Berkeley | Division of Equity & Inclusion

Berkeley STEM Equity & Inclusion Initiative: Executive Summary

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Division of Equity & Inclusion

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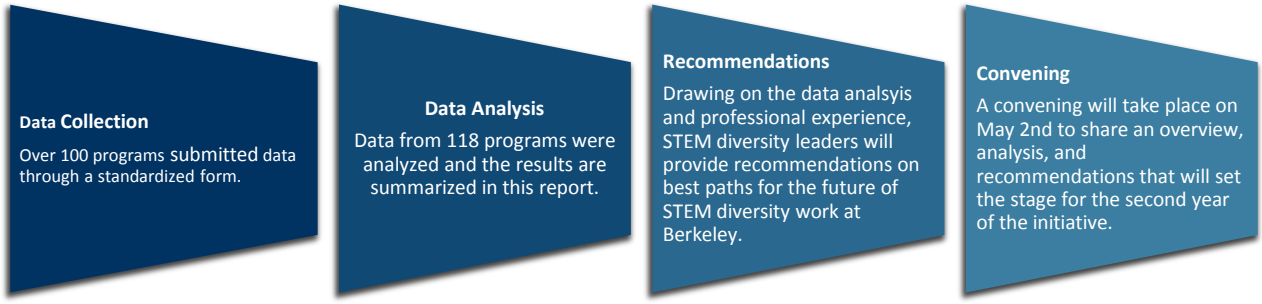
Berkeley STEM Equity & Inclusion Initiative: Overview

The University of California, Berkeley Division of Equity & Inclusion is deeply committed to ensuring that our campus, and indeed our nation, provides opportunities for all members of our communities to pursue opportunities in STEM fields. Towards that end, we have undertaken a new initiative that generates a clearinghouse of STEM diversity programs at the university and supports the campus in creating a campus-level vision for STEM diversity moving forward. By working collaboratively with the many partners and stakeholders doing critical STEM diversity work on campus, we aim to deepen campus impact and strengthen and support UC Berkeley's STEM diversity programs. Shaila Kotadia, the Division's STEM Equity Planning Director, is leading the foundational work for the initiative, which is being implemented in four phases:



Over the first year (July 2016 – June 2017), the planning phase of the STEM Equity & Inclusion Initiative consists of data collection, data analysis, working collectively to build recommendations for the implementation of the initiative, and a convening to disseminate the analysis and recommendations and determine the plan for the second year of the initiative. We seek to learn from the experts that are successfully implementing STEM diversity programs at UC Berkeley and assist these key stakeholders in creating a campus vision around STEM diversity by helping to support and building resources for programs that will better assist the diverse individuals in STEM on our campus.

Berkeley STEM Equity & Inclusion Initiative: Data Analysis Results

To better determine how programs can work more collaboratively, we first needed to gain knowledge of the existing STEM diversity programs offered at or closely partnered with the University of California, Berkeley. A survey was designed to collect data on individual programs, including information on targeted and beneficiary constituencies, targeted underrepresented groups, partnerships, funding, cohort size, longevity, assessment, outcomes, and strengths and weaknesses.

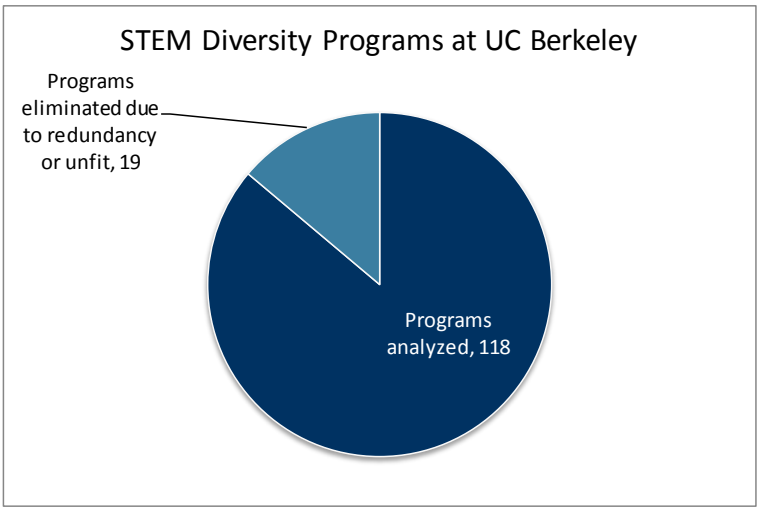
The vast number of programs demonstrates that many colleges, divisions, departments, and individuals are working to create opportunities in STEM for diverse individuals. From the analysis below, programs offer a wide breadth of services with overlap. These results allow a basis to collaborate, leverage collective knowledge, identify unfilled opportunities, and determine a strong vision for an initiative to increase support for diverse individuals in STEM.

The Division of Equity and Inclusion will convene these program leaders and allies to further discuss patterns and trends uncovered through the data analysis and subsequent recommendations. This forum will allow individuals to discuss, network, and connect to improve their programming efforts. In addition, we will collectively determine how to use the data to set a vision for Berkeley's future.

Here, we provide a summary of a subset of the aggregate data, cluster analysis, and a model of themes employed by programs. Additional information is presented in the appendix.

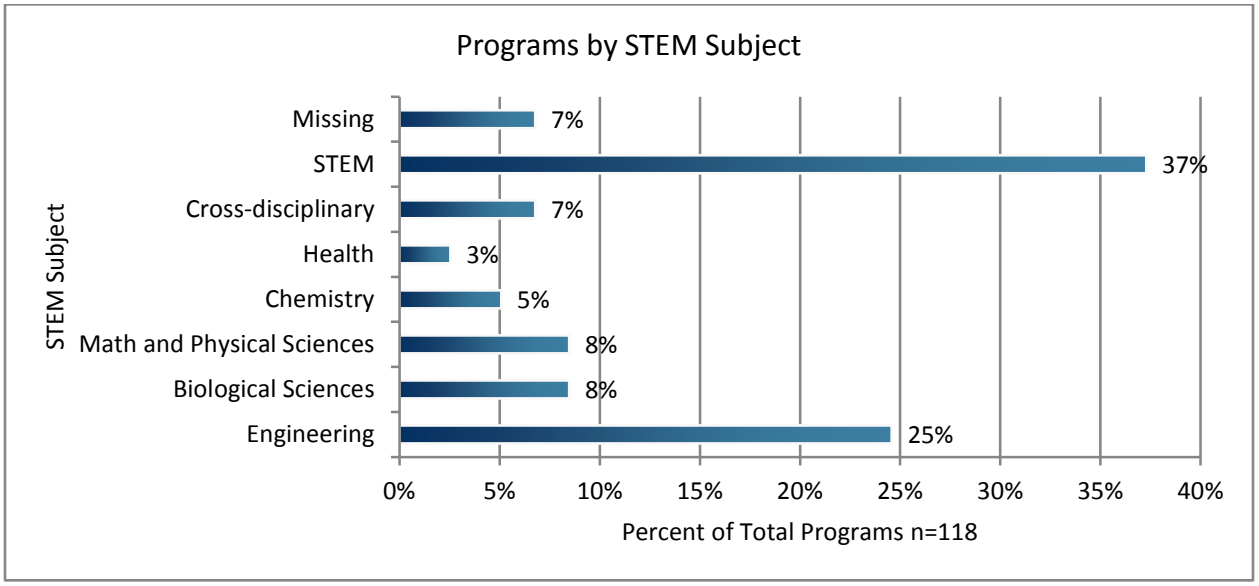
Number of Programs Analyzed

Program developers, coordinators, and directors submitted a total of 137 forms. A total of 118 programs were analyzed. Due to redundancies, programs not geared towards an underrepresented group, or programs not closely connected with campus were not included. If a program targeted an underrepresented group that included but was not limited to STEM individuals, it was included. Additional programs were contacted but did not fill out a form, thus we estimate that at least 150 STEM diversity programs exist on campus.



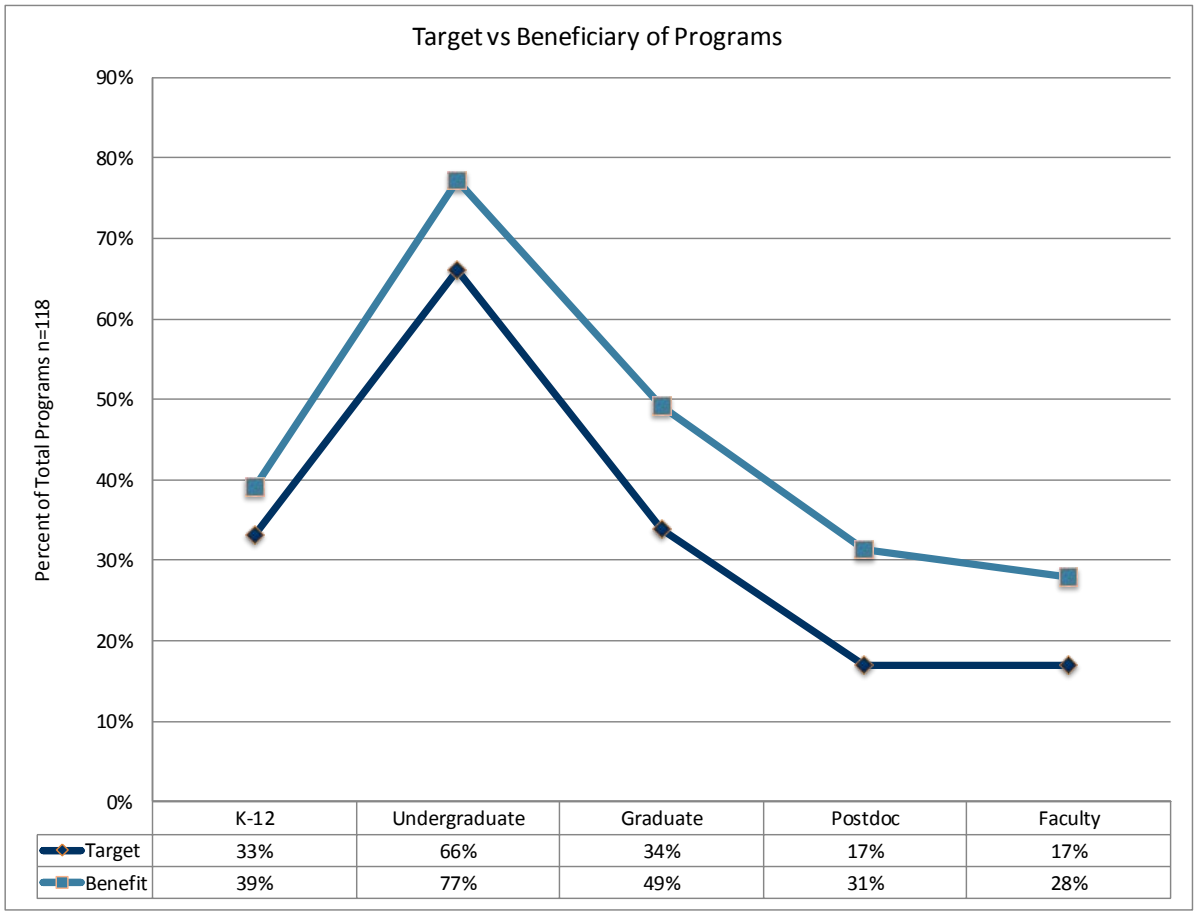
STEM Subject

Respondents were prompted to enter the STEM subject that best fit their program. Based upon the responses, these were then broken down into five categories: engineering, biological sciences, math and physical sciences, chemistry, and health. STEM indicates all fields and cross-disciplinary indicates multiple but not all fields.



Target and Benefit Constituency

All constituencies from K-12 to Faculty were considered when collecting data. Predominantly, the target constituency also benefitted from the program in addition to other categories (e.g. a K-12 targeted program benefits the K-12 and the graduate level due to mentoring opportunities). This results in the trend seen when comparing the two graphs: all levels increase from target to benefit. Notably, this informs the landscape of who programs are predominantly targeting in STEM. Most programs are targeting undergraduates (66%) or benefitting undergraduates (77%) with a stark drop-off as you move to lower and upper levels.

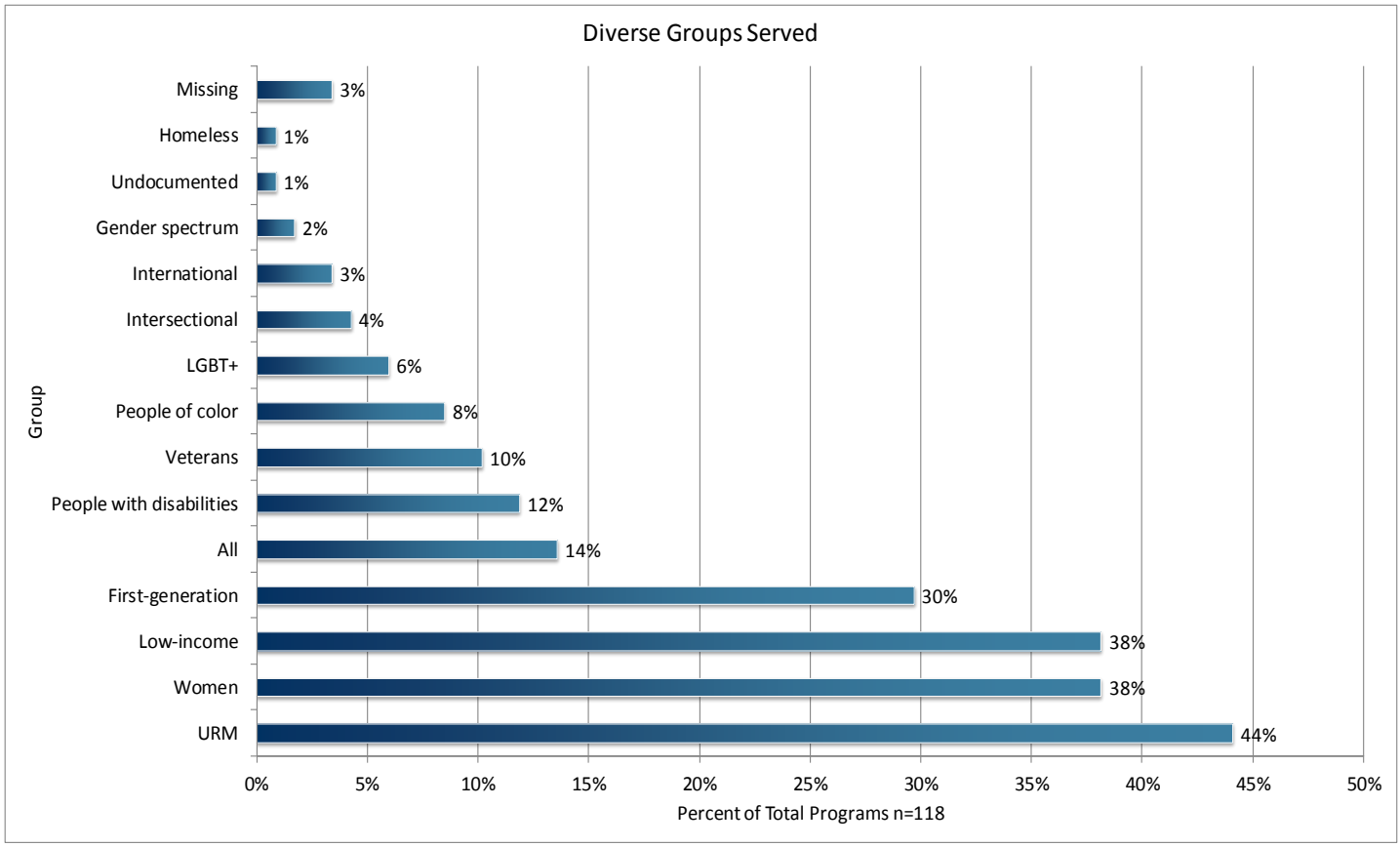


	K-12	Undergraduate	Graduate	Postdoc	Faculty
Target	33%	66%	34%	17%	17%
Benefit	39%	77%	49%	31%	28%

Targeted Underrepresented Group

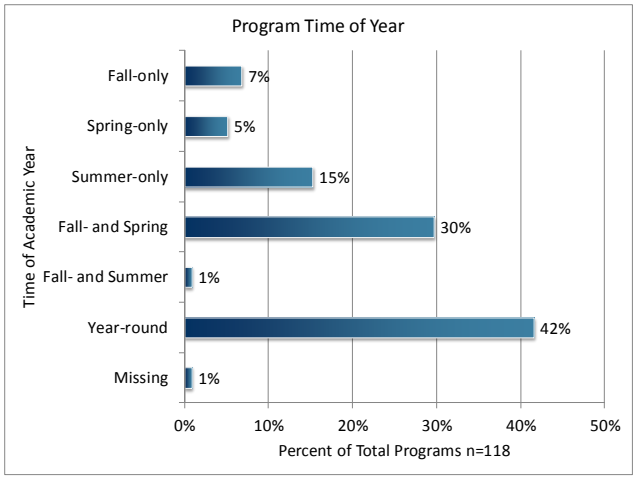
To better understand how programs work to support diverse populations, the survey asked which underrepresented population the program targeted. To not limit any groups that identify as underrepresented, this was an open-ended question asking for all populations served. To recognize the nuances of different groups, the answers were carefully considered, resulting in a wide array of categories. The terminology used to describe the groups was determined by responses received. Many programs listed their targeted population as All and thus were reported as such. A subset of programs specifically looked at intersectional identities resulting in the Intersectional category. Intersectional is not the same as All as it does not necessarily suggest that intersectionality is addressed in the All programs. People of Color is a separate category from underrepresented minorities (URM) as not all people of color are underrepresented minorities and programs stated a distinction between the two. Responses were disaggregated for each program.

While many groups are represented by less than 10% of the programs, there is value to recognizing these populations, as diversity requires this fine-tuned approach in order to be effective. Populations differ from each other and may require different needs and services based on their identity. Thus, lumping groups together does not necessarily recognize that programs targeted to different groups likely take various approaches to specifically serve that group. URM, Women, Low-income, and First-generation individuals are the populations that are being served the most in the programs offered through or at UC Berkeley. However, the breadth of underrepresented groups in STEM goes far beyond these populations.



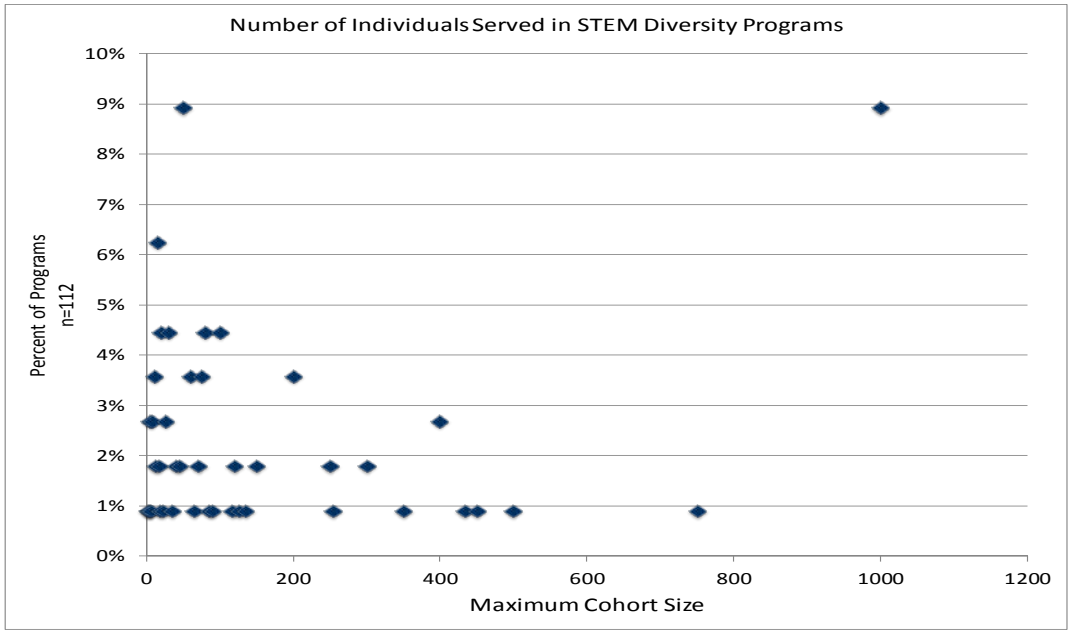
Time of Year

Respondents were prompted to select the time of year their program took place and could select multiple options from Fall, Spring, Summer, and Other, to enter a write-in response. These responses were broken down into six categories: Fall-only, Spring-only, Summer-only, Fall and Spring, Fall and Summer, and Year-round. All other combinations for time of year had zero programs.



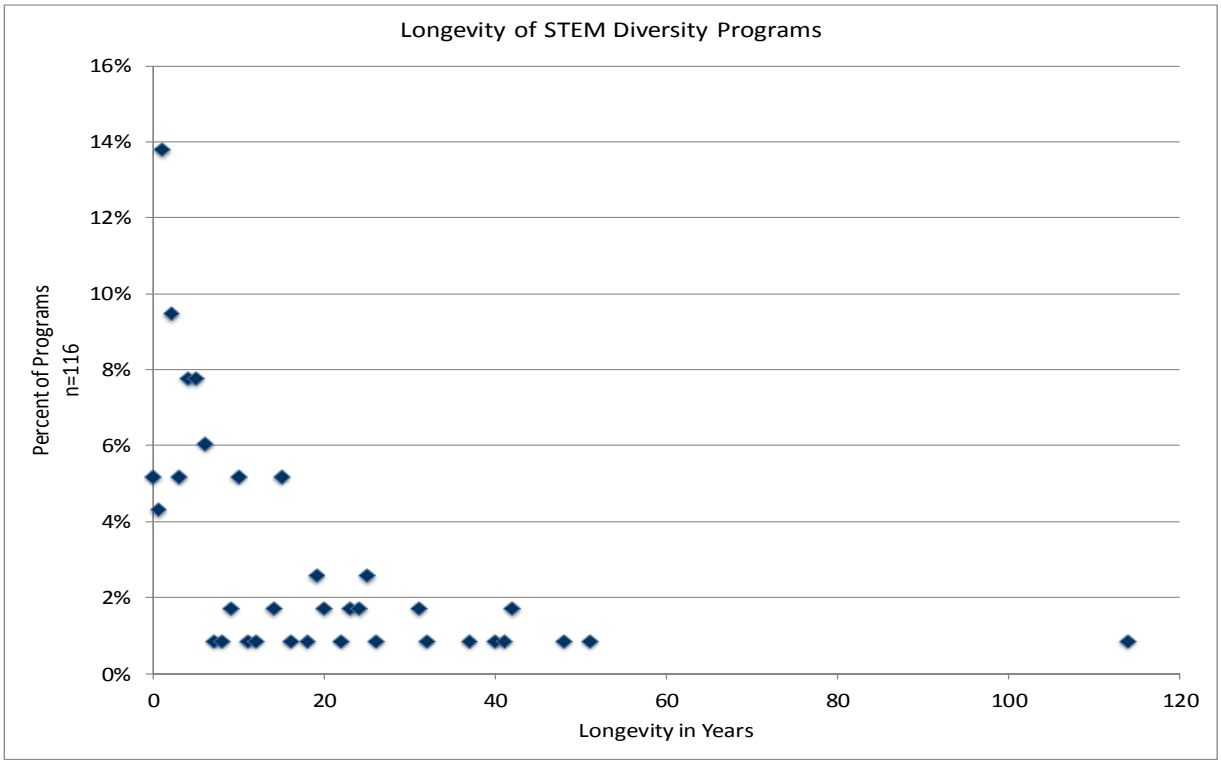
Maximum Cohort Size Served

Programs were asked to report the number of individuals served in a cohort of their program. The maximum number reported was used to analyze the exact distribution of cohort size. Six programs did not provide data. Most programs serve 1-20 individuals (~26%) and nearly an equal amount of programs serve groups of 21-50, 51-100, and 101-999 individuals (~20% each). This suggests that most programs can only serve the needs of a limited number of individuals and scaling programs to a larger size may be a common barrier.



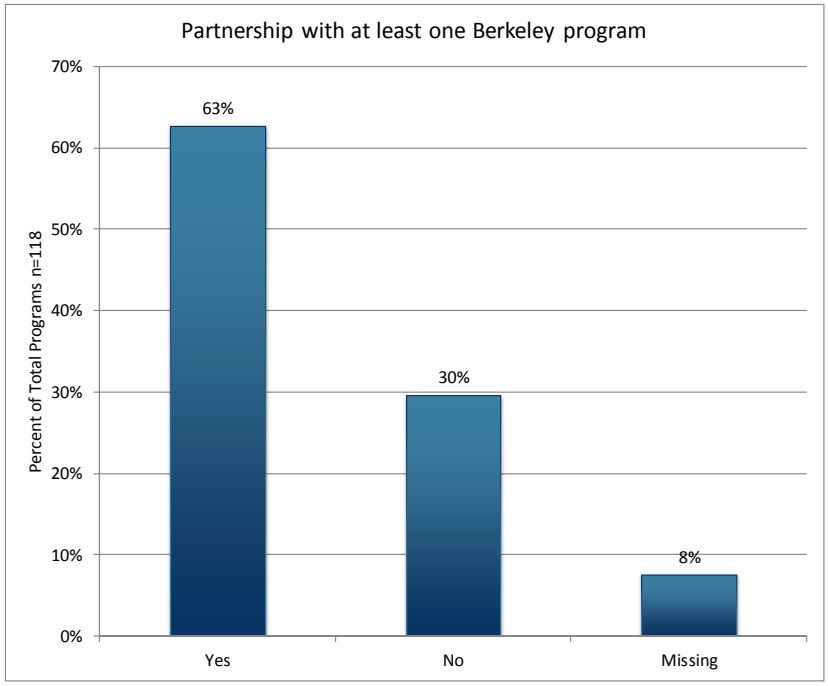
Longevity of Programs

Programs reported the year of their founding. From this response, the longevity of the program in years was determined and the exact distribution is reported. Two programs did not provide data. Six programs are still in the idea stage and thus are reported as zero years and five programs were in the midst of their first year and thus reported as 0.5 years. The rest of the programs were reported as a whole number starting at 1 year. One-third of programs have been in existence for 0-2 years and greater than half (~53%) have been in existence for 0-5 years with a general decreasing trend of longevity. This suggests a high turnover of programs and a possible resulting loss of strong work, resources, and tools for increasing STEM diversity.



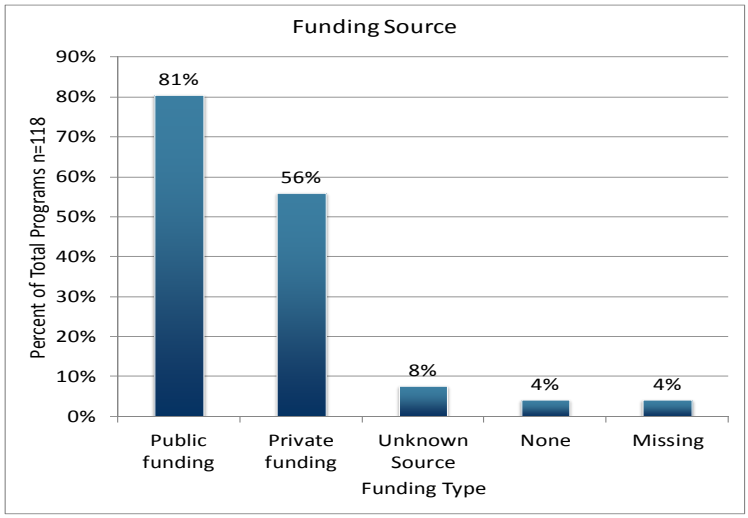
Partnerships

Given the above results that many programs are servicing similar STEM subjects, academic levels, underrepresented groups, etc., partnerships between programs is predicted to occur. The survey allowed programs to write-in partnerships by their own definition. The responses led to a recognized pattern of multiple partnerships for many programs both within and outside of Berkeley. To better determine the landscape at UC Berkeley itself, the percentage of programs that partner with other programs on campus was quantified. Surprisingly, 30% of programs do not have any campus partners and an additional 8% of programs had missing data on partnerships. While this is the case, qualitative assessment of partnerships shows that programs have an overall positive attitude about partnerships, desire to expand existing partnerships, and want to build new partnerships. A more in-depth social network analysis of on campus partnerships is presented in the appendix (See: Social Network Analysis for Partnerships in Appendix).

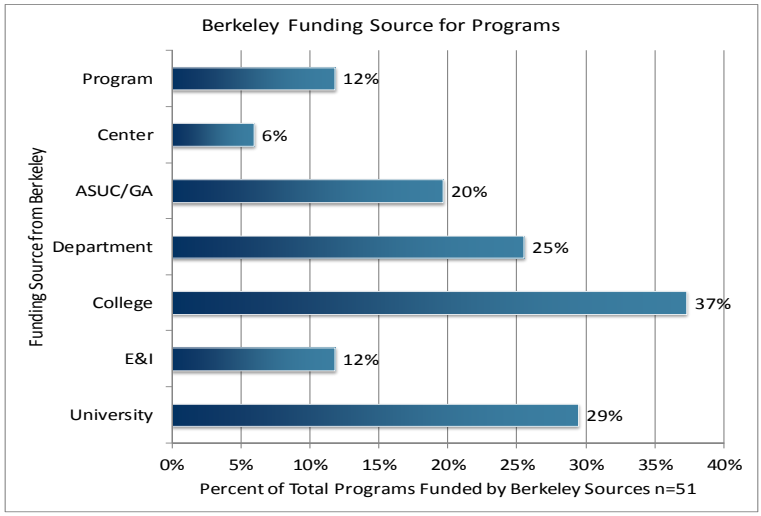


Funding

To determine how programs are being funded, an open-ended response prompted respondents to list their funding sources and the length of funding. While the length was less frequently reported, those that did respond generally ranged from one-year to five-year cycles of funding and reported a difficulty of sustaining funding (thus correlating with the data for Longevity of Programs discussed above). Funding sources were broken down into two main categories, public and private. Public funding consisted of internal Berkeley funds (see Berkeley Funding Source for Programs below), funds from the University of California Office of the President (UCOP), and federal, state, or district funds. Federal funds were predominantly from National Science Foundation grants and were overall the largest source of funding. Private funds consisted of public and private donations, foundation grants, and client-based fees for services. A large portion of private funding comes from industry and corporations.



Of the 118 programs, 51 programs receive funding from an internal Berkeley source. These sources include funding from another campus program, a center located on campus, Associated Students of the University (ASUC)/Graduate Assembly (GA), departmental funding, college-level funding, the Division of Equity & Inclusion, and more general university funds. This shows that funding is redistributed across the campus for nearly half of the programs analyzed.



Overall, qualitative assessment shows that most programs have different funding mechanisms and multiple funding sources. These data suggest that more detailed funding through campus channels needs to be assessed and, given that funding was reported to be unstable, discussion concerning program collaboration to gain long-term funding is of use. Seeking out larger amounts of funding from one or two sources in a collective effort may be of greater use than each program seeking out smaller amounts of funding from multiple sources.

Cluster Analysis

Programs were clustered based on similarities for the above data categories. Programs were scored based on which subcategories they served for STEM Subject, Target Constituency, Benefit Constituency, Targeted Underrepresented Group, Time of Year, Funding Sources, and Berkeley Funding Sources. Additionally, programs were analyzed for similarities in the number of Partnerships Internal to Berkeley. Cohort Size and Longevity were measured and compared by actual values. Programs were then cross-compared for similarities between all of these categories. The more similar two programs are to each other, the more likely they are to cluster together on the dendrogram below. The dendrogram can then be broken into specific clusters to identify programs that are most similar and the factors most common to each cluster.

The cluster dendrogram resulted in six clusters as follows (for a list of programs in each cluster, see: Programs in Clusters in Appendix):

Cluster 1: Larger and newer programs, overwhelmingly concentrated in STEM. Almost all programs target and benefit undergraduate students, and many include graduate students as well. These programs focus on low-income, first generation, or everyone. These programs have a higher likelihood of UCB partnership; are mostly funded by donors and UCB, particularly individual programs and colleges. Almost all programs run in the spring and fall; summer is uncommon. One of the larger clusters (n=23).

Cluster 2: Larger and older programs, spread across many subjects with a plurality in STEM. Primarily target and benefit graduate students, but often include other populations. Focus on women, URMs, or all groups. The programs have a medium likelihood of UCB partnership and the highest likelihood of UCB funding especially from the departments. Many programs run year-round, some not during the summer. Largest cluster (n=27).

Cluster 3: Smaller and medium-aged programs mostly concentrated in engineering or STEM. Overwhelmingly target and benefit K-12, particularly low-income or first generation. The programs have the lowest likelihood of UCB partnership. Wide variation in funding, but UCB is most common with the plurality of that funding coming from the colleges. Middle-sized cluster (n=20).

Cluster 4: Medium-sized and oldest programs, concentrated in STEM. These programs primarily target K-12 and undergraduate students, with benefits accruing to all populations. Focus is on URMs, low-income, women, and first generation. Almost all programs in this cluster are UCB-partnered. Funding sources are broad, with UCB (from the university itself) donors, and the federal government being the most common. Many programs run year-round, with some excluding summer. Medium-sized cluster (n=19).

Cluster 5: Medium-sized and medium-aged programs, spread across subjects with a plurality in engineering. All of these programs target and benefit undergraduates, and focus on URMs or all groups. These programs have a lower-likelihood of UCB partnership, with most funding coming from the federal government. Most programs run one or two semesters, with summer being the most common. Smaller cluster (n=16).

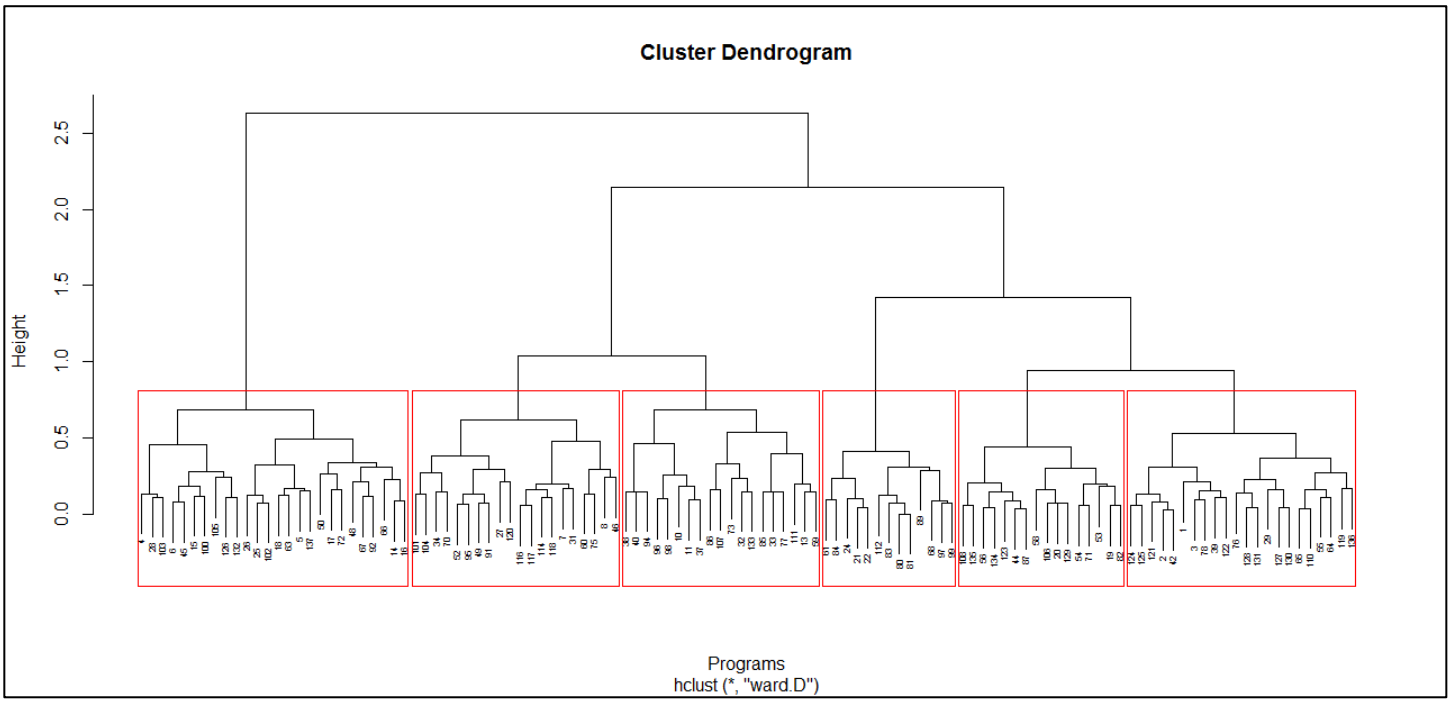
Cluster 6: Medium-sized and newer programs, overwhelmingly concentrated in engineering. Nearly all programs target undergraduates, with a heavy focus on low-income, first generation, URMs, and women. Most veterans' programs are in this cluster. Programs in this cluster have a medium likelihood of UCB partnership, with most funding coming from UCB (through the colleges) or industry. Most programs run one or two terms, with the fall being most common. Smallest cluster (n=13).

Cluster analysis and dendrogram completed by Kevin Griffith, a Research Analyst in the Berkeley Resource Center for Online Education (BRCOE).

This clustering signifies a new method to motivate how programs could begin to collaborate. Most apparent, programs can seek out other programs in the same cluster to develop new partnerships[1]. Programs reaching out to a different cluster indicate another

[1]Notably in some instances, the same program developer entered multiple programs that ended up in a single cluster.

possible way to share resources through commonalities between clusters and consider new approaches to grow their efforts based on differences between clusters. This approach relates to self-reported strengths and weaknesses (see: Strengths and Weaknesses in Appendix) that were found to be complimentary between programs. Finally, comparing the aggregate data to the clusters uncovers new opportunities to fill (e.g. no clusters were identified to target and/or benefit postdocs or faculty suggesting room for growth in these areas and doing so by building upon efforts that exist as indicated by the aggregate data).



Modeling Themed Outcomes

Five major themes arose when qualitatively analyzing the self-reported outcomes of the programs. All programs address at least one of the themes and most programs address multiple themes:

Student Learning: assistance that allows underrepresented students to fit into the current STEM environment through increasing student learning performance

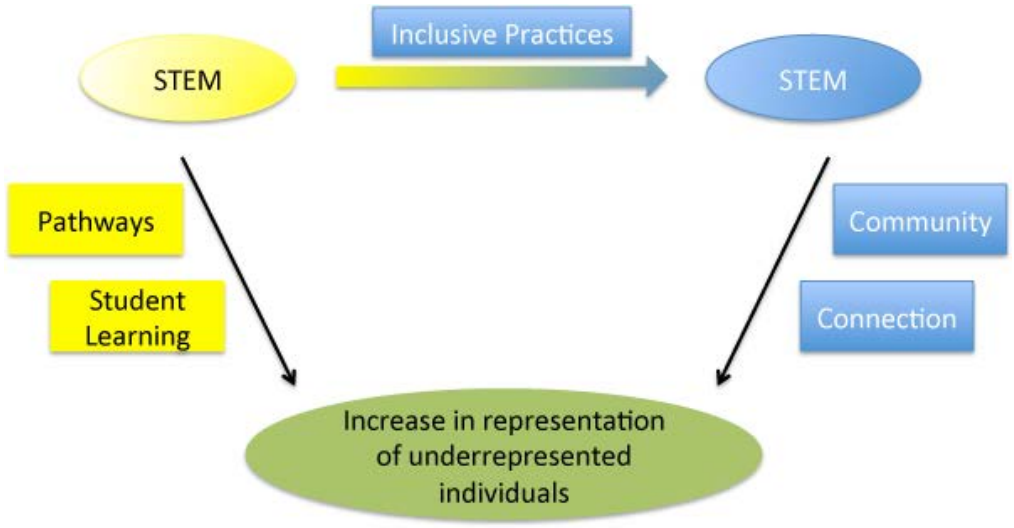
Pathways: assistance that allows underrepresented individuals to fit into the current STEM environment by providing research experiences, professional development, and networking opportunities

Community: assistance that allows underrepresented individuals to better gain a sense of belonging and identity in STEM

Connection: assistance that allows underrepresented individuals to connect their research to real-world societal issues

Inclusive Practices: assistance in the transition to a cultural shift of equity and inclusion in STEM

By addressing these themes, the analyzed programs are changing the STEM environment as modeled below. On the left is the STEM environment (in yellow), as it exists now. On the right is the STEM environment (in blue) re-envisioned as diverse, equitable, and inclusive. The **Pathways** and **Student Learning** themes used by STEM diversity programs assist underrepresented students to fit into the current STEM environment. In addition, STEM diversity programs provide **Community** and **Connection** that are often missing from the current STEM environment and are crucial to the re-envisioned STEM environment. In order to achieve a complete transition from the current STEM culture to a more equitable and inclusive STEM culture requires a shift to **Inclusive Practices** for all members of the STEM community. By achieving success in multiple, if not all, of these five areas, STEM diversity programs demonstrate successful outcomes through increased representation of underrepresented individuals at all levels, amongst other positive outcomes.

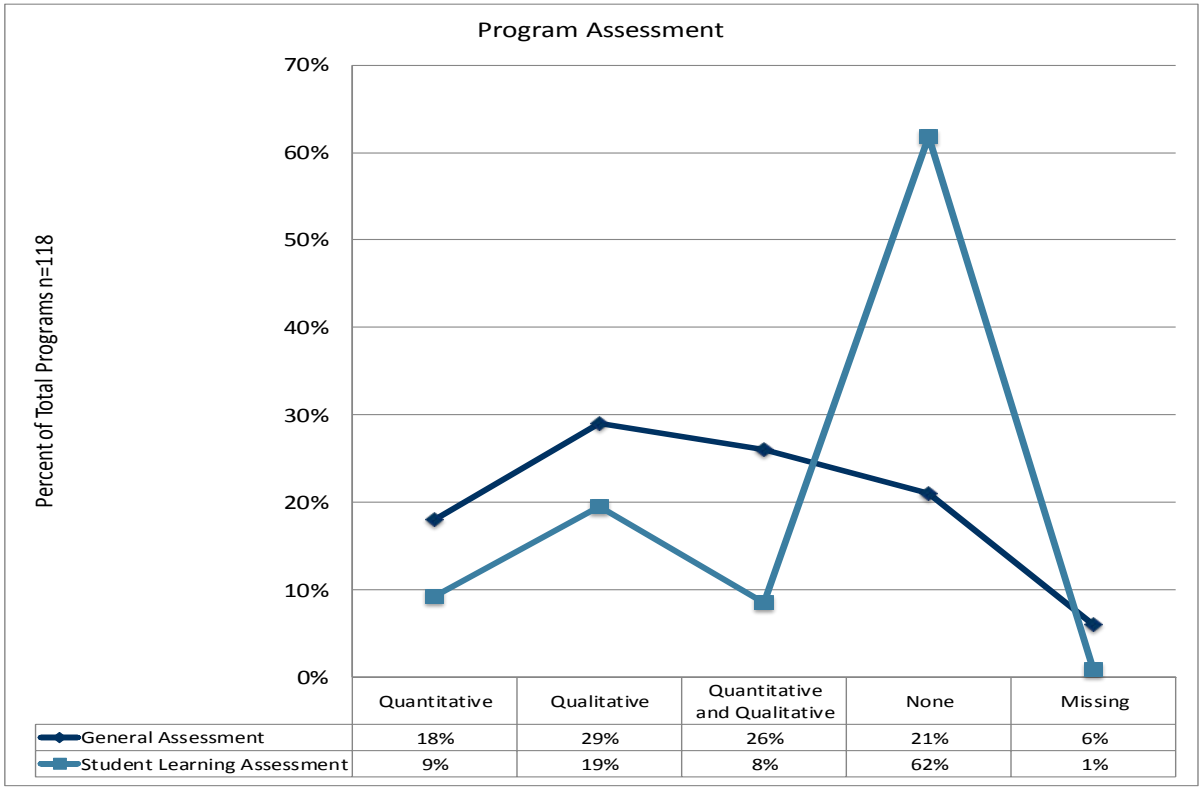


Berkeley STEM Equity & Inclusion Initiative: Appendix

The appendix provides additional analysis of aggregate data, campus partnerships, and a key for the cluster analysis above.

Assessment and Outcomes

Respondents were asked if they conducted general assessment or student learning assessment for their programs with no additional specific prompts. These answers were determined to be Quantitative, Qualitative, or both Quantitative and Qualitative. Programs also responded that no assessment is conducted or the data collected was missing. While general assessment is conducted for most programs, student learning assessment is not. This difference likely reflects that many programs do not have student learning goals embedded into their framework. Self-reported outcomes from assessment were generally qualitative. These outcomes were used to generate the model above (see: Modeling Themed Outcomes in Data Analysis Results).



	Quantitative	Qualitative	Quantitative and Qualitative	None	Missing
General Assessment	18%	29%	26%	21%	6%
Student Learning Assessment	9%	19%	8%	62%	1%

Strengths and Weaknesses

In qualitatively assessing the self-reported strengths of programs and what programs wanted to work on, it was clear that these become increasingly complimentary. By formulating common categories where programs maintain different partnerships, use different methods for recruitment, have different funding sources, express different strengths, etc., the opportunity to work collaboratively to leverage everyone's efforts and fill existing gaps and opportunities becomes strong.

Social Network Analysis for Partnerships

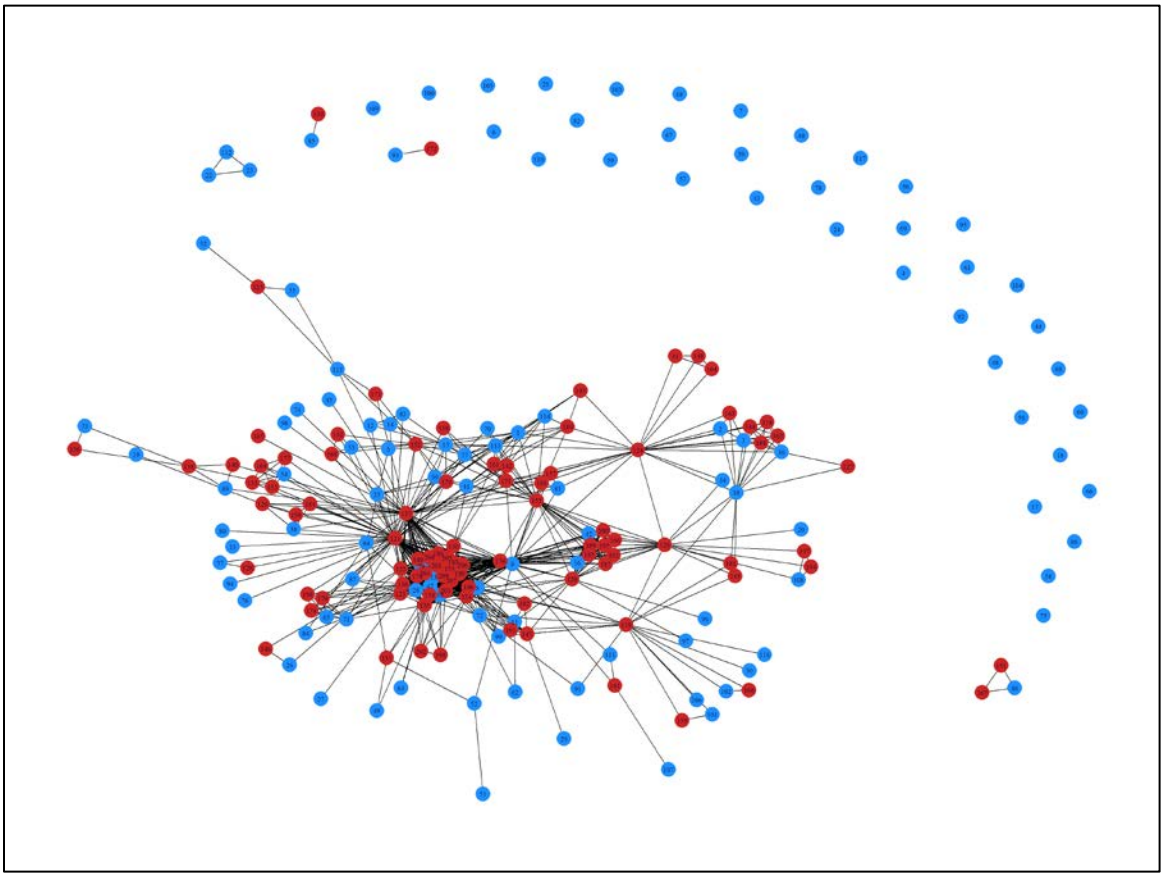
To further dissect patterns of partnerships on campus, a social network analysis was performed for programs analyzed and any indicated Berkeley partners specifically named. Programs listed partners as they saw best fit, which could include formal or informal

partnerships and did not take into account the strength of each partnership. For ease, some partners were grouped (e.g. academic departments, faculty, labs, etc.). Blue dots indicate the programs submitted for analysis and red dots indicate additional campus partners.

Unconnected blue dots indicate programs with no campus partnerships. Blue dots connected to other blue dots show that programs analyzed are partnering, although these often occur in a two-way partnership rather than multiple programs working collectively together (linear lines between two blue dots are more common than clusters of blue dots). Blue dots connected to red dots show programs analyzed partnering with additional campus partners that may or may not be specifically STEM diversity programs. Some clustering of the red dots indicates that multiple programs are partnering with similar campus entities (most common are academic colleges, academic departments, individual faculty, and student organizations). Red dots connected to other red dots indicate common partnerships through the programs analyzed. These connections do not necessarily mean that these additional campus partners are directly partnering with each other absent of the programs analyzed, as additional campus partners were not surveyed for partnerships.

Overall, partnerships vary greatly across programs and no definite pattern was seen through this analysis. However, the interconnected nature of the majority of the programs analyzed shows that cross talk exists. This also suggests that there exists an opportunity for a more coordinated approach between partnerships across campus for both programs analyzed and additional campus partners. In order to better understand the true nature of partnerships, a deeper and clearer analysis of partnerships is necessary.

Social network analysis and diagram completed by Kevin Griffith, a Research Analyst in the Berkeley Resource Center for Online Education (BRCOE).



Programs in Clusters

As reported in the Cluster Analysis (see: Cluster Analysis in Data Analysis Results), six clusters were found. Below lists all programs in each cluster. All program names appear as entered by the submitter.

Cluster 1:
Berkeley Compass Project
Haas Scholars Program
UROC - Underrepresented Researchers of Color
American Indian Science and Engineering Society
EOP STEM Mentorship Program
Miller Scholars Program
oSTEM @ Berkeley
From Day One
Latinx and Native American STEM Living Theme Program
Communicating Ocean Sciences (EPS and IB c100); Communicating Climate Science (Geog 147); Faculty Learning Program (Redefining the College Lecture)
FEM Tech Talk, Make and Share
Intercultural awareness & effectiveness
LAGSES
Bergeron Scholars Program
UC LEADS
Hutto Patterson Fellows Program
MCAT Prep Scholars Program
Python Bootcamps
NERDtopia diversity STEM research conference
STEMinist
Optimizing STEM Student Success Class
Chican@s/Latin@s in Health Education

Cluster 2:
Restorative Circle Practice
Identity and Gender Spectrum (IGenSpectrum)
Women in Technology Leadership Round Table
Iota Sigma Pi - Hydrogen Chapter
Respect is Part of Research
Women in Chemistry Initiative (WICI)
Society of Women in the Physical Sciences
Unconscious Bias Project at Berkeley
President's Postdoctoral Fellowship Program (PPFP)
Berkeley Chancellor's Postdoctoral Fellowship
Graduate Women of Engineering
Office for Faculty Equity & Welfare
PMB Diversity Committee
EID Innovation Award - IB/MCB Luncheon Series
Coalition for Excellence and Diversity in Math, Science and Engineering
Chembio & QB3
Graduate Diversity Council
Channels Program
PMB

The Noetherian Ring
Student Diversity Committee
Master of Engineering
OPEN (Opportunity for Postdoc Equity Networking)
NSF Bridge to the Doctorate (B2D)
California Alliance
MPS Diversity Office

Cluster 3:
BERET +C
Cal Teach
Intercultural Awareness and Communication: Skills for Effectively Engaging with Difference
Berkeley Girls in Engineering
NanoBears
California Outdoor Engagement Coalition
CEP for Oakland Promise
Code 510
Bridging Berkeley
The Berkeley NanoLab High School Intern Program For Young Women
Society of Physics Students - Outreach
Products & Services
CCASN - College and Career Academy Network
METALS (Minority Education Through Traveling and Learning in the Sciences); developed as part of the SF-ROCKS program at San Francisco State University
Pre-College Academy
Engineering for Engineering Kids (E4K)
Mini-University
Engineering Day
SWE Overnight Host Program
PreK-12 programs and resources

Cluster 4:
Biology Scholars Program
McNair Scholars Program
Bay Area Scientists in Schools (BASIS)
Multiverse
TechHive
NSF Summer Research Experience for Undergraduates (REU): Integrative Biology at UC Berkeley, from Molecules to Ecosystems
Berkeley Science & Math Initiative
Coalition for Education and Outreach
Expanding Your Horizons (Berkeley chapter)
University-Community Links (UC Links)
SMASH Berkeley
Scientific Adventures for Girls
PDP Gateway Courses and Pre College
GiGS (Getting into Graduate School)
Upward Bound Math-Science
African American Male Pipeline Project/ Womyn In STEM Education
DaVinci Camp Summer Institute

Be A Scientist
Berkeley Science Network & Berkeley Science Connections

Cluster 5:
BioEngineering Guaranteed Research Opportunities program (BEGROw)
Undocumented Student Program
Transfer Alliance Project - NIH Bridges to Baccalaureate program
Opto-Camp
Research Experience for Undergraduates (REU) Program
TRIO
CS Scholars Program
Center for Sustainable Polymers Summer Research Program
UC- Berkeley, Historically Black Colleges and Universities Research Experiences for Undergraduates Program
Cal-ADAR: Advancing Diversity in Aging Research
Enhancing Diversity Biomedical Data Science
Undergraduates in Engineering, Mathematics & Applied Science Mentoring Program
NSF CAMP
Visiting Scholars Program
Berkeley Science Network-Leadership Program
Berkeley Edge

Cluster 6:
Engineering Scholars as Engaged Scholars
Pre-Engineering Program (PREP)
T-PREP (Transfer Pre-Engineering Program)
Chemistry Scholars Program
PER-CNR
Center for Energy Efficient Electronics Science Research Experiences for Undergraduates (E3S REU)
Transfer- to- Excellence Program
E3S-Internship
Chem1A Section 4
Summer Seminar
Engineering Preview Day
Bay Area GPS (Graduate Pathways to STEM)
CEE ScholarsCluster 6:
Pre-Engineering Program (PREP)
T-PREP (Transfer Pre-Engineering Program)
Chemistry Scholars Program
PER-CNR
Center for Energy Efficient Electronics Science Research Experiences for Undergraduates (E3S REU)
Transfer- to- Excellence Program
E3S-Internship
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