AN EVALUATION OF THE
2016 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 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. CC-RISE was a paid non-residential internship at both the University of California, Santa Cruz (UCSC) and the Marine Biology Laboratory in Woods Hole, MA (MBL). Community College Cultivation Cohort (C4) was a residential paid internship at the University of Southern California (USC). For eight (CC-RISE) or nine (USC) weeks during the summer of 2016, 20 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 38 hours per week, ranging from 30 to 50 hours.

Methodology

A few weeks before program arrival, students completed an online survey (pretest), designed in conjunction with C-DEBI program staff; questionnaire completion took an average of 29 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 38 minutes. Questions included satisfaction with the course, course impact on career goals, and suggestions for course improvement.

Participant Demographics

All 20 participants completed both the pre- and posttest surveys, for a completion rate of 100%. Participant demographics were as follows:

<table>
<thead>
<tr>
<th>Gender</th>
<th>%</th>
<th>Ethnicity</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>45%</td>
<td>African American</td>
<td>2</td>
</tr>
<tr>
<td>Male</td>
<td>55%</td>
<td>Asian</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hispanic/Latino</td>
<td>7</td>
</tr>
<tr>
<td>Freshman</td>
<td>5%</td>
<td>White</td>
<td>6</td>
</tr>
<tr>
<td>Sophomore</td>
<td>85%</td>
<td>Other*</td>
<td>3</td>
</tr>
<tr>
<td>Junior</td>
<td>10%</td>
<td>(“Iranian,” “Bengali,” “multiracial”)</td>
<td></td>
</tr>
<tr>
<td>CC-RISE (UCSC)</td>
<td>8</td>
<td>1st generation college/low income</td>
<td>13</td>
</tr>
<tr>
<td>CC-RISE (MBL)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4 (USC)</td>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Most 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. Eleven were transferring this fall to a four-year college, and at least two others plan to transfer in
2017. Sixty percent had no previous lab experience and eighty percent had never presented their own research results.

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 may have been lightly edited for spelling and punctuation.
SUMMARY OF FINDINGS

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

1. Satisfaction with the summer program

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

- Students connected both with mentors and their classmates. Mentors were supportive, patient, role models, and their classmates provided a supportive cohort.

- Beyond the hands-on research experience, the programs’ field trips and related research activities enhanced the students’ enjoyment and learning. The presentation symposium/poster sessions were especially valuable.

Suggestions:

- Students would appreciate more pre-program information, both from the program itself and from their intended research lab, beyond an introductory email. Perhaps study materials could be provided ahead of time.

- Only one of the three locations provided housing, and the non-residential students felt the financial and geographic burdens of not living nearby/together. The program might work toward securing housing from the host institutions.

- The MBL location did not have all students do an oral presentation. Since this was such a positive experience for the other locations, the MBL cohort may want to institute this valuable activity.

- Also, MBL’s seminar series received low ratings. The program should strive to provide engaging and relevant seminars. One student suggested having all participants attend some morning lectures already programmed at MBL.
2. Impact on participants’ career goals

- Although most 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.

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. They program can continue to support alumni by having mentors stay in touch with their students, letters of support, and the like.

3. Inclusion and diversity

- Even though most students felt their home institutions have a commitment to diversity, participants noticed the program’s deliberate focus on diversity and inclusion.

Suggestions:

- The program should continue to address the needs of underrepresented students.
COMPARING THE GEM PROGRAM TO STUDENTS’ EXPECTATIONS

For most students, the summer program either met (20%) or exceeded (70%) the students’ expectations. Students expected to learn **hands-on laboratory skills**.

→ “I was hoping to attain experience doing graduate and post-graduate research. The program actually provided me with a higher level of research than what I was expecting.” USC

→ “I wanted to work in a lab and get real world experience of how it is to work in a scientific field.” UCSC

→ “This program exceeded my expectations, as I now have experience of culturing, extracting DNA, PCR, running a gel electrophoresis and more. This knowledge will help greatly in my future classes like cell biology and genomics.” MBL

Unexpected benefits included **making connections** and exploring **careers options**.

→ “I expected to just get research experience but I felt that I got a lot more out of it. I made connections through networking and learned a lot about how to prepare for the future in my career.” USC

→ “The relationships that I have formed have become very important to me. Many of the discussions that I have had with these people have shaped me as a person and a scientist and deepened my love for and interest in pursuing my goals and dreams.” MBL

→ “I was hoping to gain insight into the research process. I wasn't expecting to network as much as I did.” USC

→ “It exceeded my expectations since there were several opportunities for personal growth, like workshops, and also time to make new connections (meet a scientist, Peanut Butter Club at WHOI, etc.). Loved it!” MBL

→ “I was hoping to get insight to real lab/research work and guidance on my career path. I got exactly what I hoped for from the internship.” UCSC

However, two students (10%), both from UCSC, said the program **did not live up to their expectations**.

→ “I was hoping to get a STEM related research experience, but it ended up being focused on social science. I did not have many expectations, but had a positive overall experience.” UCSC

→ “I was hoping to be able to get more experience in the laboratory environment with utensils I was unfamiliar with.” UCSC
Students derived a variety of benefits from the summer research program.

• For some, the opportunity for **hands-on research experience** and learning was the most significant aspect of the course.

  → “Researching and classifying a novel organism. EPR-M is a new wonderful species that has not yet been classified.” USC
  → “Being involved in real research that will be published. It feels good to help contribute to something that can be read and referenced by other scientists in this field.” USC
  → “Working and learning with Greta! She’s a great teacher and I got a LOT of valuable info in such a short time. I feel really comfortable now to take science labs at my transfer institution.” MBL
  → “The best part was working with novel organisms.” MBL
  → “The weekly seminars, because they covered a wide scope of marine science research and being able to speak with professors after they spoke was very interesting.” UCSC

• For others, making **connections with colleagues and mentors** was the main benefit.

  → “The best part of the summer program was having the opportunity to engage with other scientists and other undergraduates. Firstly, these interactions have given me a better perspective on how to analyze or interpret other people’s results. Secondly, speaking with all of these people reinforces how I hope to develop as a scientist because all of them are wonderful role models.” MBL
  → “The best part was working so closely with my mentor. I enjoyed having someone there to guide me and to ask questions.” USC
  → “The best part was having a cohort group of peers to support one another throughout this journey. We had the chance to socialize and have fun when we went on field trips.” UCSC
  → “Getting along with everyone in the program. Being able to feel comfortable with my colleagues really helped me stay positive and motivated throughout the summer.” USC
  → “My coworkers (lab tech, grad student, and professor) because they made day-to-day work much more enjoyable than it should have been.” UCSC

• **Field trips** were also a program strength.

  → “Our day at Catalina was also really great.” USC
  → “Field trips, I liked going outside.” UCSC
  → I also enjoyed the day trips to some colleges (Bridgewater, UMass Dartmouth) and seeing others research experiences (Emily’s students on the Vineyard). I
think having educational field trips is something that should be continued and maybe even expanded upon! MBL

→ “The best part was all of the spectacular extracurricular activities we did outside of the lab. For example touring UMASS-Dartmouth and Bridgewater, going to Martha’s Vineyard, visiting the MRC, lunch, the Peanut Butter club and snorkeling at Stony Beach.” MBL

→ “The best part was snorkeling at Wrigley. The water was so clear that day.” USC
STUDENT PERCEPTIONS OF PROGRAM WEAKNESSES

Students experienced some disappointments or frustrations during the summer program.

• For many, their main frustration involved the science itself.

  → “I think the worst part was waiting so long in between my timepoints. My microbe did not have as much to do for it as far as timepoints go so there was a lot of waiting around.” USC
  → “Having to repeat experiments due to mistakes, variables, etc. It led to a lot of frustration, even though setbacks are to be expected.” USC
  → “Took a long time for me to get any positive results, but that's just science!” MBL

• For others, logistical details caused some annoyance.

  → “The worst part of the summer was not having continual access to the laboratory, or having to have a supervisor there in order to work in the laboratory.” USC
  → “The parking situation. I could've been compensated for Remote parking, but the level of inconvenience from having to wait for the bus and ride up campus was too much to deal with. Instead, I paid for parking every week, at 36 dollars per week.” UCSC
  → “Dropping off surveys and picking up less than 20% of what was dropped. I was not expecting this to be the daily activity.” UCSC
  → “Not being able to attend activities during the nighttime (since I was commuting from the Hyannis area). It ended up being too long of a day to stay until 8 or so and then drive home. That was the only con!” MBL

• A few students (UCSC) complained about communication within the program.

  → “I felt as though the communication wasn't always the best. Some of the important information was given a bit last minute.” UCSC
  → “I felt as though the people in charge of CC-RISE were not prepared (especially Esra). This was especially obvious in the beginning when the interns had to do online training and create a UCSC email account. They were not knowledgeable about the steps needed and often gave out misinformation. Esra had multiple instances of giving out misinformation by setting up one of our field trips on the day the establishment was closed, sending everyone broken links, telling people to contact sources unavailable to non-UCSC students, and, when corrected, would not notify all of the interns about her mistakes.” UCSC
  → “Mentor would occasionally take out her stress on me which was a little uncomfortable.” UCSC
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>MBL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Experience</td>
<td>9.1</td>
<td>90%</td>
<td>9.5</td>
<td>8.4</td>
<td>9.5</td>
</tr>
<tr>
<td>Mentoring from Supervisor</td>
<td>9.2</td>
<td>85%</td>
<td>9.3</td>
<td>8.6</td>
<td>10.0</td>
</tr>
<tr>
<td>Program Overall</td>
<td>9.1</td>
<td>85%</td>
<td>9.6</td>
<td>8.1*</td>
<td>10.0</td>
</tr>
</tbody>
</table>

UCSC students rated the overall program lower than did the students from the other locations, \( p < .05 \). There were no other significant differences among the locations.

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

- Students appreciated the research experience, with most rating it an “8” or higher on a 10-point scale. They learned new techniques and conducted hands-on research.

  → “I worked in a lab and gained experience both using equipment, and working with others.” UCSC
  → “I had full access to the laboratory and was able to behave independently as a researcher.” USC
  → “Culturing was a great learning experience and diluting enrichments then sequence extracted DNA was worthwhile and rewarding.” MBL
  → “I have learned and gained so much from this internship, so much that it boosted my self confidence quite a bit.” USC

- Students received helpful mentoring from their research supervisors (usually a professor, postdoc, or graduate student)—most rated the mentoring an “8” or higher.

  → “Knowledgeable, patient, and supportive!” USC
  → “He was very down to earth and straightforward. Always managed to explain things in simple terms.” UCSC
  → “Gretta is a phenomenal mentor/coordinator. A good listener and passionate teacher, she was instrumental toward making the intern’s goals attainable this summer.” MBL
  → “They had experience and personal stories that helped me.” UCSC

- Students were very satisfied with the program overall, with most rating it an “8” or higher, and more than half rating it a perfect “10.”

  → “This was my first REAL research experience. It was great and incredibly informative. I thank you for the opportunity.” USC
  → “I thoroughly enjoyed my time here. I learned a lot and gained valuable experience.” UCSC
  → “I LOVED being at the MBL for Summer ’16.” MBL
PROGRAM RATINGS: OTHER PROGRAM COMPONENTS

<table>
<thead>
<tr>
<th>Extracurricular Activities</th>
<th>Mean (0-10)</th>
<th>% 8,9, or 10</th>
<th>USC</th>
<th>UCSC</th>
<th>MBL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar Series</td>
<td>8.3</td>
<td>80%</td>
<td>9.1</td>
<td>8.1</td>
<td>6.8*</td>
</tr>
<tr>
<td>End-of-Program Poster/Paper</td>
<td>9.2</td>
<td>100%</td>
<td>9.4</td>
<td>8.5</td>
<td>--</td>
</tr>
<tr>
<td>End-of-Program Presentation</td>
<td>9.3</td>
<td>100%</td>
<td>9.6</td>
<td>8.5*</td>
<td>--</td>
</tr>
</tbody>
</table>

*MBL students rated their seminar series significantly lower than did the students from the other locations, p<.05. USCS’s symposium was rated significantly lower than USC’s. There were no other significant differences among the locations.

- Most students loved the **extracurricular field trips** the program organized. Almost all students rated it an “8” or higher.
  - “The JPL and Catalina Island trip were the best! Stephanie didn’t fail to inspire us about other opportunities out there. Always a learning experience!” USC
  - “Absolutely amazing from snorkeling on the beach to listening to free lectures the extracurricular activities surpassed expectations.” MBL
  - “It was unexpected, but it was really nice to be able to go on field trips.” UCSC

- The **seminar series** received mixed reviews; while most USC and UCSC students rated the seminar series an “8” or higher, the MBL students were less pleased with their seminars, and MBL students rated their seminar series significantly lower than did the USC or UCSC students.
  - “It was a good break from working in the lab and gave me a chance to socialize with the other interns. Also, I enjoyed learning about interesting research by the very people conducting it.” UCSC
  - “The professional development portion of the program was a way for us to get out of lab and improve our soft skills. I learned a lot from these sessions and can’t thank Stephanie enough for such an awesome combination of topics and speakers.” USC
  - “The seminars were interesting. Some of the seminars were quite out of my range of knowledge, but still engaging to learn something new.” UCSC
  - “Some were very interesting, others were hit and miss.” MBL
  - “The SUCCESS workshop series was not as well put together and engaging this summer as the one given last summer, mostly due to the little time that the organizers had to prepare it. I hope that next summer, they will feel more comfortable moving away from over-detailed Powerpoints and moving toward more personal conversations about life as a scientists with several panelists of various backgrounds.” MBL
The **end-of-program** symposium and paper/poster sessions were both positive experiences for the students. Note that some of the students completed the survey before these events, so they did not rate or comment.

→ “I loved designing my poster, and the paper makes perfect sense (summing up our research).” USC

→ “Great practice and experience. There was no pressure to be perfect.” USC
PROGRAM RATINGS: ADMINISTRATION AND FACILITIES

<table>
<thead>
<tr>
<th></th>
<th>Mean (0-10)</th>
<th>% 8,9, or 10</th>
<th>USC</th>
<th>UCSC</th>
<th>MBL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Coordinator</td>
<td>9.4</td>
<td>95%</td>
<td>9.6</td>
<td>8.9</td>
<td>9.8</td>
</tr>
<tr>
<td>Lab Space/Equipment</td>
<td>8.4</td>
<td>74%</td>
<td>8.6</td>
<td>7.6</td>
<td>9.3</td>
</tr>
<tr>
<td>Housing</td>
<td>7.3</td>
<td>63%</td>
<td>8.0</td>
<td>5.3</td>
<td>--</td>
</tr>
<tr>
<td>Pre-program Information</td>
<td>6.8</td>
<td>30%</td>
<td>7.0</td>
<td>6.1</td>
<td>7.5</td>
</tr>
</tbody>
</table>

There were no statistically significant differences among the locations on administration and facilities ratings.

- The individual program coordinators received high marks, with almost all students rating their **coordinator** an “8” or higher. There was one complaint about Esra at UCSC.
  
  → “Stephanie was patient, enthusiastic and supportive regardless of what was asked for, she got it done!” USC
  
  → “I appreciated how Gretta had a detailed plan for each of our experiments. She was always prepared well in advance and had a back-up plan if something were to go wrong. Her attitude, as mentioned before, was really great about both work topics but also extracurricular activities.” MBL
  
  → “They did a great job. The communication could have been better, but other than that it was well run.” UCSC
  
  → “Kim was great but Esra was unhelpful.” UCSC

- The **quality of lab space and equipment** received high marks from many students. However, a few had complaints, especially at UCSC.
  
  → “Lab space was capacious, sometimes the anaerobic chamber had issues, but the equipment did the jobs well.” MBL
  
  → “Everything worked, though the microscope had a few issues.” USC
  
  → “I had a reasonable amount of space to work in. The micromill I was using gave me trouble frequently, but the issues were easily solvable.” UCSC
  
  → “A good majority of my time was spent in an office. While I enjoyed myself when I was in the lab, my time in there was brief.” UCSC
  
  → “Labs were not as sterile as they could have been and some equipment was rusty and old.” UCSC

- **Housing** was provided only at USC—three-fourths of USC students rated the housing an "8" or higher, with an average score of 8.0, although several complained about street noise. A few UCSC and MBL students rated their lack of housing low, which brought the group average score down to 7.3.
  
  → “Housing was great. Everything was taken care of from kitchenware to linen. We had no problems, and the manager was always nice and helpful when we had questions.” USC
“VERY noisy street, and a lamp directly outside my window + broken blinds, but other than that the housing was much better than I expected!” USC

“Apartments were nice but living right next to the street and having a firehouse nearby made it hard to sleep sometimes.” USC

“I spent almost my entire stipend on the expensive housing for 2 months.” UCSC

“I feel that it would be a benefit for future community college students participating in this program to have the option of living in Woods Hole for the summer because it would be easier for them to participate in many of the amazing opportunities that are available for undergraduates in the later hours of the day and on the weekends, but, more importantly, because it would more fully integrate them into the undergraduate population in Woods Hole.” MBL

The pre-program information received mixed reviews from students. Even Students wanted more specificity about what they would be doing. Even before the program began, one-third of students said they would have liked more interaction with their partner/mentor before the start of the summer, especially something beyond an introductory email.

“There was great background information given, but it would’ve been nice to know more specifics about the research before the program started.” USC

“There was a great amount of misinformation given in preparation to the summer.” UCSC

“I wasn't sure what to tell anyone that I was doing until the internship actually began.” MBL
**ATTITUDES TOWARD THE PROGRAM**

<table>
<thead>
<tr>
<th></th>
<th>Mean (1-5)</th>
<th>% Agree</th>
<th>% Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help with my career</td>
<td>4.9</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>Worthwhile way to spend summer</td>
<td>4.8</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>Would recommend to others</td>
<td>4.8</td>
<td>15%</td>
<td>80%</td>
</tr>
<tr>
<td>Introduced me to new career options</td>
<td>4.6</td>
<td>30%</td>
<td>65%</td>
</tr>
</tbody>
</table>

Students' attitudes toward the program were very positive.

- All students agreed (most of them, strongly) that the program would help their future career.
- All students agreed (most of them, strongly) that the program was a worthwhile way to spend their summer.
- Most students would recommend the program (most of them, strongly) to other students at their university. 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.
Students were asked to describe their understanding of their summer research project, both before and after the program. All indications for location and whether the answer was given before or after the program were removed; their answers were then coded in the categories above by the program coordinator.

As expected, students’ level of understanding was much greater after having spent eight or nine weeks on the project.

- Almost all students (89%) were able to provide detailed content about their research project at the end of the summer, compared to only 20% before the program began.

- Students also showed a greater understanding of their research responsibilities at the end of the summer—61% were able to discuss them in-depth, while none could do so at the beginning of the summer.

- At the end of the summer, many students (67% of those in C-DEBI labs) could see how their project fit with the larger C-DEBI research goals, whereas only 13% understood this at the beginning of the summer.
# UNDERSTANDING OF THE ROLE OF P.I.

<table>
<thead>
<tr>
<th></th>
<th>% Pretest</th>
<th>% Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guides research/mentors</td>
<td>60%</td>
<td>75%</td>
</tr>
<tr>
<td>Manages undergrads, grads, postdocs, technicians</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>Head of the lab</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>Does research</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Professor/faculty</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>Teaches</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Writes grants</td>
<td>--</td>
<td>15%</td>
</tr>
<tr>
<td>Writes papers</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Committee/administrative duties</td>
<td>--</td>
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</tbody>
</table>

Both before and after the program, students were asked to describe their understanding of the role of the P.I. in the lab. Their responses were coded using the above categories by the evaluator.

These students have a basic understanding of the role of the P.I. in the lab, and spending time in a lab over the summer only slightly added to this understanding.

- Many students know that the P.I. **guides the lab research**, helping to address questions and guide students along the way.
  - “To oversee our work and give us direction.” (Pre)
  - “I am under the impression that a P.I. watches over a lab and has their own project. They can offer assistance or guidance to others in the lab.” (Pre)
  - “To oversee the laboratory. They over see the research that is being conducted and make sure the laboratory is correctly.” (Post)
  - “To supervise and advise research.” (Post)

- Some students also know that the P.I. is the **manager** for the other lab members.
  - “Utilizing people to the best of their abilities and guiding people with disparate backgrounds and academic goals.” (Pre)
  - “The role of PI is someone who oversees and maintains order of his/her students progress in their studies.” (Post)

- Just a few students mentioned that the P.I. is the **head of the lab**, does their **own research**, is a **professor**, or **teaches**.
Before coming to the program, no student mentioned that the P.I. applies for grant money to run the lab. After the program, three students mentioned this as one of the roles of the P.I.

→ “Apply for grants and give guidance to people researching under him/her. (Post)”
→ “The PI is the "overseer," the one who is providing the time and money for us to be here.” (Post)

Both before and after the program, no student mentioned that professors write papers or have any committee or university administrative responsibilities.
During the summer program, students participated in a variety of research-related activities. Note that all students did at least one of the above activities, and three-quarters did two or more.

- All students at USC and UCSC gave an oral presentation, but just one MBL student did.
- More than half the students wrote a final paper—all the USC students did, but just a few from UCSC or MBL did.
- About half the students from each location wrote an abstract for a meeting.
- All the students at USC presented a poster; the other two locations did not have a poster session.
- One student each from UCSC and MBL wrote a research proposal.

Students felt the research activities they performed were useful.

→ “Giving a presentation gives me experience in public speaking.” UCSC
→ “They have taught me how to better present my scientific data in an acceptable manner. The seminar on presentation giving was really helpful.” UCSC
→ “They were all very useful. Especially the poster & presentation from which I've learned so much—and have even begun to develop my own aesthetic for each.” USC

While some students said that they would not want to do any additional research activities like these, others would have wanted to write a research proposal. Some MBL students would have wanted some presentation experience.

→ “Writing a research proposal would have been useful since research at my current university requires writing a research proposal.” USC
→ “Presenting a poster would have been helpful in order to have further guidance for when it comes time to present a poster at the AGU conference. Writing a research proposal would have been really helpful, so that I have that skill when it comes time from me to do a real one.” UCSC
→ “Present a poster/give an oral presentation. I wish we did this because a practiced public speaker is highly-sought after and indispensable in the scientific community.” MBL
→ “I would have liked to work with my group to present a poster or something.” MBL
### PROGRAM IMPACT ON INTEREST IN SCIENCE CAREER

<table>
<thead>
<tr>
<th></th>
<th>Pretest % Agree</th>
<th>Pretest % Strongly Agree</th>
<th>Posttest % Agree</th>
<th>Posttest % Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I see myself pursuing a career in science/research</td>
<td>25%</td>
<td>70%</td>
<td>30%</td>
<td>65%</td>
</tr>
<tr>
<td>I see myself pursuing a career outside the sciences</td>
<td>--</td>
<td>--</td>
<td>10%</td>
<td>--</td>
</tr>
<tr>
<td>I am still undecided about my future career and currently exploring different alternatives</td>
<td>20%</td>
<td>10%</td>
<td>25%</td>
<td>10%</td>
</tr>
</tbody>
</table>

See the Appendix for complete question wording and response distribution. There are no statistically significant differences between pretest and posttest questions.

- At the outset of the program, almost all students were interested (70%, strongly interested) in a career in science. This did not change significantly after the students completed the program.

- Even though, after the program, a few students agreed that they might pursue a career outside the sciences, this was not a statistically significant shift from before the program began.

- The percentage of students undecided about their career did not change significantly from before to after the program.

- See the next page for data on the type of science career/education students intend to pursue.
## IMPACT ON EDUCATIONAL GOALS AND CAREER CHOICE

<table>
<thead>
<tr>
<th>Before the program, what was your academic degree goal?</th>
<th>Before program</th>
<th>After program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor’s in science</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Master’s in science</td>
<td>15%</td>
<td>25%</td>
</tr>
<tr>
<td>Ph.D. in science</td>
<td>35%</td>
<td>40%</td>
</tr>
<tr>
<td>M.D.</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>M.D./Ph.D.</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Other*</td>
<td>5%</td>
<td></td>
</tr>
</tbody>
</table>

*"M.S or Ph.D."*

Participating in the summer program encouraged students to continue their education in science beyond a bachelor’s degree. Before the program began, two in ten students intended to end their education with a Bachelor's degree. Now, all participants intend to pursue an advanced degree in science.

→ “My research experience has made me more interested in doing research and pursuing further education.” USC

→ “Before this summer, I had almost given up on my hope of becoming an astrobiologist and studying the origin and early development of life on Earth. I had heard of astrobiologists that were geologists, chemists, astronomers, but not biologists, or even microbiologists. But this summer, I had the pleasure of meeting an astrobiologist that studies microbial life, who, early in the summer, began filling my mind with wild ideas of how a biologist (or, microbiologist) could approach the origin of life question. Now, I am quite sure that my career interests are in this area of study…” MBL

→ “I just thought I would get my Bachelor's and then find a job. Now I am debating on if I should get my Master's or a PhD.” USC

→ “It has motivated me. I feel that there isn't much motivating me at my CC, so this was well needed.” USC

→ “It helped reinforce my career choice after learning more about the graduate school route.” UCSC

Two students said that the program convinced them they did not want to pursue research.

→ “It has supported my goals and plans. While I enjoyed working here, I can tell that research is not the ideal career path for me..” UCSC

→ “It has diverted my career plan by learning that research is probably not something I would love to pursue.” UCSC
### SENSE OF DIVERSITY/INCLUSION

<table>
<thead>
<tr>
<th>Responses range from Strongly Disagree (1) to Strongly Agree (5)</th>
<th>At my home institution… (pretest)</th>
<th>In the C4/CC-RISE program… (posttest)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (1-5)</td>
<td>% 4 or 5</td>
</tr>
<tr>
<td>...others believe in my potential to succeed.</td>
<td>4.8</td>
<td>100%</td>
</tr>
<tr>
<td>...my contributions are valued.</td>
<td>4.6</td>
<td>100%</td>
</tr>
<tr>
<td>...I am encouraged to participate in discussions and ask questions.</td>
<td>4.5</td>
<td>89%</td>
</tr>
<tr>
<td>...I feel a sense of belonging.</td>
<td>4.5</td>
<td>90%</td>
</tr>
<tr>
<td>...I can speak openly about diversity issues.</td>
<td>4.4</td>
<td>89%</td>
</tr>
<tr>
<td>...people are willing to talk about equity, injustice, and group differences.</td>
<td>4.4</td>
<td>95%</td>
</tr>
<tr>
<td>...there is an appreciation of cultural differences.</td>
<td>4.3</td>
<td>85%</td>
</tr>
<tr>
<td>...I have to work hard to be perceived as a good student.*</td>
<td>4.3</td>
<td>79%</td>
</tr>
<tr>
<td>...all students are treated as capable learners.</td>
<td>4.3</td>
<td>94%</td>
</tr>
<tr>
<td>...there is a commitment to diversity.*</td>
<td>4.2</td>
<td>80%</td>
</tr>
<tr>
<td>...the instructors are sensitive to the ability levels of all students.</td>
<td>4.2</td>
<td>80%</td>
</tr>
<tr>
<td>...I am often asked to speak on behalf of members of my social identity.</td>
<td>2.9</td>
<td>26%</td>
</tr>
<tr>
<td>...I feel silenced or invisible.</td>
<td>1.4</td>
<td>--</td>
</tr>
</tbody>
</table>

See the Appendix for complete question wording and response distribution.

*Home institution vs. summer program comparison significant at p<.05.

Almost all these students feel that their home institutions have a commitment to diversity.

The summer program gets slightly higher marks for diversity and inclusion than do the students’ home institutions. These differences are statistically significant for having “a commitment to diversity” and having to “work hard to be perceived as a good student.”

Many students felt their home community colleges have the same focus on diversity and inclusion as the summer program:

- “My home institution has a great amount of cultural diversity, so it was very similar to C4 in that respect.” USC
- “Honestly, I didn’t notice a lot of differences. My community college is very progressive and inclusive.” USC
- “Both my home college and CC RISE highly value diversity and inclusion.” UCSC
- “Equally as diverse.” MBL
- “I feel as though there is not much difference in terms of inclusion and diversity. Both encourage and empower people from all background to succeed, especially in a science background.” UCSC
Some students said the summer program was more inclusive or diverse than their home institution:

→ “Definitely felt the politically correct atmosphere of a UC institution.” UCSC
→ “There are diversity programs at 4Cs which is great, but I felt a stronger sense of belonging at the MBL than at 4Cs.” MBL
→ “It was much more diverse. I got to learn all about different cultures and ways of life.” USC
→ “The CC-RISE program was more diverse compared to my mostly-Hispanic college.” UCSC

One student felt the summer program was less inclusive than their home institution:

→ “The CC-RISE program chose diverse program this summer, we all acknowledged we came from different backgrounds. Compared to my home institution, I thought it was not as inclusive as I hoped it would be.” UCSC
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 requested more information about specific topics within the field, especially virology and how what they were learning affects people.

  → “I wish I could have learned more about metagenomics.” USC
  → “Plants.” UCSC

• Others would have wanted to learn more science-related skills.

  → “More about the isolation process and more about field work.” USC
  → “I wish I would have learned the whole process of conducting research from start to finish. It would have been helpful when it comes time to do it on my own.” UCSC
  → “A wider scope of the research process, such as data analysis, because we only got to the data collection stage.” UCSC

• A few students from USC said there was nothing else they would have liked to learn, or that there would not have been time to include anything else.

  → “Nothing! It was seriously a wonderful experience.” USC
  → “Although I would have liked to learn more lab skills, doing so wouldn't allow us the time to optimize our technique.” USC
  → “I do not think that there was any room to learn anything else in a meaningful way.” USC
STUDENTS’ SUGGESTIONS FOR IMPROVING THE SUMMER PROGRAM

Several students mentioned wanting more explanation of the program before they arrived.

→ “The information provided prior to the program didn't feel exactly substantial, in turn creating a sense of anxiety. The parking information was pretty unclear, leaving some students unsure if they will be reimbursed for their parking passes.” UCSC
→ “Have plans laid out for the entire internship rather than on the fly.” UCSC
→ “Providing information or study materials, papers prior to the start of the program would have given me the ability to start off running, rather than crawling.” USC

Others had suggestions about program logistics.

→ “More access to the laboratory would be nice. I am talking about after hour access.” USC
→ “I would suggest that each student work on something different. It made the presentations a little more challenging when the project was so similar.” USC
→ “Larger stipend so that if we worked 40 hours/week we would be paid at least minimum wage.” UCSC
→ “Perhaps one or two more day-events like the JPL Tour or Microbe Movie could be an asset for future students.” USC

One MBL student suggested having the students attend campus lectures.

→ “A valuable addition would be setting aside time and making the students attend some of the lectures in the Lillie auditorium before 9 am on most week days. These talks (however unrelated to our research) are very informative and eye-opening.” MBL

Several said they had no suggestions for improving the program.

→ “I think the program overall is great.” UCSC
→ “I honestly don't have any. Everything was so awesome! Couldn't have been better.” USC
→ “I'm not sure how you could improve the program without compromising other parts (like by extending the time). I absolutely RAVE about my internship all of the time so I was extremely satisfied with the program as a whole.” MBL
→ Program seems great as is.” UCSC