

# Real Change Study Report

An Institutional Impact Study of the  
Biology Scholars Program on UC Berkeley

## Summary of Research Results

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## Overview

### Purpose

- Investigate the institutional impact of the Biology Scholars Program (BSP) on 1) Administrators, 2) Program Directors, 3) Staff, and 4) Faculty at the University of California, Berkeley (UCB).
- Understand how BSP can contribute toward growing a more inclusive undergraduate STEM “ecosystem” in its parent institution.
- Describe how BSP can have collateral benefits for people in a range of institutional roles that interact with the program.
- Provide recommendations on how student development programs can more intentionally impact the institutions in which they operate.

## Key findings

- Undergraduates with high “risk factors” and who “beat the odds,” demonstrated their high capacity to succeed when provided with effective programmatic opportunities, such as what BSP offered. As many interviewees stated, BSP showed that the “impossible is possible” and that students should not be written off as lacking talent and instead be given the opportunity to grow their talent.
- Several faculty members noted that their collaboration with BSP early in their career informed how they mentored and taught students throughout their time at Berkeley. They approached mentorship with more compassion and with an attitude of supporting students, as opposed to “hazing” or writing them off.
- Program Directors noted how BSP provided a model for their own programs. BSP provided collaboration and support that informed them about how to set-up their programs and improve how they served students in a variety of disciplines across campus.
- Administrators often noted how BSP supported students effectively but did not see BSP as actively impacting campus wide policy or practices.
- Staff highlighted the importance of increasing awareness and understanding of the unseen lived experiences that underrepresented minorities (URM) and first-generation students face at UC Berkeley among all those who support student success.
- Effective student development programs may need to share impactful practices intentionally if they are to contribute to institutional change.





## Introduction

The purpose of the “Real Change Study,” generously funded by the Howard Hughes Medical Institute (HHMI), was to investigate the institutional impact of the Biology Scholars Program (BSP) on UC Berkeley’s 1) Administrators, 2) Program Directors, 3) Staff, and 4) Faculty. Before discussing the details of the study, let us first consider the history and evolution of BSP along with a brief institutional change framework to provide a context to interpret the study’s findings, starting with the question: What is BSP?

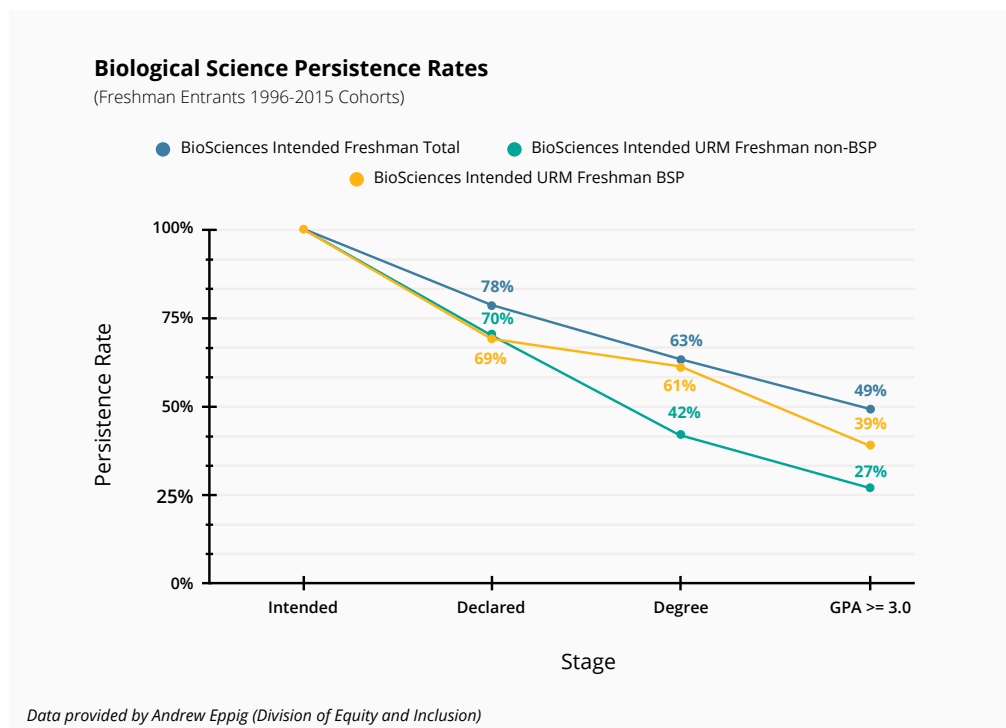
## A. BSP Is a Student Resource

In 1992, Drs. Caroline Kane, Corey Goodman, and John Matsui co-founded the Biology Scholars Program in the Department of Molecular and Cell Biology. Initially, they envisioned BSP as a mentoring and student development program. Since then, 3500 undergraduates from low-income, first-to-college, and minoritized ethnic backgrounds have participated in BSP.

Entering Berkeley, on average, with lower SATs and high school GPAs than biology majors-at-large, BSP members have been less well-prepared to meet the high academic expectations of being a Berkeley biology major. For more than 30 years, program staff has used the “BSP Approach” to develop student talent - tailoring advising, mentoring, and tutoring to each member’s personal history, current life circumstances, and readiness to succeed. This has resulted in over 3500 of its members graduating at parity with biology degrees and nearly equal exit GPAs as biology majors-at-large (Matsui, 2018). In short, BSP has helped its members close the student academic outcomes gap in biology at Berkeley. Previous research shows that the combination of participant enthusiasm for the BSP program elements, as well as meaningful connection to BSP peers, staff, and faculty, significantly contribute towards student integration into their scientific field and their intention to persist years later (Estrada et. al., 2018).

Institutional student data (1996 – 2015) demonstrate the efficacy of the program. Figure 1 compares the success of intended biology majors entering as freshmen - underrepresented minority (URM) BSP students vs. URM non-BSP students vs. all UC Berkeley students. For entering freshman cohorts from 1996 to 2015, URM BSP members graduate with a biology degree in nearly identical percentages as biology majors-at-large and only 10% lower with exit GPAs greater than or equal to 3.0. By contrast, URMs not in BSP show significantly lower degree and GPA attainment than BSP URMs.

Figure 1. Institutional Student Data from 1996 to 2015



## B. BSP Is Also an Institutional Resource

For its first 20-years, BSP focused exclusively on working with its student participants. Because of this inward student focus, BSP “flew under the radar,” with UC Berkeley faculty and staff knowledge about the program resulting mostly from contact with program members in the courses they taught, in their research labs, in office hours and advising sessions, and informal conversations with BSP staff.

In 2015, BSP was awarded an HHMI Sustaining Excellence grant to disseminate BSP’s scalable “best practices” through the development of Faculty and Staff Learning Communities. From 2015-2019, BSP held a series of well-attended faculty and staff working group meetings focused on the “BSP Approach” to improve Berkeley staff and faculty practices of more equitable and inclusive advising, teaching, and mentoring. In turn, the work of these groups resulted in a first ever series of workshops and annual conferences that explored ways to scale BSP’s “best practices” with the aim of positively supporting minoritized and first-generation students campus-wide to succeed in their STEM majors (see our *HHMI “Berkeley Science Initiative” Year 6 Final Narrative Report* in Appendix A).

This “Expanding Undergraduate Success in STEM” (EUSS) project was BSP’s first ever systematic effort to disseminate its advising, teaching, and mentoring approach to staff, faculty, graduate students, and post-docs working with students across all STEM majors (biology, chemistry, physical science, and engineering) at Berkeley. While the intended outcome was to scale up best practice usage among staff and faculty, the question of how this contributes to institutional change was less examined.

## C. Institutional Change - a Brief Review of the Literature

What do we mean by “institutional change”? There is a debate within the institutional research community about how to conceptualize institutions and institutional change, with different definitions of “institution” affecting how one defines “institutional change” (Coccia, 2018). Whereas some scholars conceptualize institutions as sets of “rules” that govern behavior, beliefs, policies, and practices (North, 1990), others view institutions as “self-sustaining, salient patterns of social interactions” that give rise to “common knowledge among the players regarding a particular equilibrium path of the game” (Aoki, 2007).

Through a systemic lens, we view an institution as four nested relational levels (individual, groups, organizations, and society) as stated in National Academies of Science (NAS) 2023 study report (NAS, 2023). This conceptual map involves a base level of the individual (e.g., faculty, students), a group level (e.g., BSP), an organizational/institutional level (e.g., UCB), and lastly the overall external context (e.g., society). The present study uses this framework for contextualizing change to explain participant responses regarding how BSP contributes toward growing a more inclusive ecosystem, as well as where BSP sits in a larger institutional context. In this view, BSP is located at the “Groups and Teams” level and the members of the UCB community (e.g., students, faculty, program directors, etc.) are located at the “Individual” level.

In addition, we will use the Aoki’s “Equilibrium Perspective,” that views institutional change resulting from changing expectations (e.g., who can do science) vs. changing “rules” (e.g., threshold grade point averages and prerequisite courses required to declare a science major).





## Methodology

We used a mixed methods approach to learn more about the institutional impacts of BSP at UC Berkeley. This process began by gathering data on the impact of the Biology Scholars Program on UC Berkeley's 1) Administrators, 2) Program Directors, 3) Staff, and 4) Faculty. We administered a Quantitative Survey in 2020 to study participants, which was followed in 2021 with a structured Qualitative Interview to a subset of survey participants. This report summarizes our mixed methods findings from the quantitative survey (n = 172) administered in 2020 and the qualitative structured interviews (n = 20) conducted in 2021. A separate analysis was conducted on institutional student data from UC Berkeley ranging from 1996 to 2015 to compare BSP students' persistence rates to other groups.

## A. Survey (2020)

In Fall 2020, we administered an on-line survey to participants using Qualtrics (see the survey questions in the online Appendix B). We selected the survey participants based on their previous participation in BSP workshops and conferences from 2015-2020. A total of 172 participants completed the one-time survey. Their ethnic breakdown is shown in Figure 2 and institutional role in Figure 3.

Figure 2. Participant Profile by Ethnicity (n = 172)

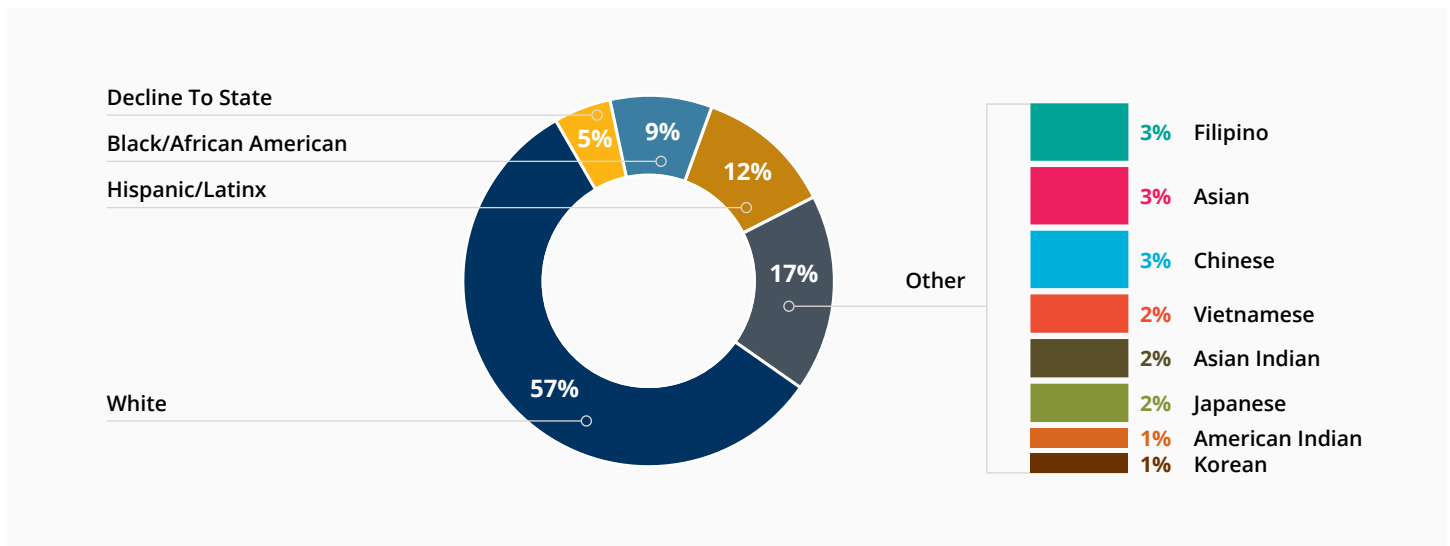
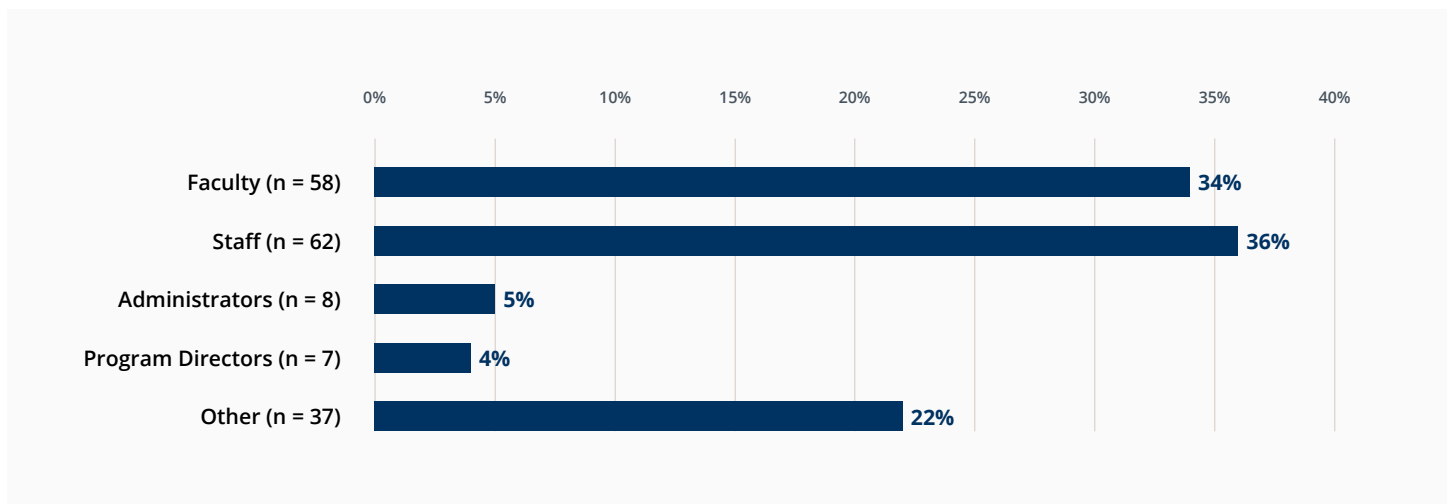


Figure 3. Survey Participant Profile by Institutional Role (n = 172)



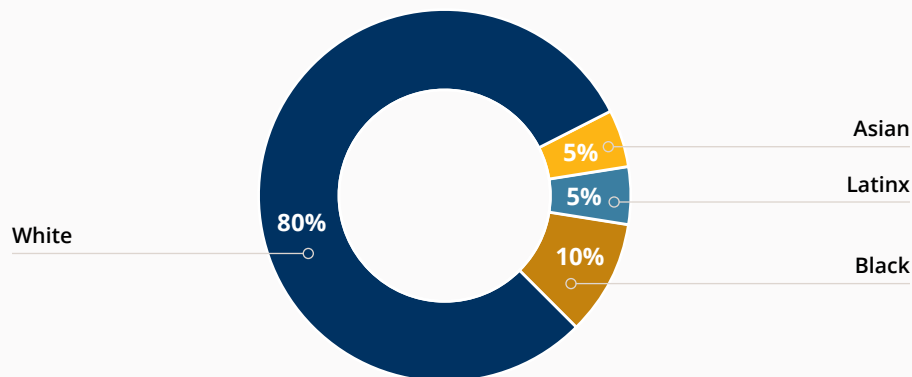
## B. Interview (2021)

Interviews were conducted by invitation-only Zoom sessions in the Fall of 2021 (see the interview questions in the online Appendix B). All responses and identities are kept strictly confidential. Our selection of the 20 participants we interviewed was based on their:

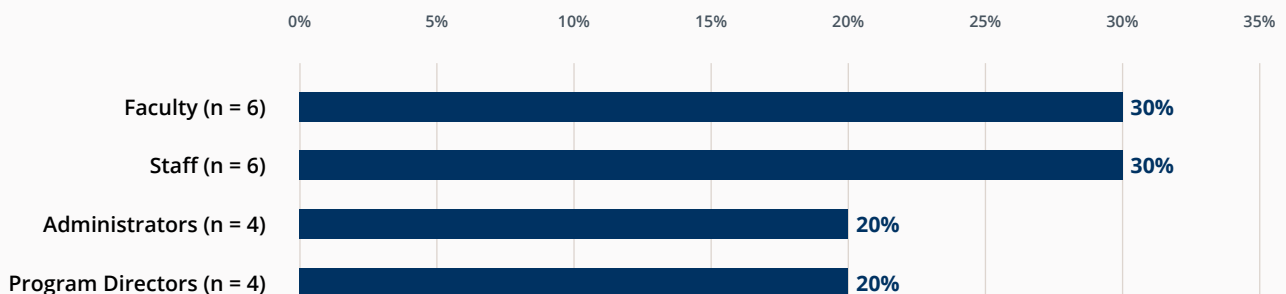
- 1) Agreement in the survey to be interviewed.
- 2) Institutional role – Administrator, Program Director, Staff, or Faculty.
- 3) Familiarity with BSP as measured by their prior level of participation in program events, with “High” = participation in 10 or more BSP events from 2015-2020 and “Low”= participation in fewer than 10 events.

We used these selection criteria to create a stratified group of 20 interviewees of which there was a balanced representation of institutional roles. A secondary criterion involved selecting for participants based on their familiarity with BSP (50% “High” and 50% “Low” Involvement). The ethnic breakdown of the 20 individuals participating in the interview is shown in Figure 4 and their institutional role in Figure 5.

**Figure 4.** Interview Participant Profile by Ethnicity (n = 20)



**Figure 5.** Interview Participant Profile by Institutional Role (n = 20)





## Results

We have organized the survey and interview results into the following categories:

**Campus Context and Climate**

**BSP's Impacts on Individuals and Community**

**BSP's Institutional Impact: Perceived Institutional Change**

## Campus Context and Climate

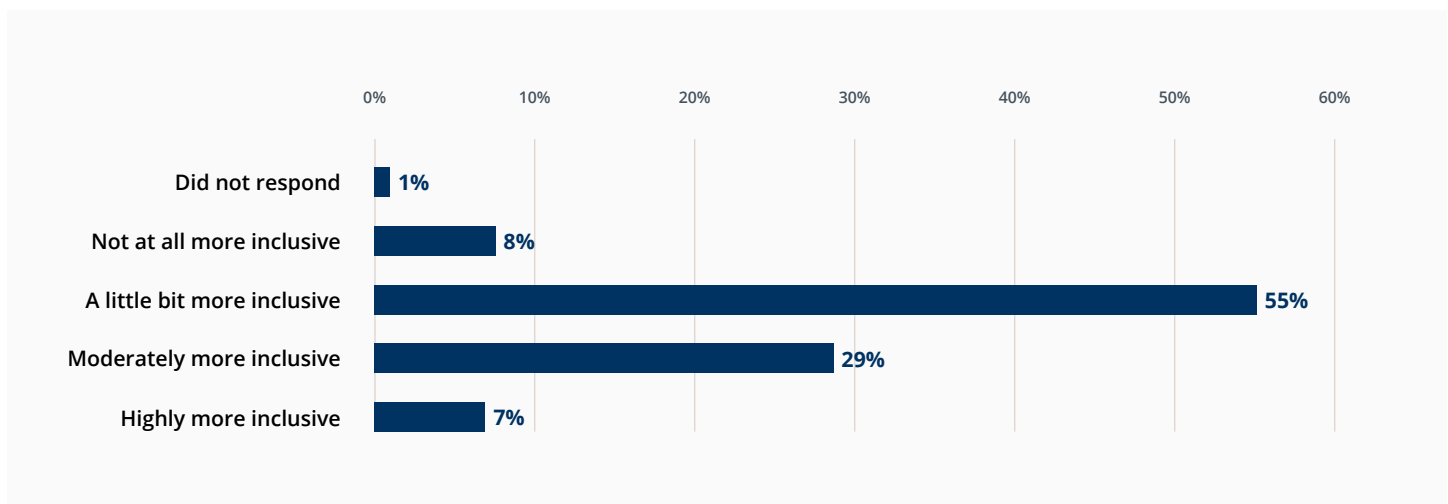
Here we present the survey and interview results that pertain to how study participants see the campus context and climate. Together these results describe the context in which BSP functions.

### A. Survey: Perception of Inclusivity of Historically Underrepresented Groups at UC Berkeley

55% of survey participants reported that the campus had only become “a little bit more” inclusive of historically underrepresented groups.

Question posed: “During your time at UC Berkeley, has the campus become more inclusive of people from historically underrepresented groups (i.e., African Americans, Latinx, and/or Native scholars) in STEM?”

Figure 6. Interview Participant Profile by Institutional Role (n = 20)



### B. Interview: “Popcorn” Word Association Exercise

We presented interviewed participants with prompts that are typically associated with selecting and training future scientists (e.g., “talented” and “barrier”) and asked them to state the first word(s) that came to mind. The goal of this exercise was to look for patterns of words associated with each prompt. Participant responses were coded for thematic similarity.

**Table 1.** Thematic Responses to “Popcorn” Word Prompts Disaggregated by Institutional Role

Word Prompt	Staff (n = 6)	Faculty (n = 6)	Program Directors (n = 4)	Administrators (n = 4)
Talented	Everyone (3x)*	Everyone (2x)	Students (3x)	Students (3x)
Barriers	Many (4x)	Obstacles (3x)	Obstacles (3x)	No single theme
Diversity	Needed (4x)	Important (4x)	DEI (3x)	Needed (2x)
Merit	Earned (4x)	Uncertain (3x)	Unearned (3x)	No single theme
Excellence	No single theme	Goal (5x)	No single theme	No single theme
Affirmative Action	Controversial (3x)	Controversial (3x)	No single theme	Needed (2x)
Underprepared	Issue (4x)	Issue (6x)	Issue (3x)	Our responsibility (3x)
Cal/UC Berkeley	University (4x)	Diverse (2x)	University (4x)	Good (2x)
Biology Scholars Program	Responses were unique, but positive (6x)	Responses were unique, but positive (6x)	Responses were unique, but positive (4x)	Responses were unique, but positive (4x)

Note: \*Within each bracket is the number of participants responding with a word related to the indicated theme

Below are more detailed descriptions of the themes for selected prompts.

- Responses to “**Biology Scholars Program**” were all unique, and positive. For example, some responses regarded BSP as a place that provided opportunity and promoted student success.
- In response to the “**Diversity**” prompt, diversity was an acknowledged goal of participants across institutional roles.
- However, beyond this agreement, there were important variations across roles.
- The prompt “**Merit**” elicited significant differences among groups, with Program Directors and Staff responses grouped under the theme “**Earned**,” dis-similar to those of Faculty who responded with “**Uncertain**” and Administrators with no clear pattern or theme to their responses.
- In response to the prompt “**Underprepared**,” there was agreement across Staff, Faculty, and Program Directors that this was an “**Issue**.” In their response, Administrators focused on whose responsibility it was to address the preparation challenge with the response “**Our Responsibility**.”
- Responses to “**Merit**” and “**Excellence**” varied widely across institutional roles.
- For the prompt “**Affirmative Action**,” Staff and Faculty responded with “**Controversial**” and Administrators saw it as “**Needed**.”

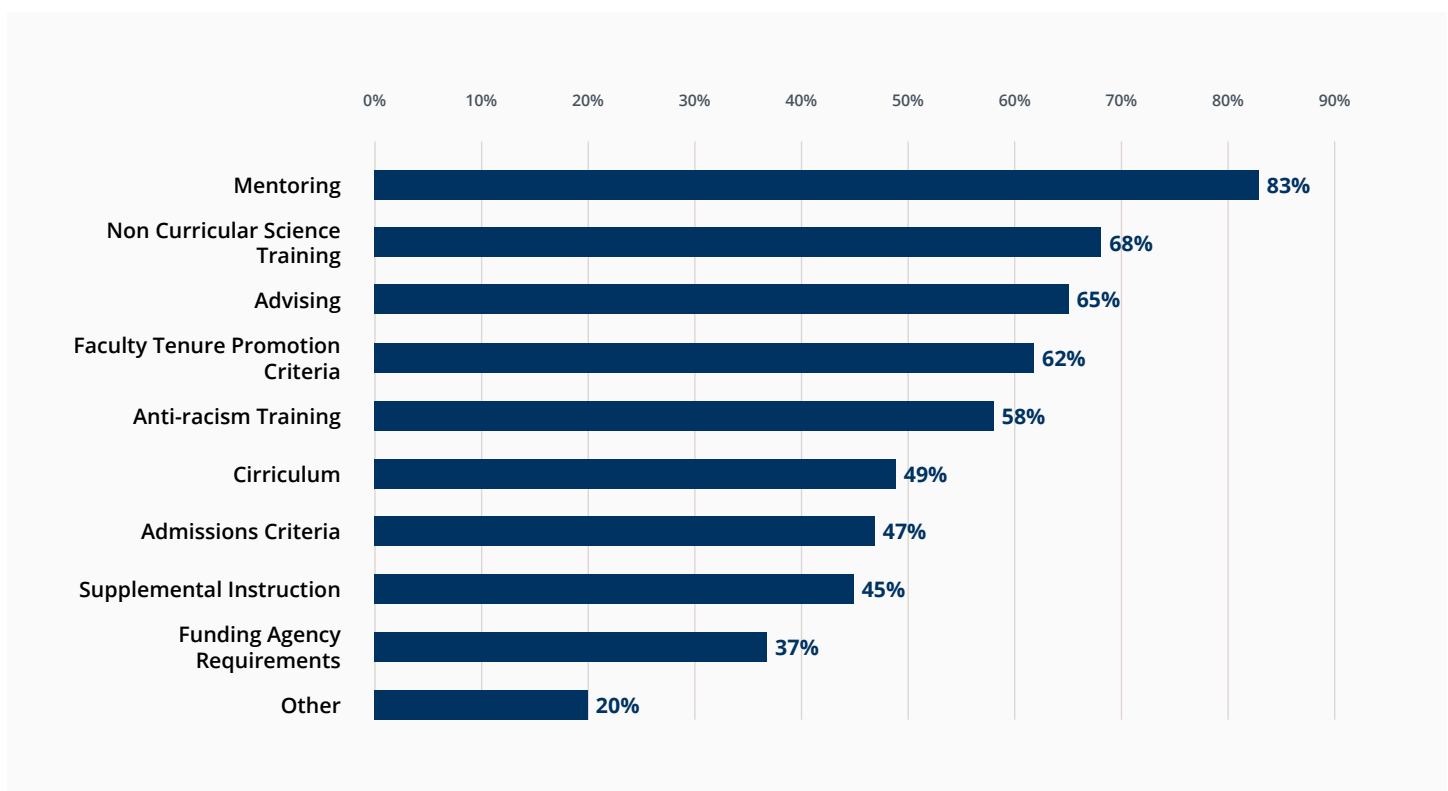
In summary, whereas participants acknowledged “Diversity” as a goal, their views/perspectives of whose responsibility it was to attain it and how we attain it varied across institutional roles.

### C. Survey: Participants Reported that Mentorship and Non-curricular Science Training Were Important to Increase Student Persistence at UC Berkeley

Ranked from greatest to least, “**Mentoring**,” and “**Non-curricular Science Training**” were chosen most frequently to increase student persistence at UC Berkeley.

Question posed: “*In your experience at UC Berkeley, what needs to change to increase historically underrepresented student persistence in STEM fields (check all that apply)?*”

**Figure 7.** Mentoring Was Chosen More Frequently to Increase Student Persistence in STEM fields



### D. Interview: Uneven Support in Classrooms and One-to-One Office Hours

#### Responses for “In Classrooms”

Overall, most responses were negative. Across the board, Administrators, Faculty, Program Directors, and Staff agreed that underrepresented students received lackluster support in their classrooms at Berkeley to be their authentic selves.

Question posed: “*On a scale of 1 to 10 (with 1 being not at all supportive and 10 being the most supportive), what level of support do you think underrepresented students experience at UC Berkeley to be their authentic selves in classrooms?*”

Responses were grouped into the following rating categories: Low (1-4), Average (5-6), and High (7-10).

**Table 2.** Responses for “In Classrooms”

Response Rating Category	Response Score Range	Number of Respondents
Low support	1-4	11
Average support	5-6	8
High support	7-10	1
No Response	-	0

- There was only one response from a staff member that rated this question highly, while over half (11/20) provided negative or low ratings.
- 8/20 were neutral or provided average ratings. A faculty member said, “Students are often part of a sea of faces, and they don’t express their individuality very much in classes, which is again a structural issue. I don’t think it’s a discriminatory issue.”
- See “Select Participant Quotes: Classroom and One-to-one Office Hours” Quotes in Table 4 for more detail pertaining to Table 2.

### Responses for “One-to-One Office Hours”

Responses were mixed among the 20 interviewees, spanning the rating categories.

Question posed: “On a scale of 1 to 10 (with 1 being not at all supportive and 10 being the most supportive), what level of support do you think underrepresented students experience at UC Berkeley to be their authentic selves in one-to-one office hours?”

Responses were grouped into the following rating categories: Low (1-4), Average (5-6), and High (7-10).

**Table 3.** “One-to-One Office Hours” and Support of Student Identity Responses

Response Rating Category	Response Score Range	Number of Respondents
Low support	1-4	4
Average support	5-6	5
High support	7-10	4
No Response	-	7

- The common sentiment was that the level of support a student received was highly dependent on the individual conducting the office hour (see “Select Participant Quotes” in Table 4).



- For example, an Administrator pointed out that there are exceptional faculty members who “embrace people’s identities and backgrounds” and others who may not provide the same experience (P139).
- Similarly, 3/6 of the Faculty participants agreed that it depended highly on the individual faculty member.
- A staff member explained how some students feel intimidated by office hours (P135) and so they may not feel free to express themselves.
- And lastly, a Program Director said, “I’ve not heard great things happen in office hours with students” (P100).

**Table 4.** Select Participant Quotes: Classroom and One-to-One Office Hours

Institutional Role	In Classroom	In One-on-One Office Hours
Administrators	“Wow, if I mean obviously answering for the campus... you probably can guess I think it’s very uneven in different, parts of campus. But if I must ask for the campus, I’d say something like 4” (P116)	“Oh, again you’re looking at averages, right? There’s obviously some great faculty here so I have to be a little careful here. I know way too many stories where the results are not great when students of color approach a faculty member. I’ll give it a four or five” (P159)
Faculty	“I think because of the very large class size at Berkeley... I think it’s very different than a small college. Students are often part of a sea of faces, and they don’t express their individuality very much in classes, which is again a structural issue. I don’t think it’s a discriminatory issue. I think it’s a structural issue with the size and nature of the university.” (P038)	“Yeah so, one-on-one office hours, that tends to be... question specific and individual specific, so I don’t know... I mean if someone shows up for office hours, I look at it, as my job to try to understand what their question is and connect with them with an answer or some sort of guidance. It’s not underrepresented or representative or anything it’s just, you know [whoever’s there]” (P080)
Program Directors	“If it’s just the classrooms, I would give it a 4.” (P033)	“Oh, that would be lower. I’ve heard some not-so-great things happening in office hours with students, so I would probably rank that a... I guess, if I was being neutral, it would be a 5 and I don’t feel neutral about it, so maybe a four” (P100)
Staff	“I don’t feel confident about saying this about the whole university. I can say it about our department. If it was a written thing, I would say N/A. But I can say a 5” (P069)	“That’s another good question because there’s a lot of conversations that we have as advisors just working with students about how... what are good ways to approach office hours because folks and students feel intimidated by office hours often. So, there were a sort of a collective faculty and information sharing about like ‘hey, we’re here for you we’re accessible, we want to talk with you’ that would definitely be helpful, I think, so in that regard, probably a 5 or 6 as well” (P135)

## E. Interview: How Has UC Berkeley Changed During Your Time?

We were interested to learn how our participant sample perceived key statements about change. Our interview sample's (n = 20) duration of employment at UC Berkeley ranged from 5 years to 45 years, with the average being 20.5 years.

Question posed: *"I am going to state 6 possible changes that could have occurred at UC Berkeley since you started working here. As I say them, please tell me if you think they are 'True', 'False', or 'Not sure.'"*

Of note, some respondents prefaced their remarks with "this is true, but just recently." A new category was created to accommodate these responses and termed "Recently True." These responses may indicate perceived progress/change in response to some statements.

**Table 5.** Statements about Change at UC Berkeley Ranked in Decreasing Order of Participant Agreement

Rank	Statements	False	Not Sure	Recently True	True
1	The use of more inclusive language in university websites and publications	0%	0%	20%	80%
2	More inclusive norms are known across the university that are regularly reflected in daily behaviors	0%	10%	25%	65%
3	University provides resources to help people conduct diversity, equity, and inclusion work.	5%	15%	20%	60%
4	Increased hiring of ethnically diverse people to faculty and leadership positions	0%	15%	35%	50%
5	There have been changes in university policy that reward inclusive faculty and staff	35%	15%	15%	35%
6	University provides dedicated time for faculty to engage in actions that increase inclusion of diverse people.	25%	50%	10%	15%

In Tables 6, 7, and 8, we disaggregated participant responses to the following three statements by institutional role, and rank ordered them in decreasing order of agreement for each statement.

In Table 6, there was greatest agreement of all participants to the University using more inclusive language in its websites and publications, with no participant from any institutional role indicating “False” or “Not Sure.”

**Table 6.** Perceptions of the Use of More Inclusive Language in University Websites and Publications

Rank	Institutional Role	False	Not Sure	Recently True	True
1	Faculty (n = 6)	0%	0%	16.67%	83.33%
2	Staff (n = 6)	0%	0%	16.67%	83.33%
3	Program Director (n = 4)	0%	0%	50%	50%
4	Administrator (n = 4)	0%	0%	0%	100%

In Table 7, coming in a close second, was the level of agreement to the statement of more diverse hiring, with some Faculty, Staff, and Administrators responding with “Not Sure.”

**Table 7.** Perceptions of Hiring a More Diverse Faculty and Campus Leadership

Rank	Institutional Role	False	Not Sure	Recently True	True
1	Faculty (n = 6)	0%	16.67%	33.33%	50%
2	Staff (n = 6)	0%	16.67%	33.33%	50%
3	Program Director (n = 4)	0%	0%	75%	25%
4	Administrator (n = 4)	0%	25%	0%	75%

In Table 8, the statement on dedicated faculty time for inclusion efforts resulted in the least agreement and greatest range/diversity of responses within and across institutional roles. Perceptions ranged from “True”/“Recently True,” to “False,” to “Not Sure,” pointing to the uncertainty about the dedicated support that faculty receive to engage in activities that lead to greater inclusion.

**Table 8.** Perceptions of Dedicated Faculty Time Provided by University to Engage in Actions that Increase Inclusion of Diverse People

Rank	Institutional Role	False	Not Sure	Recently True	True
1	Faculty (n = 6)	16.67%	50%	16.67%	16.67%
2	Staff (n = 6)	33.33%	50%	0%	16.67%
3	Program Director (n = 4)	25%	75%	0%	0%
4	Administrator (n = 4)	25%	25%	25%	25%

## BSP’s Impacts on Individuals and Community

We gathered data on how participants perceived BSP in relation to Diversity, Equity, and Inclusion issues, and on BSP’s efforts towards building community at UC Berkeley.

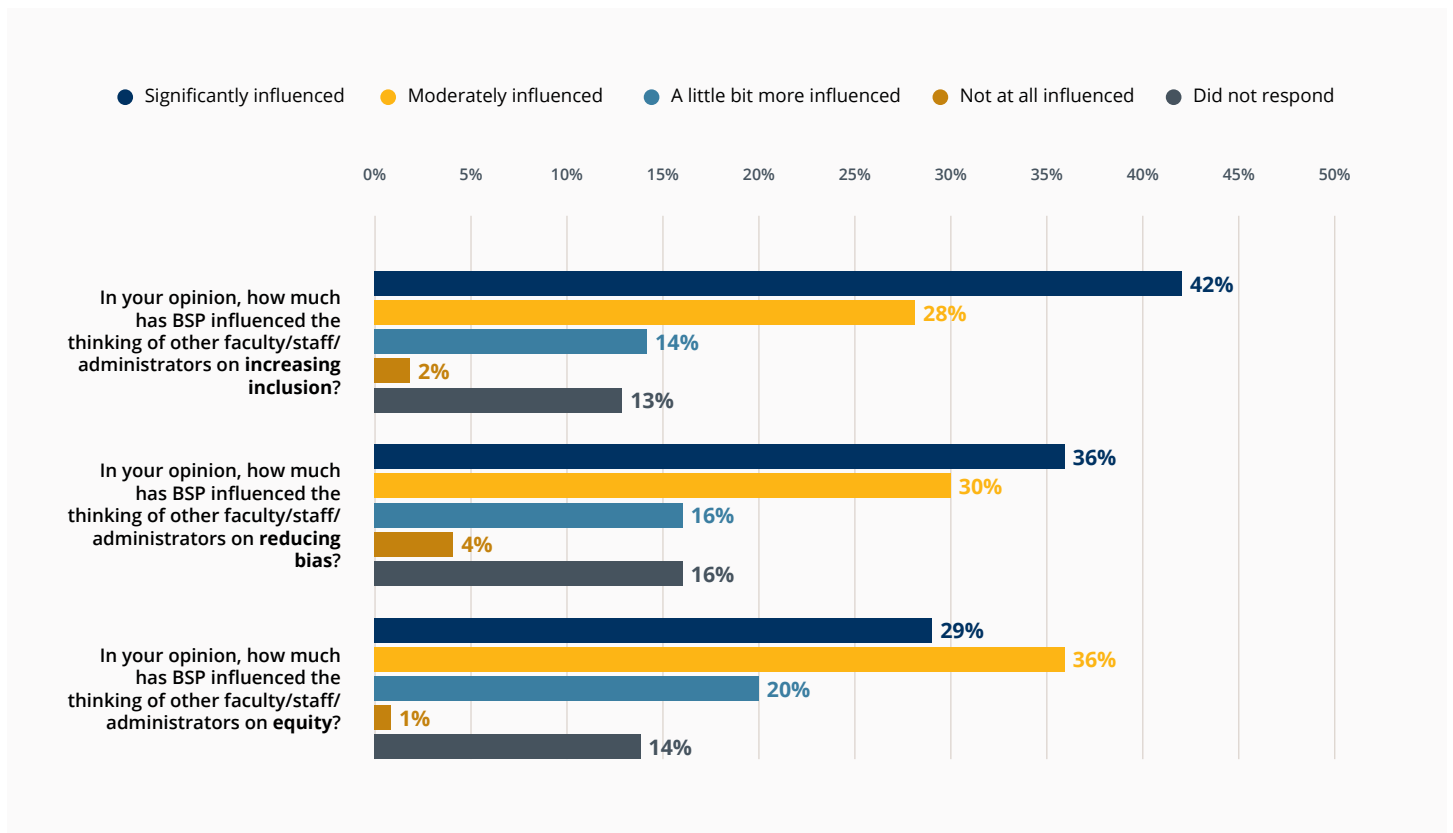
### A. Survey: Survey Findings Report that the Campus Community Was Positively Influenced by BSP on DEI Issues

Participants reported that BSP to an extent had influenced how faculty, staff, administrators, and program directors perceive Diversity, Equity, and Inclusion (DEI) issues at Berkeley (see Figure 8).

We asked participants three questions and provided them with 4 options (i.e., “Significantly influenced,” “Moderately influenced,” “A little bit influenced,” or “Not at all influenced”). The results are as follows:

- 71% stated that BSP (either moderately or significantly) influenced the increase in inclusion among faculty/staff/administrator.
- 66% stated that BSP (either moderately or significantly) influenced the reduction of bias among faculty/staff/administrator.
- 65% stated that BSP (either moderately or significantly) influenced how faculty/staff/administrators think about equity.

**Figure 8. Survey Participant Profile by Institutional Role (n = 172)**



## B. Interview: The Impact of BSP on Support and Community

From our 2020 Survey, we learned that participants viewed BSP as a place that provides community to students. We were then interested in understanding if BSP’s influence affected how participants provide community to their own students.

Question posed: *“Has BSP influenced the way you provide support and community?”*

Most responses (60%; 12/20) agreed and stated that BSP helped them provide “support and community” to students while few responses (15%; 3/20) agreed and stated that it helped them provide support to other faculty or staff (not students). The rest of respondents (25%; 5/20) either provided no response or responded that it did not help them provide support or community.

Below are excerpts of participant responses disaggregated by institutional role that illustrate the way in which BSP influenced how participants approached equity and inclusion, how they gave encouragement to students, and the importance they placed on building connections.

**Table 9.** Representative Participant Quotes: BSP, Support, and Community

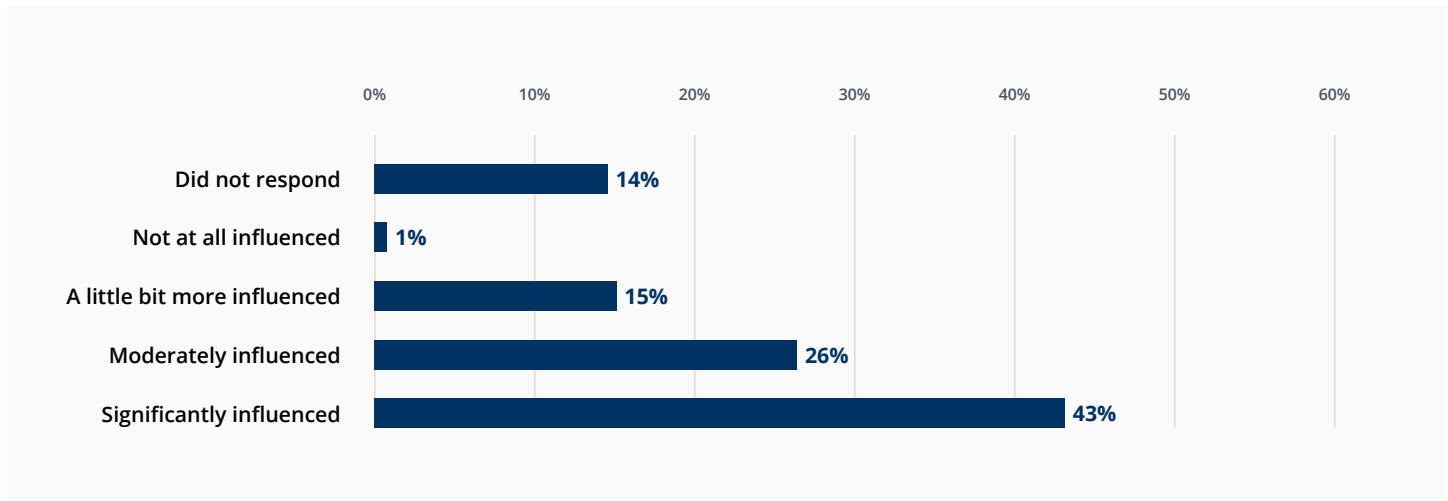
Category	Quotes
Administrators	“Yes. I mean, it’s certainly shaped my sense of how we approach equity and inclusion work, whether directly or indirectly, as one of the long-standing programs on the campus.” (P139)
	“To some degree... In a way, I aspire for that to be greater, but I also... It’s both a feature of learning more and more potential to implement and make influence from that learning. It’s two sides of that dynamic that would enable me to answer more affirmatively.” (P116)
Faculty	“Yes. I see the goal is trying to meet students, where they are and bring them along and encourage them. When I was teaching [a class] I would try [to]... give a statement about the importance of being inclusive and welcoming... that everybody has a place, and everybody should be here.” (P071)
	“I have encouraged students who were not aware of BSP to seek it out and see if it might be a good fit for them.” (P038)
Program Directors	“Absolutely. I think when it comes to working with my own staff... it’s trying to impart the same that I’ve learned through BSP, encouraging connections.” (P100)
	“Oh absolutely. I think community is the most important thing that is provided. Community resources that other people like me need. This is hard and it’s not just me.” (P148)
Staff	“... what I hear is that their closest peers and support group are usually other BSP people. I may say... well ‘you’ve brought up something that I have no experience with’ or ‘I don’t really know what the community... what resources are available to folks for this’, and so they always seem to have more information than [me]... I learned from them [students]... basically.” (P049)
	“Maybe not in my surrounding, like intermediate close community of advisors. I think we all recognize the strength of the BSP and are aligned with them or want to be aligned with them.” (P167)

### C. Survey: BSP's Influence on Student Talent Development

Question posed: *“In your opinion, how much has BSP influenced the thinking of other faculty/staff/administrators on growing student talent?”*

More than half of our survey participants (69% stated either “Significantly influenced” or “Moderately Influenced”) agreed that BSP influenced campus thought regarding developing and growing student talent (rather than selecting for specific talents and skills) (see Figure 9).

**Figure 9.** BSP Is Thought As a Place Where Skills/Talents are Developed, Not Selected



### D. Interview: Responsibility for Student Talent Development

Question posed: *“Beyond BSP, who, in your opinion, is responsible for developing student talent at UC Berkeley?”*

Half of those interviewed (10/20) expressed their opinion that all are responsible for talent development. Table 10 summarizes the distribution of responses (by institutional role) among those supporting the notion that ‘everyone’ or all units on campus have a degree of responsibility for developing student talent.

Interestingly, both Program Directors (100%; 4/4) and Staff (66%; 4/6) agreed that student talent development is a shared responsibility, whereas most Faculty (66%; 4/6) referred to themselves as being responsible for developing student talent. Half of the Administrators (50%; 2/4) stated that BSP and similar programs help develop student talent (see Table 11 for details).

**Table 10.** Degree of Agreement that All Are Responsible for Developing Student Talent

Institutional Role	Agreement that all are responsible
Administrators (n = 4)	50% (2/4)
Faculty (n = 6)	0% (0/6)
Program Directors (n = 4)	100% (4/4)
Staff (n = 6)	66% (4/6)

**Table 11.** Representative Participant Quotes: BSP, Support, and Community

Category	Quotes
Administrators	<p>“I think the entire University has a shared responsibility for creating a real opportunity for anyone we admit (to succeed). Of course, not everyone will succeed in 30,000 students. It can be a goal; it doesn’t mean you failed if it’s not every single student. No, I think it’s a shared responsibility across the entire campus.” (P139)</p> <p>“Let’s see. So, I think mostly of BSP. I think, there are some at the Multicultural Center. I think the students get a lot of support [there].” (P159)</p>
Faculty	<p>“Why, the Faculty generally.” (P071)</p> <p>That’s a good question. I feel like that falls on the faculty, primarily. And it’s largely individual-led efforts. (P165)</p>
Program Directors	<p>“I think it’s a great deal of people. Definitely people in my position in which we work with students, and my role is to help students that are in undergrad to consider, and also help them to achieve their interest in getting a Ph.D., And I think other people are responsible. I think faculty are responsible. Advisors [too].” (P033)</p> <p>“I don’t think any one type of person on campus is able to do that alone, and so I think it has to come from the staff that a student interacts with, whether it’s an academic advisor or maybe an EOP advisor, or a college advisor, a professor, their instructors, their teachers, and then the Grad students that also play a role in their teaching.” (P100)</p>
Staff	<p>“I feel like we all are.” (P049)</p> <p>“Hopefully it takes a village and a little bit of everybody (laughs). Goodness, through academic advising and academic affairs... both sides of the coin in terms of academic affairs and student affairs. There’s just so many different roles that approach student development in so many different ways that I think make a whole experience for students. And obviously, the courses, the faculty that students engage with are critical to that as well.” (P135)</p>



## BSP’s Institutional Impact: Perceived Institutional Change

The purpose of this section is to inventory study participants’ perceptions of change and the institutional impact of BSP.

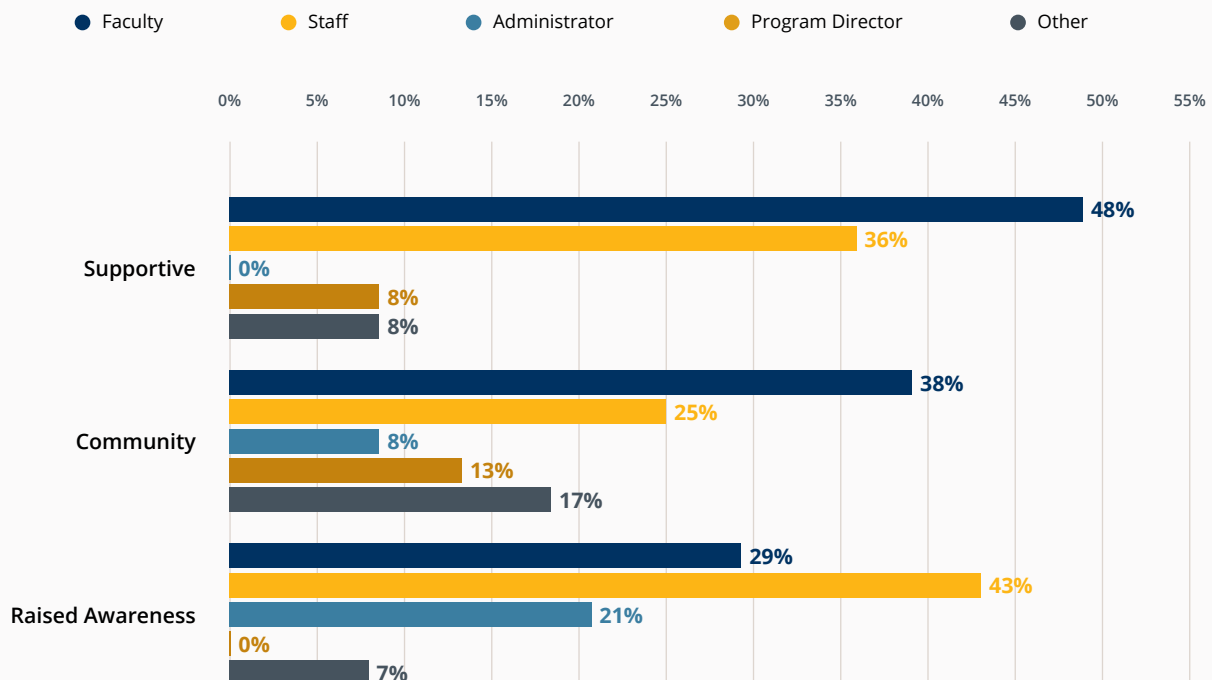
### A. Survey: BSP’s Impact on UC Berkeley (an Open-ended Survey Question)

In our 2020 survey, we asked an optional open-ended question to gather perceptions of the most important way in which BSP has impacted UCB:

Question posed: *“Please describe the most significant way BSP has impacted UC Berkeley in the time you have worked here (optional)”*

Out of the 172 who completed the survey, 102 (59%) answered the open-ended question. Ninety-three percent (95/102) of these open-ended responses were positive, commending BSP for its efforts to support underrepresented students at UC Berkeley. Importantly, the top three most frequently mentioned responses about BSP’s impact (i.e., categories) were “Support” (mentioned 25 times in responses), “Community” (24 times) and “Raised Awareness” (14 times). The Faculty group led the first two categories with 48% and 38%, respectively, and the Staff group led the “Raised Awareness” category with 43% of responses. The results in Figure 10 are an aggregate of categories, not individual participants. Participant quotes are included in Table 12.

**Figure 10.** Categories of Responses to Open-ended Question



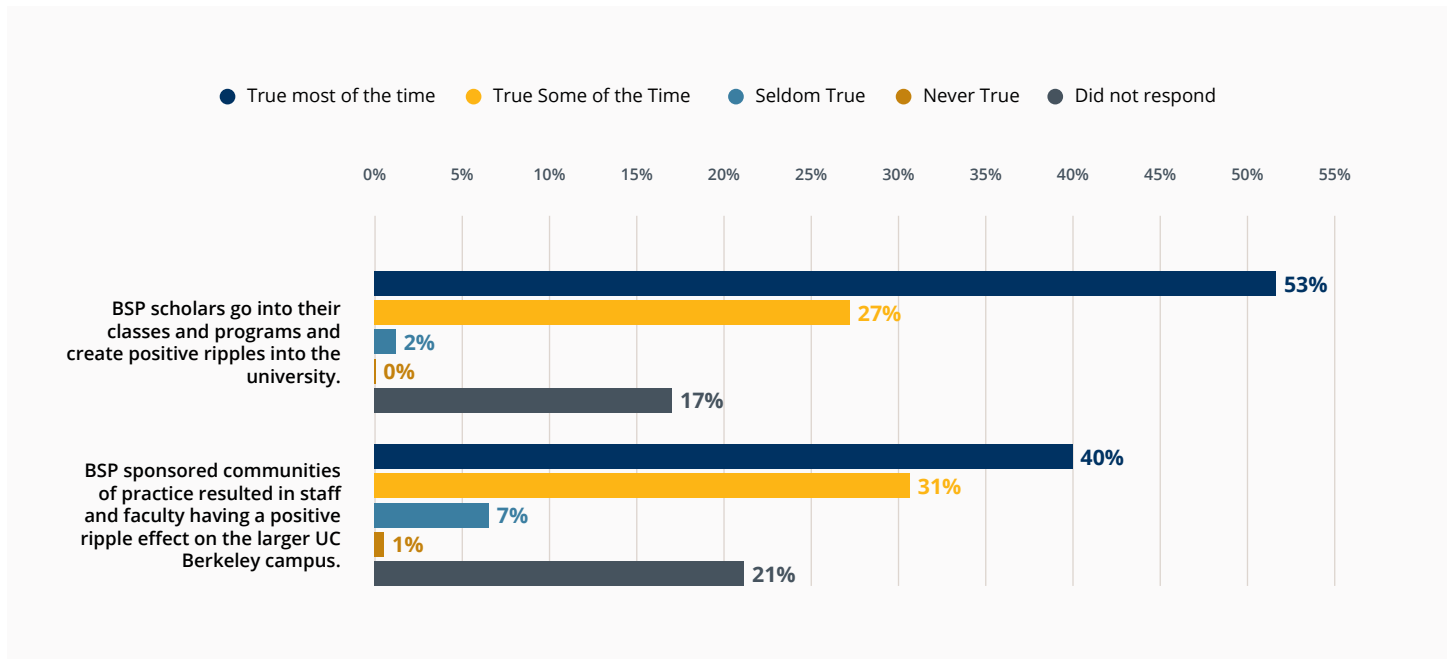
**Table 12.** Representative Participant Quotes: BSP’s Impact on UC Berkeley (Open-ended Survey Question)

Category	Quotes
<p><b>Supportive</b></p>	<p>“[BSP] provided a framework for successful mentoring and support for students from under-represented backgrounds.” (Faculty, P113)</p> <p>“BSP has provided the type of support needed by students who come in with very little capital within a higher education institution.” (Program Director, P100)</p>
<p><b>Community</b></p>	<p>“BSP has given many otherwise marginalized students a sense of belonging and a ‘family.’” (Faculty, P102)</p> <p>“BSP offered a community of support for URM students to see themselves in the sciences.” (Staff, P135)</p>
<p><b>Raised Awareness</b></p>	<p>“By consistently broadening awareness among faculty and staff of the range of student experiences on campus and stimulating work to improve access, inclusiveness, and pedagogy across the diversity of students.” (Staff, P160)</p> <p>“It also has raised faculty awareness of the kind of support all types of [URM] students might require, but apparently limited to the extent faculty have directly interacted with John and the program.” (Faculty, P071)</p>
<p><b>Growing Student Talent</b></p>	<p>“A large number of students have been able to tap into and maximize their potential.” (Administrator, P159)</p> <p>“It has allowed brilliant, yet perhaps shy/reluctant, students to blossom and strive to reach their full (and did I mention brilliant!?) potentials. It gives these competent students the confidence and support to reach for and achieve their goals (their impressive and lofty goals).” (Staff, P063)</p>
<p><b>Institutional Change</b></p>	<p>“I think the “extension” programs, where BSP has led other campus discussions and shared lessons learned more broadly, have helped influence other areas of campus. I think those efforts are needed to change the culture beyond the areas that BSP directly controls.” (Staff, P103)</p> <p>“BSP has aided the way I approach admissions for the program I oversee on campus.” (Program Director, P091)</p>

## B. Survey: “Ripples”

Participant responses indicated that BSP had a “ripple” effect on UC Berkeley, influencing not only students in the program but other members of the university community as well. Most agreed (80%; either “True most of the time” or “True some of the time”) that BSP scholars created positive “ripples” in classes and programs. Similarly, most agreed that BSP’s sponsored communities of practice events influenced staff and faculty in ways that created positive “ripples” (71%; either “True most of the time” or “True some of the time”).

**Figure 11. BSP’s Influence Extends Beyond the Program and Creates Positive “Ripples” into UC Berkeley**



## C. Interview: Participant Perception of Change at UC Berkeley

This section of the interview was designed to understand 1) participants’ view of how change occurs at UC Berkeley and 2) how BSP is perceived to influence that change. Participants were shown the 8 images below that we described as representations of how change might occur at Cal, and in the second section, how change may occur as a result of BSP. Of note, the images below were shown without labels or descriptions to avoid priming, and attempt to capture participant’s unadulterated responses.

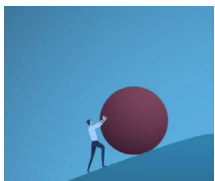
Figure 12. How Change at UC Berkeley Is Pictured



Question posed: “When you think about how an institution changes to become more inclusive and equitable, which of these pictures best represents how change happens at UC Berkeley?”

The following results show the three most frequently selected pictures along with two illustrative quotes for each image.

### Pushing a Ball Uphill



Most participants (60%; 12/20) selected the “person rolling the ball uphill” picture and reported that although there is an effort towards change, it is often a slow-moving process.

“...there’s something about the red ball image with the person that gets the long-term commitment. I just don’t see it as individuals, per se, but a lot of people in that kind of process are about what gets it for me.” (Administrator, P116)

“...it’s definitely an uphill battle. They’re just too many people who have grown up in and become comfortable in a different world. And they’re not so willing to change what they’re doing. I feel what we are trying to do is met with a lot of resistance.” (Administrator, P159)

### People Building a Puzzle



The second most frequently chosen (40%; 8/20) image was the “puzzle.” The consensus was that change at UC Berkeley feels like having all the puzzle pieces on the table, but coordinating individual efforts feels challenging.

“I always feel Berkeley has all these different committees and bodies and they’re all kind of operating somewhat independently and it’s not clear if it [they are working] together, [or] how they synergize... I don’t know how the pieces fit together.” (Faculty, P38)

“I came from a small private place that was much flatter, previous to being at Berkeley. So, the dynamics of how difficult Berkeley is to navigate and the maze. It speaks to me a little bit. And in terms of folks coming from different

departments working together and sort of building change groups and then looking at those puzzle pieces as Berkeley's big, decentralized bureaucracy and trying to put the puzzle together in new in different ways. I guess those are the reasons it speaks to me.” (Staff, P135)

Next, participants were shown the same eight pictures as shown above, but read the following prompt:

Question posed: *“When you think about how an institution changes to become more inclusive and equitable, which of these pictures best represents how BSP has influenced change towards DEI at UC Berkeley?”*

The following results show the top two most frequently selected pictures along with 2 representative quotes for each.

### Im/possible (selected 9x)



The most frequently chosen image was the “Im/possible” (45%; 9/20) image in response to this question. The trend among responses was that BSP was seen as a place where students can overcome challenges and make the “impossible,” possible.

“[BSP] gives students [that are] in a position where they feel like “this is all impossible” and this gives them tools to make it possible.” (Administrator, Po48)

“...just helping students to see beyond the barriers that they may see as “impossible” [and] recognizing that many paths are open to them [and] that they may not have seen.” (Faculty, Po38)

### Building a Puzzle (selected 5x)

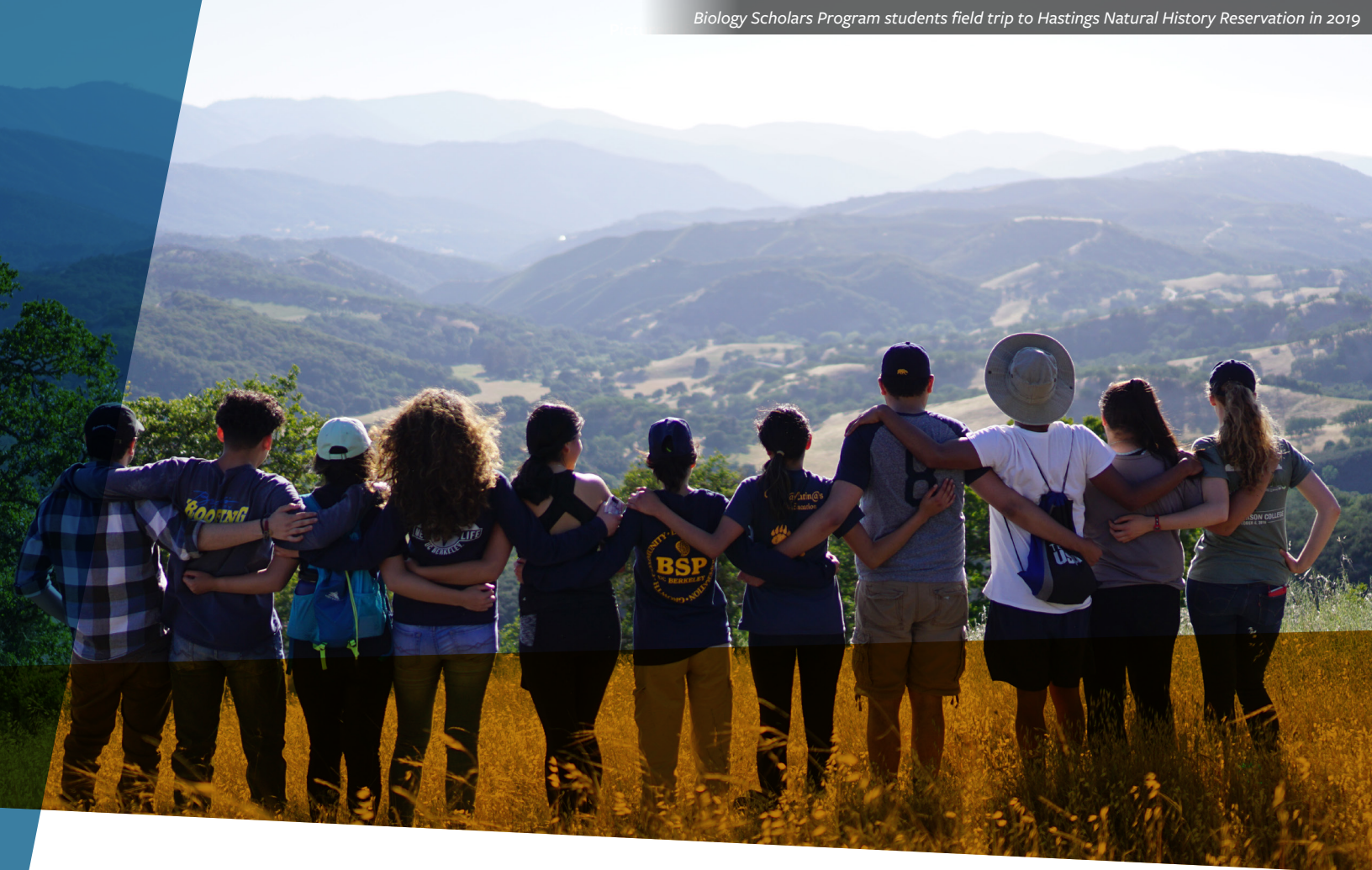


The second most frequently selected image was the “Building a Puzzle” (25%; 5/20) image, which was overall seen as demonstrating diversity and working together towards one goal.

“It takes so many different types of pieces, in order to bring everyone together, and once the puzzles are made into something where the pieces all fit then that’s a way that change will come about.” (Program Director, Po33)

“I think BSP is really supporting a diverse group of students to try to piece the puzzle together.” (Administrator, P159)





## Conclusion and Next Steps

The current mixed methods case study was designed to answer the following question: “*How do student programs contribute towards growing a more inclusive ecosystem in their parent institutions?*” We view this question solely through the lens of the Biology Scholars Program and the scope in terms of its relative impact at UC Berkeley.

Overall, the participant survey and interview responses showed that BSP has had a positive and substantive impact on UC Berkeley. At the same time, the impacts are not direct, and staff, faculty, administrators, and program directors appeared to focus on different types of impacts. Table 13 summarizes key findings and key learnings from this study.

**Table 13.** Key Findings and Lessons Learned

Key Findings	Lessons Learned
<p>Students who “beat the odds” and demonstrate high capacity to succeed convey to faculty, staff, and Program Directors that students with high risk factors can and do prevail when provided with effective programmatic opportunities, such as what BSP offered. As many interviewees stated, BSP showed that the impossible is possible and that students should not be written off as lacking talent. Instead, they should be given the opportunity to grow their talent.</p>	<p>Programs and educators can demonstrate that students (commonly and incorrectly perceived as lacking talent) can grow their talent and excel, even in highly competitive academic environments. Instructors, mentors, and advisors exposed to what is possible are more likely to adopt a growth mindset and find ways to grow students’ talents and gifts.</p>
<p>Administrators often noted how BSP supported students effectively but did not see BSP as actively impacting policy or practices on campus.</p>	<p>Effective programs will not automatically be recognized or elevated in a large institution. Active sharing of impacts and reaching across departments, schools and institutional hierarchies will benefit from intentionality and a comprehensive communication plan. Transparency and generosity in offering an alternative paradigm and value system may increase program influence and generate impacts across time.</p>
<p>Several faculty members noted that their collaboration with BSP early in their career informed how they mentored and taught students throughout their time at UCB. They approached mentorship with more compassion and with an attitude of supporting students, as opposed to hazing them or writing them off.</p>	<p>Faculty and mentors can be actively coached by program leadership to provide culturally responsive and compassionate mentorship to students. Further, this knowledge can inform how they develop and implement curriculum that connects to the cultural diversity of students (e.g., making the “hidden curriculum”<sup>1</sup> more transparent as BSP has done with their scholars).</p>
<p>Program Directors noted how BSP provided a model for their own programs, informing how they set-up and improved how they served students in a variety of disciplines on campus. BSP provided collaboration and support.</p>	<p>Effective training programs can share what they do and how they implement their activities with other program developers and leaders on campus. Sharing best practices accelerates change on campus when each program does not have to make up their own approach. When a successful program leads with generosity and rejects a competitive stance towards other programs, all ships rise.</p>
<p>Staff highlighted the importance of increasing awareness and understanding of the unseen lived experiences that URM and first-generation students face at UC Berkeley among all those who support student success.</p>	<p>Listening to staff and faculty who understand the diverse lived and sometimes challenging experiences of students, especially from first generation and historically underrepresented students, supports student success.</p>

<sup>1</sup> “The unwritten rules and norms that [first generation, first-to college] students are expected to follow and conform to, [which are otherwise] easily navigated by dominant groups (Massey et al., 2022).

## Advancing Institutional Change

There have been many efforts to describe how to shift culture and ideas towards more equitable and inclusive environments throughout the institutional change literature (Weaver, Burgess, Childress, & Slakey, 2016). A common thread of successful institutional models is the practice of organizational learning where information is actively gathered, reflected on, and analyzed to ultimately identify and target problem areas (Weaver, Burgess, Childress, & Slakey, 2016). Central to these efforts is Kurt Lewin's 3 stage Model of Change in which he describes the organization in three transitional forms: "unfreezing," "moving," and "freezing" (Burnes, 2020; Estrada et al., 2016; Lewin, 1947). Each stage can be respectively summarized with the following 1) to identify what needs to change within the institution, 2) to promote engagement from institutional members to make change, and 3) to consolidate the changes across and within the institution (Lewin 1947). There is evidence from the interviews that UC Berkeley "unfroze" in the past 5 years and the result has been increased change regarding the hiring of more ethnically diverse people and more inclusive norms across campus. Many interviewees mentioned the change happening in that time period and regarded it as positive. During a time of unfreezing, there is more opportunity to introduce new policies, practices, and norms, as well as new mindsets and assumptions.

Given this perspective of institutions and institutional change, we hypothesize that the BSP Approach, which rests on the assumption that low-income, first-to-college students' have the ability to succeed in biology at Berkeley, has been and is an equilibrium disruptor of faculty and staff expectations. Scott (2001) has referred to this weakening and gradual replacement of one set of beliefs and practices with new beliefs and practices as 'deinstitutionalization.'

In addition to the program's success and efforts thus far, its perspectives and practices were more passively disseminated throughout the campus (often through students of the program). More intentional BSP engagement with the campus community (e.g., faculty) to share "what is working" could contribute to greater positive impacts on student outcomes at Berkeley. Describing how a program works requires programs to gain deep understanding of the components of their program that contribute to student success. Guidelines or a common set of goals for programs can be shared as well as what factors to consider as flexible when creating environments in which students will thrive. A key characteristic of BSP, as an effective science talent development program, is to nurture both its student community and professional-yet-personal relationships. Concretely, community connection is measured as students spending time and communicating with each other outside of BSP activities, stating they would miss BSP staff and faculty if they were to go away, feeling "closeness" to other BSP students, faculty and staff, and showing time spent with others in the BSP community. This key learning from the over thirty years of running the program is now a measured and valued factor in understanding how to create healthy learning environments for historically underrepresented students (Estrada et. al., 2019).

Given these key observations, the case of BSP can be used to inform the STEM equity community how science training programs can better contribute to their own institutional movement towards greater diversity, inclusion, and equity and provide suggestions on how to more intentionally impact the institutions in which they operate. This study also provides insights into how a program that develops the science talent of its undergraduates can have "collateral benefits" as well for faculty, staff, and administrators that interact with the program. The most significant of which is the understanding of the importance of community in a space that students can call their own.



# Acknowledgments



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## Appendix A

Please click on this [link](#) to view a copy of our HHMI Year 6 “Berkeley Science Initiative” Final Narrative Report or insert the following URL into your web browser:

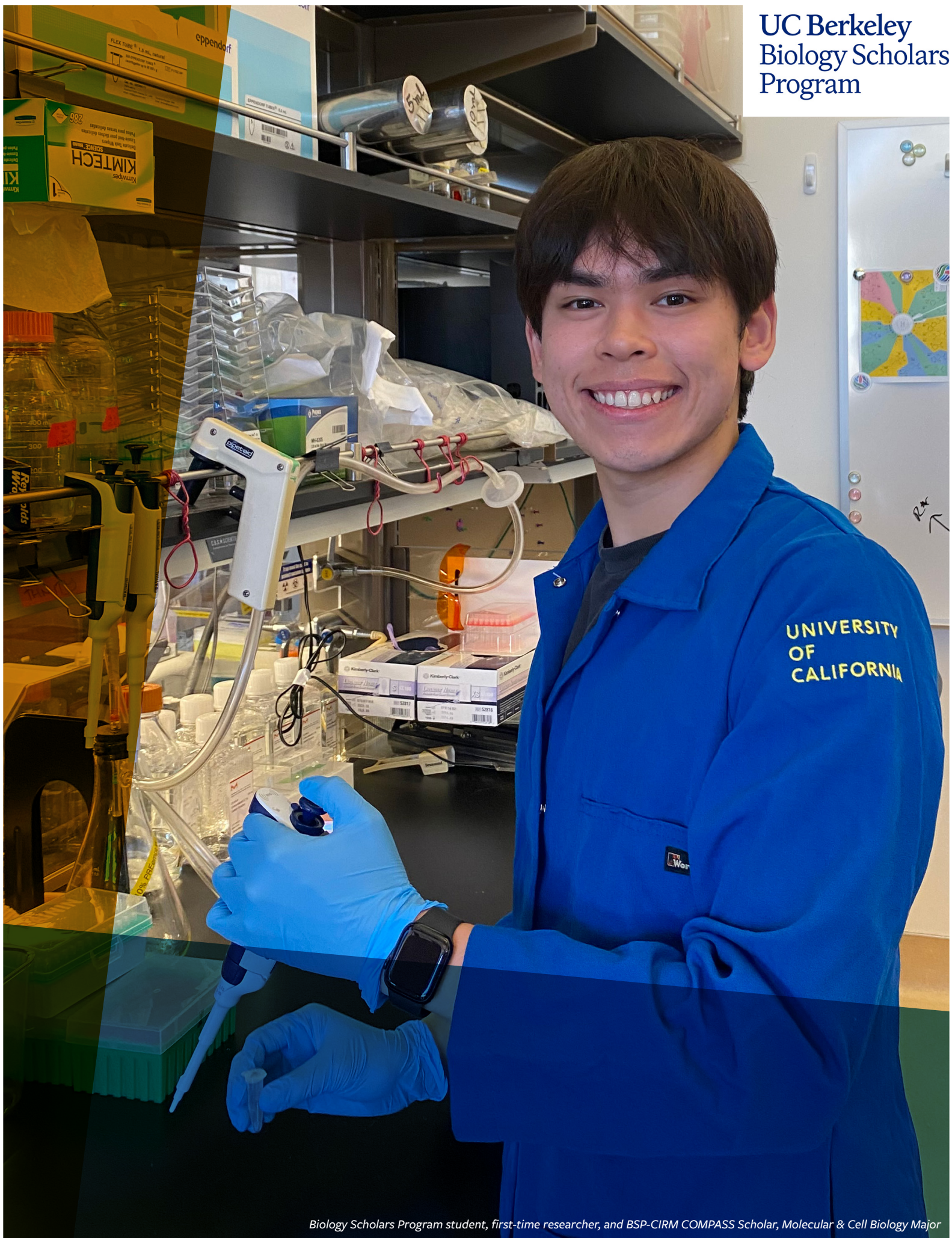
[https://bsp.berkeley.edu/sites/default/files/final\\_appendix\\_a\\_hhmi\\_berkeley\\_science\\_initiative\\_year\\_6\\_final\\_narrative\\_report.pdf](https://bsp.berkeley.edu/sites/default/files/final_appendix_a_hhmi_berkeley_science_initiative_year_6_final_narrative_report.pdf)

## Appendix B

Please click on this [link](#) to view a copy of our survey and interview questions or insert the following URL into your web browser:

[https://bsp.berkeley.edu/sites/default/files/final\\_appendix\\_b\\_bsp\\_real\\_change\\_study\\_survey\\_and\\_interview\\_questionnaire.docx.pdf](https://bsp.berkeley.edu/sites/default/files/final_appendix_b_bsp_real_change_study_survey_and_interview_questionnaire.docx.pdf)

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*Biology Scholars Program student, first-time researcher, and BSP-CIRM COMPASS Scholar, Molecular & Cell Biology Major*