the second largest district in California. In one of our busiest CSSI summers ever, CSSI/CREATE led the program OFFERS (Opportunities for Future Engineers, Researchers, & Scientists), initially running four weeks of half-day camps at Chollas-Mead Elementary to complement SDUSD's morning summer school classes and serve working families. The program was funded by the San Diego Foundation and **focused on leveraging UC San Diego students and staff in providing hands-on learning engagement in STEM activities.** After successfully serving 120 students in our first four weeks, OFFERS was extended to include an additional three weeks of full-day programming at the Logan Memorial Education Campus (LMEC), a new K-12 institution in Logan Heights. From the beginning, OFFERS was intentional about providing equitable opportunities throughout its camps. We were elated that **100% of our camps took place in Southeast San Diego** and that about **75% of participants (with a total of 180 summer students) were from underrepresented communities.**

As key in-person community events, our Southeast San Diego and Barrio Logan Science & Art Expos returned in person in Year 9, **reaching over 3,000 students and community members.** In the two events below, **close to 50% of exhibitors were UC San Diego student organizations, faculty members and campus labs/centers.**

Southeast San Diego Science & Art Expo

With support from community and campus partners, CSSI/CREATE led an inaugural Science and Art Expo in August 2021 at the Malcolm X/Valencia Park Branch Library in Southeast San Diego, providing a free, family-friendly atmosphere for students and their families to experience the "science of the world around us." CSSI's DoDSTEM program (see Special Projects, below) added to support from San Diego Unified School District's Level Up SD and the San Diego Foundation, and **close to 700 children and adults** enjoyed the Expo's day of culturally relevant and engaging interactive demonstrations featuring more than 40 STEAM (science, technology, engineering, art, and math) organizations. Demonstrations and hands-on activities included live reptile exhibits from EcoVivarium, live science performances from Mad Science, lowrider hydraulic demos from Viejitos and Classic Car Clubs, and a "cool" show (using demos with sub-zero temperatures) from General Atomics. In addition to the expo itself, which provided a variety of activities, microscopes, giveaways and opportunity drawings, attendees were also able to take advantage of tours of the Legler Benbough Teen IDEALab located at the Malcolm X Library and the iconic local Elementary Institute of Science (EIS).

The Barrio Logan Science & Art Expo

This year, one of our larger events, **the 2022 Barrio Logan Science & Art Expo, served close to 2000 attendees** as one of three community-based events sponsored by the San Diego Festival of Science & Engineering. **The Expo had us working closely with local industry and UC San Diego partners** while designing an intentional and genuine opportunity to make cultural connections to STEM. Held on Saturday, April 16, 2022, our second annual Expo was truly a representation of the growth and resilience of the CSSI throughout the pandemic – and a celebration of the science, art, and culture that surrounds us every day. Held at the Mercado del Barrio in the heart of Barrio Logan, a historically Latino community, the Expo offered over 50 booths hosted by community organizations and businesses. Close to 2,000 children and adults enjoyed a day of culturally relevant and engaging interactive demonstrations, including the DIII-D National Fusion Facility's cool and explosive show (using demos with sub-zero temperatures) with Dr. Boom. Local businesses Ryan Bros Coffee and Attitude Brewery gave behind-the-scenes tours of the science of coffee making and brewing. San Diego Mayor Todd Gloria stopped by the event to remind our students "that if you see it, then you can be it," and to celebrate the innovation, creativity, and culture that make San Diego **(and UC San Diego!)** so great.

During the Academic Year

Throughout Year 9, our **commitment to increasing UC San Diego's institutional presence** in various communities throughout the county was evident in our **involvement in science festivals** from as far south as San Ysidro School District's inaugural STEAM Festival and Millennial Tech Middle School's Annual STEAM Family Night to as far north as Del Mar.

This year, we also have been able to provide **weekly Science Clubs at schools and community centers, sharing UC San Diego science activities directly with children**.

Year 9 partnerships included:

- Sherman Elementary - Sherman Heights
- Perkins K-8 - Barrio Logan
- Logan Memorial Educational Campus - Logan Heights
- Encanto Elementary - Southeast San Diego

- Millennial Tech Middle School - Southeast San Diego
- La Maestra's Center for Youth Advancement - City Heights
- Sherman Heights Community Center

Most of these sites hosted Science Club for up to 30 students one hour/each club day after school and served students from socioeconomically disadvantaged communities.

Continued Community College Connection

Additionally, in Year 9 we continued reinforcing our **relationships with our local 2-year institutions, crucial to the higher education pipeline to and through our campus.** This year, we were excited to secure funding from a local philanthropic organization, the San Diego Foundation, for a second year of STEMULATE – our **CSSI/CREATE summer research experience for community college students, now hosting students from five different community colleges.** In Year 9, we also increased our community college efforts through assisting San Diego City College in securing a $5M HSI STEM grant; hosting community college group tours of UC San Diego (e.g., for Umoja and formerly incarcerated students); and employing community college students alongside students from UC San Diego's Undocumented Student Services PACE Program in our STEM outreach efforts, to create equitable access to meaningful employment.

We did all of this while continuing to partner with faculty from varied disciplines (Engineering, Physics and Biology) **to develop their individual projects and integrate them into our community work.**

Highlights CSSI Year 9 | Special Projects

Department of Defense (DoD) Defense STEM Education Consortium (DSEC)

In Year 9, we continued another intensive project **linking UC San Diego to the community since 2019** – the **Department of Defense's (DoD) five-year Defense STEM Education Consortium (DSEC).** As one of three DESC hubs across the nation, CREATE is excited to continue our **UC San Diego-based work with DSEC partners to strengthen and expand the reach of all DoD STEM outreach programs in the San Diego region, specifically providing more equitable extracurricular opportunities for underrepresented and military-connected groups**. The $75 million national effort, which is headed by RTI International in North Carolina, focuses on STEM enrichment programs for students and educators, STEM workforce engagement, program evaluation, and public outreach. As leads of San Diego's DSEC hub, CSSI staff at CREATE continue to provide organization, coordination, and communication across new and existing DoD-supported STEM outreach programming, **connecting regional and UC San Diego-specific resources, faculty, staff, and student groups to DoD-supported STEM outreach programs**.

In Year 9, CSSI DSEC efforts included the following:

- **We deepened relationships with local educators and schools that serve priority student groups and military-connected families.** CSSI team member Dr. Beto Vasquez serves as Chair for the Southeast San Diego STEM Ecosystem, expanding targeted outreach efforts in historically underserved communities in Southeast San Diego, City Heights, South San Diego and North County.
- **We convened and supported regional efforts to build an extensive network of local STEM-supporting organizations, such as museums & non-profits, industry partners, local government, the San Diego Workforce Partnership, federal resources, and DoD partners alongside UC San Diego.** Goal: To create a holistic approach leveraging STEM learning to create economic, generational, and community opportunities for upward mobility in San Diego.
- **We advanced efforts to co-develop regional data maps providing visual representations of regions in San Diego County where DOD-funded STEM opportunities are simply not being offered.** Based on mapping results, the UC San Diego CREATE DSEC hub identified and is building efforts to increase STEM support in San Diego Unified School District's (SDUSD) Southeast San Diego area schools (specifically Morse and Hoover clusters), and schools in the Sweetwater Union High School District (SUHSD). These areas serve predominantly Black, Latinx, and military-connected students.

Highlights CSSI Year 9 | Special Projects

UC San Diego Climate Champions

Most teachers and parents (>80%) think climate should be taught in schools, but less than 42% of teachers actually teach about climate. **How can UC San Diego assist?** The Climate Champions initiative, a key CSSI project led by CSSI support team member Dr. Nan Renner (also of **Birch Aquarium at Scripps),** aims to get more climate teaching, learning, and action in regional schools. **The Social Sciences Climate Action Lab** provided financial support to launch this initiative in May 2020 to begin to respond to an unmet demand for climate education. We continued to build in Year 9.

In our first year, during the pandemic, secondary teachers **worked with UC San Diego colleagues to develop climate science curriculum** (with math and language arts connections) for distance learning focused on local phenomena, UCSD research, climate solutions, and climate justice. Youth leaders, with support from a graduate student researcher from Education Studies, curated climate resources for humanities and social science classes. The year culminated with the **Climate Champions Virtual Summit, with 252 attendees.** The Climate Champions website links to all curriculum, summit session recordings, and additional learning resources.

During Year 9, the 2021-22 academic year, Climate Champion teacher leaders continued to test and refine the Climate Champions curriculum; to date, thanks to these efforts, **more than 1000 San Diego students have learned with the curriculum.** Additionally, CSSI team members have focused in Year 9 on expanding the infrastructure to support Climate Champions Teacher Communities of Practice connecting climate-interested educators throughout the region. **Partners from CREATE's California Subject Matter Projects** (state-funded teacher professional development programs in CREATE), **Birch Aquarium, and the Scripps Institution of Oceanography, are working with the San Diego County Office of Education** toward this collective goal of linking teachers trying to teach on climate. In August 2022, a Climate Champions Design Summit will engage 20 science teachers and researchers at Scripps and UCSD, focused on sparking learning on a specific climate issue affecting San Diego: marine heat waves and impacts on ocean communities and people.

By investing like this in teacher professional learning and leadership development, we anticipate a multiplier effect for **UC San Diego-supported climate teaching in our region and beyond.** Through strategic network building, teachers will influence other teachers to adopt climate curriculum; each Climate Champions teacher could reach thousands of students through their careers. As San Diego teachers and their students learn about local climate impacts, concrete climate solutions, and collective action for broadscale change, climate-responsive activity is growing in our region. As Climate Champion teachers noted in Year 9:

> "I used to think that climate change as social justice would be too complex to introduce to elementary students. But now I know that through beautiful literature and stories, even our youngest students can be inspired to be climate activists."
> "I want to learn more about how we can teach in ways that motivate and equip people to take action to advance climate justice."

And as one student in a Climate Champion classroom put it in a six-word story, "We shall cure the Earth's pain."

Spreading the CSSI model
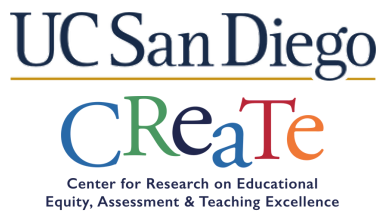
CSSI Communications
CSSI staff invites you to follow our social media platforms to learn about UC San Diego's K20 education efforts across the San Diego community and beyond.

Sign up for our blog, our CREATE at UC San Diego Facebook and Twitter account, and help us #CREATEequity!