AN EVALUATION OF THE
2019 COMMUNITY COLLEGE OUTREACH PROGRAM (CC-RISE)

Executive Summary

Prepared for:
Center for Dark Energy Biosphere Investigations (C-DEBI)

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September 2019
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 2019, four community college students conducted hands-on research under the supervision of a mentor, attended seminars, and participated in field trips and social activities at the Woods Hole Oceanographic Institution in Woods Hole, MA (WHOI)—in this last year of the program, there were no participants at UC Santa Cruz or at USC. Students worked an average of 36 hours per week.

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 14 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 47 minutes. Questions included satisfaction with the course, course impact on career goals, and suggestions for course improvement.

Participant Demographics

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

<table>
<thead>
<tr>
<th>Gender</th>
<th>Hispanic/Latino</th>
<th>White</th>
<th>1st generation college and/or low income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>2</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Male</td>
<td>2</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Sophomore</td>
<td>3</td>
<td>1</td>
<td>--</td>
</tr>
<tr>
<td>Junior</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>(Year just completed)</td>
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Three of the students had already declared an undergraduate major in the biological or environmental sciences; the fourth student is liberal arts major. Half had already had a “little bit” of lab experience and had presented their own research results, and the other half had no previous lab experience. At the outset of the program, all intended to pursue a career in science (including the medical field).

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 lightly edited for spelling and punctuation.
SUMMARY OF FINDINGS

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

1. Satisfaction with the summer program

- Students were enthusiastically positive about the “life-changing” program that was the “greatest summer of my life.”

- 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.

- Students benefitted from the hands-on research opportunities that they could not get elsewhere. The skills they learned will help with their future careers.

Suggestions:

- If there is time to add to the program, students would like to learn how to write a research proposal.

2. Impact on participants’ career goals

- The program showed students what a career in research science could be and boosted their confidence. For at least one student, it deepened their interest in marine microbiology.

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. Half the students felt that CC-RISE was more inclusive than their home institution.
COMPARING THE SUMMER PROGRAM TO STUDENTS’ EXPECTATIONS

For all students, the summer program exceeded their expectations. Students expected to learn hands-on laboratory skills, and they were pleasantly surprised at how much fun they had, or at the connections they made with colleagues.

→ “I went into this program expecting to acquire general lab experience and help finding a school, but did not expect to find such an encouraging environment with such a wealth of information. I learned how to network, which I think was most important.”

→ “When I first signed up for the summer program I was hoping to get some lab work experience out of it. The program did offer me that but way more. I got to understand how a science research group and how a science institution works. I got to meet people from the most diverse areas of study and all that just made me feel confident and ready to go back to school and finish my bachelors degree.”

→ “Just some experience in the field of science. The summer program was much more hands-on than expected, far more fun as well.”

→ “I wanted to be challenged, and have new experiences in the lab and doing research, all while being as helpful as possible to everyone in lab. The summer program really didn't differ much at all from what I had expected, it did go by outrageously fast though.”
STUDENT PERCEPTIONS OF PROGRAM STRENGTHS

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

• For many students, the relationship with colleagues and mentors was a program standout.

  → “The people. Everyone was so welcoming and helpful. I was surprised by how much independent work we received in the lab.”

  → “The best part was talking to everyone and learning what other students were researching/what was possible to research, as well as how to find research and internship opportunities and what to look for in a school because it will help me plan/find my future.”

  → “The best part of the summer program was being around so many people who love science, technology, engineering, math and the ocean + planet as a whole. Being in an atmosphere such as this doing research, and feeling like a part of a community, is an extreme joy.”

• For one student, seeing the breadth of science was the best part.

  → “The best part of my summer was the opportunity to be exposed to so many different areas of science. It made me realize that everything is connected and how cool science is.”
STUDENT PERCEPTIONS OF PROGRAM WEAKNESSES

Students experienced some disappointments or frustrations during the summer program, often involving program logistics.

→ “I wouldn't say it was the worst part but it was the most annoying part which was having to find housing. I came from out of the Cape and I wish the internship had housing so it could give more opportunity for students that live far away.”

→ “The food. I like a good salad bar.”

→ “The worst part of the program was learning how to use the microscopes. It was stressful, handling such expensive equipment, and very disorienting at first.”

→ “I don't think there was a worst part of the summer program, except perhaps when it ended.”
PROGRAM RATINGS: RESEARCH EXPERIENCE

<table>
<thead>
<tr>
<th></th>
<th>Mean (0-10)</th>
<th>% 8,9, or 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mentoring from Supervisor</td>
<td>10.0</td>
<td>100%</td>
</tr>
<tr>
<td>Research Experience</td>
<td>9.8</td>
<td>100%</td>
</tr>
<tr>
<td>Program Overall</td>
<td>9.8</td>
<td>100%</td>
</tr>
</tbody>
</table>

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

- Students received helpful mentoring from their research supervisors (a professor for three students and a postdoc for one student)—all rated the mentoring an a perfect “10.”
  - “So helpful, patient, forthcoming and amazing.”
  - “The mentoring that I received was amazing.”

- Students appreciated the research experience, with all rating it an “8” or higher on a 10-point scale; 75% rated the research experience a perfect “10.”
  - “The research was challenging, interesting and rewarding.”
  - “The research experience was great - I felt like I was doing something worthwhile and something I may legitimately need to do for a future job.”
  - “Ran independent experiments allowing us as individuals to make mistakes but also feel far more connected to our work.”

- Students were enthusiastically positive about the program overall, with all rating it an “8” or higher, and 75% rating it a perfect “10.”
  - “The greatest summer of my life so far. Will be forever thankful for the experience.”
  - “This program was the best opportunity I’ve had in my entire life. Everyone was great, the lab experience was great, and the opportunities to learn were great - I just wish we were studying more things than microbes (but it is all expected in the Huber lab, of course).”
  - “The program overall has changed my life. Words cannot really describe all that it has done for me. I am truly grateful to have participated, and for all the opportunities and experiences that it has afforded me.”
PROGRAM RATINGS: OTHER PROGRAM COMPONENTS

<table>
<thead>
<tr>
<th></th>
<th>Mean (0-10)</th>
<th>% 8,9, or 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extracurricular Activities</td>
<td>9.5</td>
<td>100%</td>
</tr>
<tr>
<td>End-of-Program Poster Session</td>
<td>9.0</td>
<td>75%</td>
</tr>
<tr>
<td>Seminar Series</td>
<td>8.0</td>
<td>75%</td>
</tr>
</tbody>
</table>

- Students enjoyed the **extracurricular field trips** the program organized. All students rated them an “8” or higher.
  
  → “I found the extracurricular activities to be both enjoyable and beneficial.”
  → “I did not attend many of the extracurricular activities, but the ones that I did had a very good community-feel to them.”

- The end-of-program **poster session** was a positive experience for most students; three-quarters rated it an “8” or higher.
  
  → “It was a challenging and rewarding experience to make a poster this summer. The experience that I've gained by doing so will certainly help with future research experiences and academic pursuits.”
  → “So much fun, more coffee next time... maybe.”
  → “It was a good experience and will be beneficial for when I'll need to make posters in the future, but pushed me out of my comfort zone.”

- The **seminars** received mixed reviews; while most students (75%) rated them an “8” or higher, some students felt that their interest levels varied among the different topics.
  
  → “Most the seminars that I attended were really great, a few were less specific towards my interests and therefore somewhat less beneficial.”
  → “Some of the seminars weren't very engaging, one, in particular, it was very clear that they didn't take it very seriously and the presentation was poor, slow and not well thought out. Overall good.”
  → “The seminars were interesting, but I did not find anything that related to my specific interests, and a few of them were a little beyond my knowledge.”
PROGRAM RATINGS: ADMINISTRATION AND FACILITIES

<table>
<thead>
<tr>
<th></th>
<th>Mean (0-10)</th>
<th>% 8,9, or 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Coordinator</td>
<td>10.0</td>
<td>100%</td>
</tr>
<tr>
<td>Lab Space/Equipment</td>
<td>9.5</td>
<td>100%</td>
</tr>
<tr>
<td>Pre-program Information</td>
<td>9.3</td>
<td>75%</td>
</tr>
</tbody>
</table>

- The program coordinator received very high marks, with all students rating the **coordinator** a perfect “10.”
  - “Everyone did a fantastic job making this program worthwhile for interns.”
  - “The program coordinator was amazing. She is an amazing mentor, teacher and scientist. I am so grateful to have participated in this program.”

- The **quality of lab space and equipment** received high marks from the students, with all students giving a rating of “8” or higher.
  - “The lab space was awesome. The lab was a great environment, with lots of natural light, and really awesome equipment. I really enjoyed being in the lab.”
  - “It seemed fine to me, but I have never worked in a lab before and so have nothing to base my experience on.”
  - “We had our own corner in the lab to work.”

- The **pre-program information** received positive ratings from students; three-quarters rated it a perfect “10.” All students were satisfied with the amount of contact they had with their mentor before the program began.
  - “The information that I received before the program began was perfect, I pretty much knew what to expect.”
  - “I attended the talk about the internship at 4C’s and was personally communicating with people who had previously done the internship or work at WHOI and are part of the internship program.”
  - “We received a decent amount of information, but I was only able to grasp the meaning of all of the information once I began working at the program.”
ATTITUDES TOWARD THE PROGRAM

<table>
<thead>
<tr>
<th></th>
<th>Mean (1-5)</th>
<th>% Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would recommend to others</td>
<td>5.0</td>
<td>100%</td>
</tr>
<tr>
<td>Worthwhile way to spend summer</td>
<td>5.0</td>
<td>100%</td>
</tr>
<tr>
<td>Help with my career</td>
<td>5.0</td>
<td>100%</td>
</tr>
<tr>
<td>Introduced me to new career options</td>
<td>5.0</td>
<td>100%</td>
</tr>
</tbody>
</table>

Students’ attitudes toward the program were extremely positive.

- All students would **recommend the program** (all of them, strongly) to other students.
- All students agreed (all of them, strongly) that the program was a **worthwhile** way to spend their summer.
- All students agreed (all of them, strongly) that the program would **help their future career**.
- All students strongly agreed that the program introduced them to new **career options**.
During the summer program, students participated in different research-related activities.

- All students at WHOI presented a poster.
- One student also gave an oral presentation.
- Final papers, writing an abstract, and writing a research proposal were not part of the CC-RISE program at WHOI.

Students felt the research-related activities they performed were useful and enabled them to practice skills that can help them later.

- “Yes, anything engaging that also helps reiterate what your doing helps anyone feel more comfortable and confident with their ability to perform well.”
- “Yes, definitely! Making posters is a skill future scientists are going to need to have, and this was an opportunity to learn to make a good poster early in my career.”
- “Yes it was a useful exercise. It was challenging and rewarding.”
- “The poster presentations were a great way to learn how to present your work to other scientists.”

Some students felt that some of the other research-related activities would have been useful, especially writing a research proposal or a final paper.

- “I would like to have written a research proposal, because I believe that would be very useful in my scientific career.”
- “I think writing a paper would also have been useful, since we will also need that skill in the future. I have opportunities to give oral presentations in my classes at school, but I do not have legitimate experience writing a final paper.”
- “I think that writing a final paper or giving an oral presentation might have been useful. These are both good skills to hone throughout one's academic and career journey.”
- “Maybe a research proposal, I can't assume much because many of these tasks take a large amount of time. Even the poster was hard to complete on top of the lab work. It was fun but not sure if doing more on top of the lab work would go from fun and engaging to an overload, stressful and sloppy work.”
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>% Definitely</td>
<td>% Probably</td>
<td>% Definitely</td>
</tr>
<tr>
<td>100%</td>
<td>25%</td>
<td>75%</td>
</tr>
</tbody>
</table>

If you are planning to pursue a career in science, which ONE of the following best describes you career goal?

<table>
<thead>
<tr>
<th>Career Goal</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic/research science at a university</td>
<td>75%</td>
<td>75%</td>
</tr>
<tr>
<td>Biotechnology industry</td>
<td></td>
<td>25%</td>
</tr>
<tr>
<td>Medical field</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Teaching K-12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government/public policy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science writing</td>
<td></td>
<td></td>
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<tr>
<td>Other</td>
<td></td>
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</tbody>
</table>

See the Appendix for complete question wording and response distribution.

- At the outset of the program, three students hoped to have an academic/research science career at a university, and one student was interested in the medical field. At the end of the program, the student with the medical interest had switched to academic/research science, and one of the academic/research science students had shifted their main interest to the biotechnology industry.
- For other students, the program helped solidify their career goals and made them seem more attainable.
  - “This program gave me the confidence to try pursuing engineering, something I have always been too scared to do. If I go into the biology field, I will have more confidence in whatever I am doing, and have a strong grasp on the use of a microscope. If I go into engineering - I owe that decision entirely to this internship.”
  - “My research experiences in the program have absolutely supported my education and career development goals, by giving me experience in a research laboratory, and perspective on what it is like to be a scientist. My experience also gave my career/degree plans direction by giving me experience in the field of microbiology; this field of science, especially marine microbiology, has truly become my passion.”
  - “This summer definitely helped me think more about graduate school, I learned about the different types and how each of them work.”
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>25%</td>
<td></td>
</tr>
<tr>
<td>Master’s in science</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>Ph.D. in science</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>M.D. or medical field</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>M.D./Ph.D.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The student who at the outset of the program was interested working in the medical field now wants a Bachelor’s degree in science. For other students, the program pointed them toward a research career, but some are still undecided.

→ “Go to graduate school and do more lab work.”

→ “I'd like to be able to get a job doing some kind of research, hopefully something related to marine, or at least environmental science. I'd like to possibly try to work in both industry and academia throughout my career path, and hopefully be able to educate to some capacity, either as a professor or as a tutor, along the way.”

→ “I believe after graduation I will pursue to a Master Degree and try to get some job experience before apply for a Ph.D.”

→ “I am still undecided. I would either like to do research in the processes of the human body or go into biomedical engineering.”
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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10.0</td>
<td>100%</td>
</tr>
</tbody>
</table>

All of the students felt that the program provided a learning environment that was respectful of diversity and inclusion; all students rated it program a perfect “10” on this measure.

→ “The entire campus is very inclusive to all ethnicities and social issues. Everyone is incredibly respectful to the differences of others.”
→ “The learning environment that was provided was absolutely respectful of diversity and inclusion.”

Two students did not notice a difference in respect for diversity between this program and their home institution. Two other students felt that WHOI has a stronger sense of community, and WHOI values differing opinions more than does their home institution.

→ “I believe both institutions are great and have awesome science to offer.”
→ “I didn't really think about it. I know 4Cs and the internship had various people with all different backgrounds who were more than qualified to work there. I am in no position to assume someone's gender or race for diversity.”
→ “Everyone at WHOI is very welcoming. Learning and questions are encouraged - as does 4Cs, but the environment of WHOI also encourages questions more than 4Cs will ever be able to. There are much smaller groups at WHOI, and so it is easier to have one-on-one conversations and voice your opinions.”
→ “I think that my home institution has less of a defined sense of community and collaboration.”
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 or content.
  → “I wish I learned more about submitting a research proposal and got to see how that part works in real life.”
  → “I wish I had learned a bit more about genomics and bioinformatics during the summer program.”

• Others felt there was no room to add anything else to the course.
  → “I honestly don't know, we did everything plus more than I have ever done in a lab.”
  → “I think we learned a lot in the internship. I thought it was a little overwhelming, keeping everything we learned straight in my head.”
STUDENTS’ SUGGESTIONS FOR IMPROVING THE SUMMER PROGRAM

Students had suggestions for additional educational experiences they wished they could have had, especially more field work.

→ “Read more papers on the work we are doing in the lab and having time to go over those papers with the Professor.”

→ “I wish I had more opportunities to try everything there was to do in the lab - making media - every step of it - and washing dishes. I feel like I was always a step behind others on making media and learning to wash dishes.”

→ “A bit more experience with experimental design, genomics and bioinformatics. Also a bit more field work experience if applicable/possible.”

→ “I think the program is great and it had a diverse plan for the summer. We got to go out to visit different universities; important science plans in WH and even a field work. I do wish we got to experience a bit more field work.”