AN EVALUATION OF THE
2018 COMMUNITY COLLEGE OUTREACH PROGRAMS:
CC-RISE AND C4

Executive Summary

Prepared for:

Center for Dark Energy Biosphere Investigations (C-DEBI)

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INTRODUCTION

The Center for Dark Energy Biosphere Investigations (C-DEBI) NSF-funded Science and Technology Center offered a summer program, designed to encourage community college students to pursue a career in research science. Women, first-generation college students, and underrepresented students were especially encouraged to apply. For eight weeks during the summer of 2018, 16 community college students conducted hands-on research under the supervision of a mentor, attended seminars, and participated in field trips and social activities. Students worked an average of 39 hours per week. CC-RISE was a paid non-residential internship program at the University of California, Santa Cruz (UCSC) or the Woods Hole Oceanographic Institution in Woods Hole, MA (WHOI). Community College Cultivation Cohort (C4) was a residential paid internship program at the University of Southern California (USC).

Methodology

A few weeks before the program began, students completed an online survey (pretest), designed in conjunction with C-DEBI program staff; questionnaire completion took an average of 10 minutes. Questions included goals and expectations for the upcoming summer course, career plans, and previous research experience.

At the end of the course, students completed an online survey (posttest), also designed with the C-DEBI program staff. Questionnaire completion took an average of 51 minutes. Questions included satisfaction with the course, course impact on career goals, and suggestions for course improvement.

Participant Demographics

All 16 participants completed both the pre- and posttest surveys, for a response rate of 100%. Participant demographics were as follows:

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<tbody>
<tr>
<td>Female</td>
<td>50%</td>
<td>African American</td>
<td>6%</td>
</tr>
<tr>
<td>Male</td>
<td>50%</td>
<td>Asian</td>
<td>13%</td>
</tr>
<tr>
<td>Sophomore</td>
<td>88%</td>
<td>Hispanic/Latino</td>
<td>25%</td>
</tr>
<tr>
<td>Junior</td>
<td>12%</td>
<td>White</td>
<td>57%</td>
</tr>
<tr>
<td>(Year just completed)</td>
<td></td>
<td>1st generation college and/or low income</td>
<td>75%</td>
</tr>
<tr>
<td>CC-RISE (UCSC)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC-RISE (WHOI)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4 (USC)</td>
<td>8</td>
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All of the students had already declared an undergraduate major in a STEM field, and most of those were related to the biological or environmental sciences. The majority (62%) already had at least a “little bit” of lab experience, but about one-third (38%) had
no previous lab experience. Also, the majority (56%) had never presented their own research results. At the outset, all intended to pursue a career in science.

This document provides a summary of the survey responses. Complete data for both the pre- and posttest surveys are provided in the Appendix. Participant comments were copied directly from the online survey and were lightly edited for spelling and punctuation. In this report and in the Appendix, participants’ comments are labeled with the name of the institution at which they attended the program.
SUMMARY OF FINDINGS

Overall, the community college summer program was a success, with appreciative participants who reaped many benefits.

1. Satisfaction with the summer program

- The majority of the students had little or no previous meaningful research or presentation experience before the course began. They learned a great deal about the research process during the summer.

- As in previous summers, students connected with both mentors and their classmates. Mentors were supportive, and patient role models, and classmates provided a supportive cohort.

- The programs’ exposure to career options was viewed as a strength.

- Students’ satisfaction with the pre-program information improved from previous years at both USC and WHOI.

Suggestions
- Only a handful of students prepared a research proposal; students across all three locations suggested adding this task to the summer experience.

Suggestions specific to USC:
- Last year, the USC students found the seminar series to be dull, too broad, or irrelevant. This year, the seminars were too advanced (and again, irrelevant), and the webinars did not allow students to connect with the information. Students say they would prefer to spend that time in the lab.

- There seemed to be scheduling conflicts between the different parts of the program; meetings would conflict with their lab work, homework would conflict with workshops, etc. The program should manage students’ expectations and stay in touch with the research labs about required program elements to avoid conflicts.

- Some USC students complained about lack of availability of microscopes. Perhaps this can be rectified next year.

Suggestions specific to UCSC:
- The poster session was again a logistical struggle. Students did not have enough time to complete it. As suggested last year, poster guidelines and details should be shared with students and mentors at the beginning of the summer.
2. Impact on participants’ career goals

- Although all of the participants had already chosen a science-related career path, the program gave many students more confidence and motivation to pursue an advanced degree.

- For a few students, the program showed them that they do not wish to pursue lab-based science.

Suggestions:

- C-DEBI should continue to follow-up with program alumni to track their career progress and determine how the program has influenced their educational and career choices. The program can continue to support alumni by having mentors stay in touch with their students, providing letters of support, encouraging them to attend conferences, and other such activities.

3. Inclusion and diversity

- Students felt the program provides an environment that is respectful of diversity and inclusion. “Diversity” included race/ethnicity as well as gender.
COMPARING THE SUMMER PROGRAM TO STUDENTS’ EXPECTATIONS

For all students, the summer program either met (31%) or exceeded (69%) their expectations. Students expected to learn **hands-on laboratory skills**.

→ “I was hoping to gain new laboratory techniques and experience collaborating with others. I came into the program with an open mind so I didn't have many expectations.” USC

→ “I was hoping to gain lab experience and learn about new techniques and equipment. I did learn all of that as well as make great friends, great connections/networks and have an experience of what it would be like being away from home. It was kind of like a college life simulation.” USC

→ “I was hoping to get experience being in a lab and being able to finish a project. The summer program was extremely helpful because I was exposed to so much more than just that. We were immersed in the scientific community of Woods Hole, experiencing talks and surrounded by interesting science.” WHOI

→ “I expected to do lab work and learn more about PhD students’ educational journeys, which were fulfilled. I hoped for project organization to have enough time and data to make a poster and presentation, but my work moved slowly for the first several weeks and most of it was jammed into the last 2-3 weeks and I understand that not every experiment will have significant results.” UCSC

Unexpected benefits included a **warm community** and **independence**.

→ “The summer was different than I expected because I had much more autonomy and latitude to learn at my own pace and because of that I feel I have gotten so much more out of it than I thought I would.” WHOI

→ “I was hoping to gain lab experience, a greater understanding of lab flow and what help in determining the type of work I wish to pursue. The program provided all of these things as well as a large amount of independence in conducting and developing our own experiments and work flow.” WHOI

→ “The biggest difference I was hoping for was to actually follow through with an experiment to completion. The summer program actually offered this tenfold. We completed more than a few experiments which were all challenging and required complete involvement.” USC

→ “I was hoping to gain lab experience from it. In terms of how it differed from what I expected, it was more welcoming than I expected.” USC

→ “I was hoping to gain some insight into the research field. The summer program was more supportive and welcoming than I had originally thought.” USC
STUDENT PERCEPTIONS OF PROGRAM STRENGTHS

Students derived a variety of benefits from the summer research program.

• For many students, the relationship with mentors was a program standout.
  
  → “Professional development seminars and working closely with a PhD mentor, learning about their story from high school to grad school.” UCSC
  
  → “In addition to the research experience, networking with many PhD and graduate students was the best part.” USC
  
  → “Connecting with my peers in the lab and working closely with Julie and Gretta.” WHOI
  
  → “Interacting with such a large concentration of career scientists who were all excited to share their knowledge and experience. Interacting with such a diverse group of dedicated researchers taught me much about the direction I wish to take my career, the type of work that is done, and the people involved.” WHOI
  
  → “The best parts of the summer program were all the people that I was able to meet and learn from. Almost every single person I met and talked to taught me something, whether it was a big or small concept, about science or even just about life. Being in such an intellectually stimulating environment and meeting such wonderfully enthusiastic people was really the best part of this program. The guidance and mentoring that I received during this program was really beyond anything I've ever experienced before, and the knowledge and experience that it helped cultivate within me is something I hope to carry and utilize throughout the rest of my life and academic/professional career.” WHOI
  
• For others (mostly students in USC's residential C4 program), making connections with colleagues was the main benefit.
  
  → “The best part was the overall exposure and the people. It feels like we took advantage of resources and fully immersed ourselves in an honest study of science. My cohort made this experience something I will definitely remember for the rest of my life as a positive experience.” USC
  
  → “The relationships that I had built between the advisors and other groups members. The meetings, workshops and trips allowed that to happen.” USC
  
  → “The best part of the program was the amazing people I met. Everyone was supportive and encouraging, and had unique perspective to learn from.” USC
  
  → “The best part of the program was meeting such great people, I’m sure I could have found work in a lab anywhere, although this was a unique experience and I lived it, but the new friends and mentors was what really set the experience apart and made it memorable.” USC
• For some students, the opportunity for **hands-on research experience** and learning was the most significant aspect of the course.

→ “The field work. It was exciting and well just fun. It also gave me an appreciation for what I was seeing in the lab.” UCSC
→ “Pfft, working in the lab of course! There are so many things I can't believe I did this summer. I extracted DNA from a 'bug' stolen from the bottom of the ocean sea floor off the coast of Japan! I learned not just to understand current articles from the literature our group was reviewing, but also how that literature fit into the Hydrogenovibrio characterization research in the Huber lab. Even just all the microscopy or GOsh just washing the dishes was so great. I guess I just really loved being in the lab, even if I was confused about what I was doing. I felt good even being confused.” WHOI

• Students felt the program gave them insight into **potential careers**, both the positive and negative aspects.

→ “Not only did I get experience in a lab environment but I also got to meet people and learn what day to day work in the field would entail. The career work seminars also gave me a lot to think about for my future.” UCSC
→ “I honestly felt like we were being as graduate students, which is a good thing. It gave me a real feeling for what type of stresses and tight deadlines one might feel in grad school and beyond.” USC
→ “The main benefit was figuring out that I really love lab work and experimentation, especially where we don't know the outcome. I can take what I got from this experience and help spread knowledge on why this research is so important while also being able to narrow down my field of study for the future because I know I'll be wanting to continue on this path.” USC
→ “It assured me that I can handle research and that I want to pursue it in the future at my university.” WHOI
→ “The program opened my eyes to research and grad school as options for my future, which I will continue to consider. However I did realize I don't enjoy them as much as I hoped I would.” USC
→ “I actually learned that I do not enjoy research or lab work.” UCSC

• Students’ **autonomy** was also a program strength.

→ “I think the best part was choosing my own question and having the outcome of the research depend on my work.” UCSC
→ “The best part of the summer program was getting to design my own experiment and just working with something with no known answer. I am saying this because it allows me to experience the independence and frustrations that go into research.” USC
STUDENT PERCEPTIONS OF PROGRAM WEAKNESSES

Students experienced some disappointments or frustrations during the summer program.

• Some of the USC students felt their science experience was not well-organized, or felt rushed.

  → “I feel like the different aspects of the program were not well coordinated, making us fall behind with lab work and struggle to catch up.” USC

  → “The worst part of the program was the confusion. At times it seemed that the people directing the program didn't have an open line of communication with one another. For instance, sometimes it seemed that some people were unaware of the meeting we were attending which could conflict with plans made in the laboratory.”

  → “The worst part of the summer program was the lack of lab resources. Sometimes we would be short on supplies which would make the hours we worked in the lab longer. I also didn't like how seminars and other meetings were crammed into critical sampling times.” USC

  → “It could be a little chaotic at times. The research part of the program could've communicated better with the non-research side. We would be sampling three times a day (slide prep, counting etc.) but also have homework needed for the other non research (bioinformatics, workshops, lab meeting powerpoints, etc.).” USC

  → “The program was not long enough. We didn't have enough time to complete some of our tasks.” USC

• Students in the non-residential (CC-RISE) programs were unhappy with their commute or housing.

  → “Commuting from Monterey.” UCSC

  → “Finding affordable housing accommodations (for the duration of the program) was a bit difficult.” UCSC

  → “My long commute in to work everyday. Traffic is not good in the summer.” WHOI
PROGRAM RATINGS: RESEARCH EXPERIENCE

<table>
<thead>
<tr>
<th></th>
<th>Mean (0-10)</th>
<th>% 8,9, or 10</th>
<th>USC</th>
<th>UCSC</th>
<th>WHOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mentoring from Supervisor</td>
<td>9.4</td>
<td>100%</td>
<td>9.3</td>
<td>9.3</td>
<td>10.0</td>
</tr>
<tr>
<td>Research Experience</td>
<td>9.1</td>
<td>87%</td>
<td>9.6</td>
<td>8.0*</td>
<td>9.3</td>
</tr>
<tr>
<td>Program Overall</td>
<td>9.0</td>
<td>100%</td>
<td>9.1</td>
<td>8.3</td>
<td>9.5</td>
</tr>
</tbody>
</table>

*UCSC rated their research experience significantly lower than did USC students, p<.05. There were no other significant differences among the locations on these ratings.

Students were quite satisfied with the main components of the summer research program.

- Students received helpful **mentoring** from their research supervisors (usually a professor, associate scientist, postdoc, or graduate student)—all rated the mentoring an "8" or higher, with 56% rating it a perfect “10.”

  → “My mentor was wonderful. She helped whenever we needed and explained things a thousand times if we needed it.” USC
  → “Rachel and Logan made it a priority to get me educated in not only what I was doing but gave me a background to continue with in my academic career.” UCSC
  → “Always available when needed, always happy to help, but always pushing you to find the answer and work towards finding things on your own.” WHOI

- Students appreciated the **research experience**, with most rating it an “8” or higher on a 10-point scale; 50% rated the research experience a perfect “10.”

  → “I enjoyed my research experience and the level of autonomy I was given to complete the work.” UCSC
  → “The actual focus on information gathered, studied and interpreted was immaculate. I learned so much applying real research into the lab.” USC
  → “Directed but with independent work flow and as much or little assistance as needed.” WHOI

- Students were very satisfied with the **program overall**, with all rating it an “8” or higher, and 38% rating it a perfect “10.”

  → “Definitely one of the best programs I could have ever taken part in. This experience was perfect for me and there really isn’t much to complain about. You guys are doing it right and I’m so happy with how this summer turned out.” USC
  → “I would do it again in a heartbeat. This was just an amazing program.” UCSC
  → “Hands down one of, if not the single most, influential, impactful and enjoyable experiences of my entire life thus far. Thank you!!!” WHOI
PROGRAM RATINGS: OTHER PROGRAM COMPONENTS

<table>
<thead>
<tr>
<th></th>
<th>Mean (0-10)</th>
<th>% 8,9, or 10</th>
<th>USC</th>
<th>UCSC</th>
<th>WHOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>End-of-Program Poster/Paper</td>
<td>8.9</td>
<td>70%</td>
<td>8.8</td>
<td>6.0†</td>
<td>8.9</td>
</tr>
<tr>
<td>End-of-Program Presentation Symposium</td>
<td>8.8</td>
<td>86%</td>
<td>8.5</td>
<td>8.8</td>
<td>10.0</td>
</tr>
<tr>
<td>Extracurricular Activities</td>
<td>8.8</td>
<td>88%</td>
<td>9.0</td>
<td>8.0</td>
<td>9.3</td>
</tr>
<tr>
<td>Seminar Series</td>
<td>8.4</td>
<td>81%</td>
<td>7.5*</td>
<td>9.0</td>
<td>9.8</td>
</tr>
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*USC students rated their seminar series significantly lower than did the students from other programs, p<.10. There were no other significant differences among the locations.
†Only one student rated UCSC’s poster/paper.

- The end-of-program **poster/paper** was a positive experience for most USC and WHOI students, although some USC students would have liked more time to prepare their poster. While some UCSC students worked on a poster, there was not time to complete it before the end of the program.

  → “The poster should have been due after the presentations, rather than so far in advance. Much information was changed and discovered after the posters had already been printed, so the information on them is not correct. Additionally, the fact that they were due so early and on a weekend gave us no time to consult mentors and revise them.” USC

  → “More time must be dedicated to directing students on what is expected. Again, aside from lack of proper equipment, quality control suffered tremendously.” USC

  → “This was my first science symposium, so I had a great time. I really liked learning about other people’s research and I loved how our research in the Huber lab excited others so much.” WHOI

  → “This was a really great learning experience, and I was glad to be able to participate and produce a poster that was representative of a large portion of the work that myself and my fellow interns were able to accomplish this summer.” WHOI

- The end-of-program **presentation symposium** was also a positive for most students, with most rating it an “8” or higher. USC students wished they had more notice and preparation time.

  → “I thoroughly enjoyed presenting my summer work and hearing about the work of other interns and volunteers.” UCSC

  → “This was very good practice for scientific communication.” UCSC

  → “I kinda wish there was more people but the structure was not boring. Everyone got to present a piece of the narrative of what we did and that was an awesome narrative that we organized.” USC

  → “The presentation topics were assigned very last minute, with less than a week to prepare before the symposium and before experimentation was actually finished.” USC
• Most students loved the **extracurricular field trips** the program organized. Almost all students rated it an “8” or higher, and 44% rated them a perfect “10.”

  → “We were able to tour some potential schools to transfer to which helped make decisions on where might be a good fit.” WHOI
  → “Every trip was very enjoyable. I especially liked kayaking.” UCSC
  → “I liked these a lot because without this program I probably would never have been able to visit any of the places we took little field trips to.” USC

• Just as with last year, the **seminar series** received mixed reviews; while all UCSC and WHOI students rated the seminar series an “8” or higher, the USC students were less pleased with their seminars, rating their seminar series significantly lower than did the other students. Some USC students found the seminars to be too advanced or irrelevant and the webinars were harder to connect with than in-person seminars.

  → “Most were awesome, some not my cup of tea, but mostly I found all the seminars poignant, thought provoking, insightful, a little scary, engaging, and inspiring.” WHOI
  → “The seminars were very informative and fitting for cc students.” UCSC
  → “Some of the seminars I didn’t care for because I felt like it was too advanced for me, especially the geology seminars. Another thing I don’t like about it is that it is during lunch or after lunch and I get sleepy or feel like I have lost my lunch (free time) time. But the ultimate thing I don't like about the seminar series is that it is a webinar. I don't feel a connection and even the information being conveyed to us properly unless it is face to face. USC
  → “The seminars were great don’t get me wrong. They gave us a lot of valuable information and exposed us to different areas of study we could potentially be interested in. It was mainly the video chats and how it must just be during the time they were being done because we are all tired and it was hard to focus, especially on presentations where we had no idea what they were talking about because we had no prior knowledge on their subjects of research. At some points we would have just preferred to continue with lab work instead of having to leave for an hour and come back. Maybe morning sessions would be better? To start the day with a seminar or maybe Friday after we get done with lab work? I know they are difficult to schedule in the first place so it will need some brainstorming. Overall the in person seminars, more about college stuff, was very worthwhile and I loved the under the microscope videos.” USC
  → “The seminars were good in theory but not in practice. Most days were webinars which were very difficult to pay attention to and enjoy, the only seminars that were actually helpful were when we physically had a person in the room. Most topics seemed irrelevant to our work and only took away
valuable time catching up in lab, which we had to make up by staying late. For the future it would be better for guest speakers to be physically present and to cover themes that were helpful for our academics or lab work, such as more background on the microbe, making a resume/CV, and more interactive activities.” USC
### PROGRAM RATINGS: ADMINISTRATION AND FACILITIES

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<thead>
<tr>
<th></th>
<th>Mean (0-10)</th>
<th>% 8,9, or 10</th>
<th>USC</th>
<th>UCSC</th>
<th>WHOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Coordinator</td>
<td>9.9</td>
<td>100%</td>
<td>9.9</td>
<td>9.8</td>
<td>10.0</td>
</tr>
<tr>
<td>Pre-program Information</td>
<td>8.4</td>
<td>68%</td>
<td>8.6</td>
<td>7.3</td>
<td>9.0</td>
</tr>
<tr>
<td>Lab Space/Equipment</td>
<td>8.2</td>
<td>81%</td>
<td>7.4</td>
<td>8.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Housing</td>
<td>6.3</td>
<td>25%</td>
<td>7.5</td>
<td>3.0</td>
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There were no statistically significant differences among the locations on these ratings.

- The individual program coordinators received high marks, with all students rating their **coordinator** an “8” or higher; most (87%) rated their program coordinator a perfect “10.”

  - “Dr. Schroeder couldn't have been more kind, helpful and just overall a perfect support system. She is a machine and worked so hard for all of us. Loved her.” USC
  - “Julie and Gretta were great at giving us a project that was manageable and complete-able in the 12 weeks.” WHOI
  - “Joe worked really hard to schedule among several different people (even coordinating carpools for field trips) and was very available to answer our questions, and was very willing to help me search for housing before the program started.” UCSC

- The **pre-program information** received largely positive ratings from students; scores for this item went up from last year for both USC (6.6 in 2017 vs. 8.6 this year) and WHOI (6.7 in 2017 vs. 9.0 this year). UCSC remained the same (7.3) and slightly lower than the other two locations. Students appreciated the amount of information and details they received. Just two (both at USC) said they would have liked a bit more interaction with their mentor before the start of the program.

  - “The timing of the information being sent was appropriate which didn't overwhelm us when we had to start the lab. As well as the easing into the research and what organism and problem we are tackling helped with simple articles being sent.” USC
  - Any more information before the program would have been overwhelming and confusing.” USC
  - “The information I received before the program began was perfectly sufficient.” WHOI
  - “I got all the basic information but a lot of specifics were not fully conveyed.” UCSC
The quality of lab space and equipment received high marks from many students, with most students giving a rating of “8” or higher. However, some USC students complained about the lack of microscopes.

→ “Brand new lab with excellent equipment.” WHOI
→ “The Log Marine was a wonderful location to perform my work.” UCSC
→ “The lab was great and for the most part well equipped and stocked. It could be challenging completing tasks when there was one station to more than four people but I don’t see how that could be helped.” USC
→ “Supplies became limited as experiments progressed despite being requested (filters, needles). The fact that there was only one microscope for all the experiments going on set us back with counting but I realize it is not anyone’s fault.” USC

Housing was provided only at USC—about half of USC students rated the housing an “8” or higher, although a few complained about the dorm conditions. The average rating from the USC students for housing was 7.5. A few UCSC and WHOI students found their commute or living expenses to be a challenge.

→ “The housing was great. Really close walking distance to everything we would need, as it was in the village. The beds were extremely noisy and kind of annoying but there isn’t really much to be done about that, that isn’t expected in other dorms.” USC
→ “There is a huge bug problem! Also, the rooms had carpeting and we were not allowed to rent vacuums from the front desk.” USC
→ “It was a place to eat, sleep, and keep my things. It was a bit cramped, but dorm living isn't a comfortable experience for everyone.” USC
→ “The program's support for housing costs was almost just breaking even and leaving no stipend I could save, and the search for housing prior to the internship was stressful.” UCSC
→ “I commute from home, because housing in Santa Cruz is so expensive. I didn’t feel the compensation covered housing.”
→ “I lived with my Grandmother in Falmouth for the summer.” WHOI
Students’ attitudes toward the program were very positive.

- All students would recommend the program (most of them, strongly) to other students.

- All students agreed (most of them, strongly) that the program was a worthwhile way to spend their summer.

- All but one of the students agreed (most of them, strongly) that the program would help their future career. Only one student was “neutral” on this item.

- Most students agreed that the program introduced them to new career options. Only one student was “neutral” on this item.
**RESEARCH-RELATED ACTIVITIES DURING THE PROGRAM**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Give an oral presentation</td>
<td>94%</td>
</tr>
<tr>
<td>Present a poster</td>
<td>81%</td>
</tr>
<tr>
<td>Write a final paper</td>
<td>56%</td>
</tr>
<tr>
<td>Write an abstract for a meeting</td>
<td>50%</td>
</tr>
<tr>
<td>Write a research proposal</td>
<td>19%</td>
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</table>

During the summer program, students participated in a variety of research-related activities. Note that all students did at least two of the above activities, and many (62%) did three or more.

- Almost all students gave an oral presentation, and all the USC and WHOI students presented a poster.
- All USC students and one WHOI student wrote a final paper.
- Half the students wrote an abstract for a meeting, including all the UCSC students.
- Three students (two from WHOI and one from USC) wrote a research proposal.

Students felt the research-related activities they performed were useful. Many felt they would use these skills in their future careers.

→ “Yes they helped me be able to effectively communicate what I learned during the course of the program.” UCSC
→ “All tasks were useful, especially the presentation and the poster. It was my first time giving a scientific talk and I feel more confident about the whole experience now.” USC
→ “They were critical exercises because I think there will be a lot of these types of exercises in the near future, especially for a career in science.” USC
→ “Yes, explaining your work always helps give a more cohesive understanding to both the audience and to the presenter.” WHOI

Some students across all three locations said they would have liked to write a research proposal.

→ “Writing a research proposal would have been helpful. Some summer research programs require a proposal.” USC
→ “Learning to write a research proposal would have been beneficial for future research opportunities.” UCSC
→ “Writing a research proposal would have been a valuable experience as securing funding for research is a crucial skill in any scientific career.” WHOI
### PROGRAM IMPACT ON INTEREST IN SCIENCE CAREER

<table>
<thead>
<tr>
<th>“How likely are you to pursue a career in science?”</th>
<th>Pretest</th>
<th>Posttest*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Probably</td>
<td>% Definitely</td>
</tr>
<tr>
<td>Definitely not</td>
<td>6%</td>
<td>94%</td>
</tr>
</tbody>
</table>

*At the posttest, two students were “not sure” if they will pursue a science career.

<table>
<thead>
<tr>
<th>If you are planning to pursue a career in science, which ONE of the following best describes your career goal?</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic/research science at a university</td>
<td>50%</td>
<td>38%</td>
</tr>
<tr>
<td>Biotechnology industry</td>
<td>19%</td>
<td>25%</td>
</tr>
<tr>
<td>Medical field</td>
<td>13%</td>
<td>13%</td>
</tr>
<tr>
<td>Teaching K-12</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Government/public policy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public health</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Science writing</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>19%</td>
<td>13%</td>
</tr>
</tbody>
</table>

See the Appendix for complete question wording and response distribution.

There is not a statistically significant difference between pretest and posttest questions.

- At the outset of the program, all students were planning to pursue a career in science. This did not change significantly after the students completed the program, but several students said the program cemented or focused their science career. For a few students, the program showed them that they don’t wish to pursue research.
  
  → “It has only made me more confident and reinforced my passion and love of science. I envy everyone who actually got to stay working and studying in those labs after the program was over.” USC
  
  → “It has opened up some career opportunities such as hazmat work and laboratory safety work. The program has solidified my educational goal in microbiology so I am working towards that right now.” USC
  
  → “This experience has made my idea of working in a lab and doing research more concrete. I want to learn more about everything “biology” and this program really fed that will to learn and pushed me to want to continue in this field.” USC
  
  → “This encouraged me to know that my goals are attainable, my goals differed from the research but this helped me understand skills that are needed.” WHOI
  
  → “It has me very confused honestly. I realized I don’t like research and would rather work with people. I am still interested in teaching and science but am also considering nursing.” UCSC
### IMPACT ON EDUCATIONAL GOALS AND CAREER CHOICE

<table>
<thead>
<tr>
<th>Which best describes your educational goal?</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor's in science</td>
<td>6%</td>
<td>13%</td>
</tr>
<tr>
<td>Master's in science</td>
<td>19%</td>
<td>19%</td>
</tr>
<tr>
<td>Ph.D. in science</td>
<td>38%</td>
<td>38%</td>
</tr>
<tr>
<td>M.D. or medical field</td>
<td>13%</td>
<td>19%</td>
</tr>
<tr>
<td>M.D./Ph.D.</td>
<td>19%</td>
<td>13%</td>
</tr>
<tr>
<td>Other*</td>
<td>6%</td>
<td>--</td>
</tr>
</tbody>
</table>

*"MPH and MD."

Although the program influenced or confirmed some participants’ career choices, their educational goals did not change appreciably from before they entered the program.

→ “It hasn't changed my career plans but it's motivated my undergraduate minor decision. I feel much more confident with this formal research experience, and I know it will help me get into a university lab when I transfer (which I was worried about due to transfer stigma and coming in with a two year disadvantage to other juniors).” UCSC

→ “My involvement in this program has strengthened my desire and ability to pursue a science education and career.” UCSC

→ “This experience absolutely supported my education and career development goals, although it did peak my interest in the field of Microbiology, and now I'm more interested in pursuing a career in that field.” WHOI
PROGRAM RATINGS: SENSE OF DIVERSITY/INCLUSION

<table>
<thead>
<tr>
<th>Sense of diversity/inclusion</th>
<th>Mean (0-10)</th>
<th>% 8.9, or 10</th>
<th>USC</th>
<th>UCSC</th>
<th>WHOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense of diversity/inclusion</td>
<td>9.5</td>
<td>100%</td>
<td>9.8</td>
<td>9.0</td>
<td>9.5</td>
</tr>
</tbody>
</table>

There was no statistically significant difference among the locations on this rating.

All of the students felt that the program provided a learning environment that was respectful of diversity and inclusion. In fact, 75% of students rated their program a perfect “10” on this measure.

→ “The seminars shed light on the issues with diversity in the science field, but also inspired us to push through these stereotypes and glass ceilings.” USC
→ “I felt that the program was very respectful of and engaged in promoting diversity and inclusion.” UCSC
→ “There was a lot of diversity that was apparent to me during my experience this summer, and I personally never felt excluded from a single aspect of anything, and never saw anyone else being excluded either. I think it was a warm and welcoming place to all. Everyone was united and brought together by the love of science and discovery, or at least that was my experience.” WHOI
→ “PI really supports women in scientific research, no discrimination/prejudice was felt at any time from anybody I encountered.” UCSC

Some students did not notice a difference in respect for diversity between this program and their home institution. However, there were quite a few students for whom this diverse summer experience was especially beneficial.

→ “I was exposed to and able to interact with people of differing viewpoints and backgrounds, much more so than what is offered at my home institution.” UCSC
→ “I felt I received a lot more guidance and help with C4/CC-RISE.” USC
→ “The summer C4/CC-Rise made me feel like I had somewhere that I actually belonged. My home institution can be cold and unwelcoming in some cases simply because there are people or situations which might make you feel unfamiliar or as if you may not belong.” USC
→ “I can’t see any obvious differences but with more female interns in this cohort, it seemed like we were able to speak up and show our curiosity/intelligence more, whereas at home in my science classes there would usually be the same four male students speaking out. But that might simply be a matter of statistics.” UCSC
→ “There are not a lot of minorities and women in my science classes. So it was refreshing to see a lot of post docs/graduate students working in the lab that are Latinos as well as women. It was inspiring to see and gave me a lot of hope.” USC
ADDITIONAL CONTENT STUDENTS WOULD HAVE LIKED IN THE COURSE

Students were asked if there was anything else they would have liked to learn as part of the summer program.

- Some students would have wanted to learn more **science-related skills**; a few requested specific topics as well.

  → “More biology based material, but that's a matter of lab placement and it was refreshing to learn about geochemistry.” UCSC

  → “I wish I had learned some geology and the water column to get a better context of the biogeological experiments we are conducting as well as learning how to make enrichments and isolating a microbe from the environment.” UCSC

  → “I wish that I had the opportunity to do more with GC or HPLC or PCR but those were not important to core research that needed to be done. What I did learn, though, was invaluable to my education.” USC

  → “More hands on training with SEM.” USC

  → “Research proposals and more about what goes into funding a project. Funding is very complex and a lot goes into it, so I do understand that it's a topic that can be glossed over when discussing it with undergrads.” USC

  → “Would have liked to learn more about the initiatives surrounding in situ cross contaminating.” WHOI

  → “How to create a CV.” USC

  → “I would suggest some demonstrations or exposure to other laboratory techniques and a well time managed bioinformatics session. This would be helpful in coming up with individual experiments in a timely manner.” USC
STUDENTS’ SUGGESTIONS FOR IMPROVING THE SUMMER PROGRAM

Several students had suggestions about program structure.

→ “Either remove the seminars or replace them with interactive workshops relevant to the research, transferring process, grad school, etc.” USC

→ “Communication between the research and non research teams. Bioinformatics and the lab team would have different ideas about individual projects. Sampling 3 times a day is chaotic and seminars/bioinformatics cuts into that so we often have to stay overtime in lab to gain back time on the microscope/slide prep station.” USC

→ “Quality control. Sufficient amount of equipment. Adequate organization and timing for efficient production. There was a constant feeling as though there was absolutely no room for error, which continuously drops morale and makes things feel unrealistic and pointless.” USC

→ “Perhaps integrating lab work and field work together a bit more, and allowing the opportunity for a bit more field work if interest is expressed.” WHOI

Some student suggestions would improve student interaction and communication within the program.

→ “I think working with a peer would have been helpful and more exciting. It would have been nice to talk with a peer about the research instead of just with your mentor.” UCSC

→ “Perhaps teamwork building seminars in the first week would be good. Maybe even something like the Myers Briggs personality typing would be helpful so students could understand the unique traits each person brings to the table and how everyone interprets situations differently.” USC

One student mentioned wanting more explanation of the science before they arrived.

→ “As for our work in the lab - I would love to have gotten a better understanding of the work that was done before we got there. I had a hard time really understanding what was going on with the meta-genomes and genomes and how the 16S gene allowed for us to carry out taxonomy/phylogeny of bacteria.” WHOI

UCSC students wanted more help with housing.

→ “Housing support in addition to the stipend.” UCSC

→ “I think providing on campus housing would be a nice addition.” UCSC

→ “I would suggest offering more aid (financial or otherwise) to students to mitigate the struggle of housing/transportation.” UCSC