AHORA

Alliance for Health Opportunities Research Advancement

Charting a Path for Underrepresented Minority Success in Biomedical and Behavioral Research Careers

Project Report

NCLR ▲ CSULB
CENTER FOR LATINO COMMUNITY HEALTH,
Evaluation & Leadership Training

CALIFORNIA STATE UNIVERSITY
LONG BEACH

Charting a Path for Underrepresented Minority Success in Biomedical and Behavioral Research Careers

Project Report

Authors:

Britt Rios-Ellis, Ph.D.
Guido Urizar, Ph.D.
Paul Buonora, Ph.D.
Gino Galvez, Ph.D.
Mara Bird, Ph.D.

Table of Contents

I. Report Outline

Background Statement

Despite comprising over 30% of the U.S. population,[1] Latinos, African Americans, Pacific Islanders, and Native Americans represent only 14% of earned scientific bachelor's degrees in the biomedical sciences - compared with 81% for their non-underrepresented student (non-URS) peers (i.e., White & Asian American).[2] This pattern continues in graduate school with only 6% of scientific doctorates awarded to UR graduate students (URGS), compared to 74% for non-URGS.[3,4] The statistics do not reflect a lack of interest since recent national data demonstrates that, relative to their peers, underrepresented students (URS) show comparable percentages of strong interest in biomedical science and in pursuing scientific majors.[5] Increasing the participation and success of URS in biomedical and behavioral research training contributes to the economic and physical health of the nation by expanding the talent pool, enhancing innovation, and improving the nation's global economic leadership.[6]

Overall Literature Review

Many factors contribute to the attrition of URS from the biomedical and behavioral research career pipeline. Governmental agencies and educational institutions recognize the need to create significant changes in institutional infrastructure and programming to increase the engagement and retention of underserved students in the biomedical and behavioral science disciplines. The *NIH Working Group on Diversity in the Biomedical Research Workforce* specifically recognized the need to strengthen the infrastructure of under-resourced institutions, such as minority serving institutions, with a documented track record of supporting the development of URS.[7]

A number of factors influence entry, retention, and matriculation in biomedical and behavioral degree programs. Lack of programmatic support often results in students switching majors, and approximately half of all undergraduates with initial interest in the sciences change majors within two years of study due to the rigors of entry-level courses in chemistry, biology, and quantitative methods.[7] The rate of science major completion for URS is even lower (only 24% who begin college as science majors complete a bachelor's in science within six years of college entry compared to 70% for non-URS).[8,9] First generation-educated URS, in particular, are at risk of not completing their science major (62% do not complete degrees vs. 35% of students with at least one parent with a bachelor's degree or higher).[10] Lack of parental role models in higher education, combined with living in lower income households that require URS to contribute to their family's economic survival, make

it difficult to balance work and school and limits student engagement in on-campus activities.[11] As such, innovative programs honoring URS life contexts are critical to engage students in the sciences. *These data highlight the need to identify factors that increase the success of URS earning degrees in the biomedical sciences.*

Institutional factors that affect the retention of URS in biomedical science majors include training opportunities that may not be available in minority serving institutions (MSIs), such as Hispanic Serving institutions (HSIs), Historically Black Colleges and Universities (HBCUs), and Asian American and Native American Pacific Islander-Serving institutions (AANAPISIs). Studies demonstrate consistently that students who attend "higher status" institutions (usually measured by level of competitiveness for admissions) are more likely than their counterparts to develop the identities, attitudes, and skills that will prepare them for their career paths.[12] These results may be a function of existing institutional infrastructures and normative contexts (e.g., infrastructure support for faculty preparing students for graduate training, and peer expectations for continuing on to graduate school) for promoting graduate education in the sciences that are compelling socializing factors in determining student success.[13] URS are much less likely than non-URS to attend "high status" institutions or those that open "status opportunities" for graduates.[14] In fact, URS who earned an undergraduate degree in the sciences are more likely to have graduated from a MSI than one of "high status", especially among first generation-educated ethnic minority students. In addition, URS who attend highly selective institutions tend to have lower graduation rates and grades than their non-UR peers with comparable academic preparation and socioeconomic backgrounds.[15] Considering that URS are less likely to attend and graduate from "high status" schools, there is an opportunity to strengthen MSIs to provide the critical research environment, support, and opportunities URS need to pursue careers in the biomedical sciences.

Many institutional and student factors, such as campus climate and student disengagement, contribute to the "underperformance" observed among URS in "high status" institutions. Studies show that URS persistence in the biomedical sciences decrease in academic environments that lack institutional diversity (among both faculty and students) and in those that are highly competitive.[16] In addition, URS who feel isolated and do not receive peer support at their respective institutions show lower levels of commitment to the science field both during and after college.[16] Finally, several contextual and cultural factors faced by first generation-educated URS lead to lower degree science completion rates. These include lack of family understanding and support for pursuing graduate school (can occur for URS with non-native English-speaking parents who have received little to no culturally-relevant information regarding the meaning of higher education), socioeconomic adversity (having to balance work and school to help support themselves and their families),

and lack of faculty and student role models to proactively navigate and pursue training opportunities leading to increased aspirations for graduate school.[13,18,19] *Given the unique factors related to lower retention rates of URS in the biomedical sciences, transformative institutional programs that directly address these issues for URS engagement and success are needed.*

Governmental agencies and educational institutions have long recognized the need to create clear changes in institutional infrastructure and programming to increase the engagement and retention of URS in the biomedical sciences. Previous studies have found that offering undergraduate students research opportunities makes a difference not only in attracting and retaining science majors but also in facilitating students' classroom learning by introducing them to what science research careers entail.[10,20,21] For example, URS participating in a health science research program in their first year of college were over 60% more likely to persist in their major than those who did not participate in such programs.[22] Campus research programs and opportunities reveal increased engagement, retention, and preparation of URS in the biomedical sciences by enhancing knowledge and comprehension, promoting self-identity as scientists, developing confidence in applying their research skills in diverse settings, and clarifying graduate school or career plans.[23,24]

Another important component for promoting URS engagement in the biomedical sciences includes understanding student motivators for pursuing science careers. Specifically, findings from an NIH initiative on *Research to Understand and Inform Interventions that Promote Research Careers* identified four key motivational factors for predicting successful URS engagement and pursuit of research careers: mindset, interest, sense of belonging, and science identity.[25] Studies show that programs designed to promote students' mindsets, or beliefs about themselves and what leads to success in science, have powerful effects on students' perceived ability to develop strong academic identities.[26] Moreover, classroom and research training opportunities that help URS experience and develop interest in the sciences are critical for sustaining motivation in pursuing biomedical research careers.[26] Yet, URS often experience unsupportive and discriminatory campus climates that affect their sense of belonging in the sciences. Additionally, an unsupportive campus climate inhibits the integration of families and cultural identities with their emerging identity as a scientist.[13,28,29] URS then lose interest in science, often switching to majors and careers that they perceive as being more congruent and supportive of their cultural identities.[30] Successful programs for developing URS' sense of belonging and science identity use mentoring networks in a research lab environment (wherein lab mates provide peer mentorship to augment faculty support)[25] and helping URS integrate their intrinsic motives for pursuing science, with an emphasis on helping one's community and playing an important role in scientific discovery, respectively.[31]

Traditionally, mentors provide guidance by playing an active role in the students' education and sharing career experiences, knowledge, skills, and perspectives.[32] However, these traditional approaches to mentoring often lack appropriate attention to cultural competence and the social and contextual factors many URS face when pursuing college degrees in the biomedical sciences. For example, one study found that URS in the sciences reported feeling less cared for or liked by their fellow instructors and students, which increased levels of alienation and diminished academic engagement.[33] In contrast, another study revealed that family support, as well as encouragement and guidance from faculty mentors, were associated with the development of greater academic engagement, student confidence, and persistence and success in the sciences, especially among Latino students.[29] A study examining the effectiveness of peer mentorship for first-year undergraduate students in the biomedical sciences showed that URS found this component to be useful for building relationships with upper division students in applied science, having guidance for science classes, increasing involvement in campus activities, and receiving tips on how to be a successful student.[33] Therefore, a mentorship style that incorporates cultural relevancy and peer mentorship is more likely to lead to mutual personal and professional trust between faculty or peer mentors and URS, inciting motivation and confidence.

Current Project Funding

With support of the National Institutes of Health planning grant for the NIH Building Infrastructure Leading to Diversity (BUILD) Initiative (RFA-RM-13-001) the California State University, Long Beach (CSULB) developed the AHORA (Alliance for Health Opportunities Research Advancement) initiative designed to facilitate the assessment and strategic planning needed to bring together our collective research infrastructure and resources to synergistically strengthen CSULB's ability to support the success of those population groups most underrepresented in biomedical and behavioral research. Within this process a consortium of external and internal institutional partners and programs was formed to conduct an analysis of existing research development programs and institutional research resources to promote advancement through the biomedical and behavioral doctoral pipeline.

A key feature of AHORA's work was conducting a strategic planning, strengths, weaknesses, opportunities, and threats (SWOT) analysis to assess programmatic resources and needs, as well as integrate these findings with expert feedback on institutional infrastructure, in order to develop a preliminary best practices report that informed the development of the CSULB BUILD Initiative application.

CSULB Institutional Profile

CSULB, located in our nation's most diverse city,[34] provides an ideal environment and documented track record of supporting the development of first generation-educated URS in the biomedical sciences. Throughout its history, CSULB has provided research training to URS through various campus and grant-funded programs, often operating in isolation. The aim of these programs is to increase the availability of mentored research and training opportunities among URS seeking doctorate degrees. These programs have been successful in increasing URS engagement in several areas of biomedical research. However, there is an urgent need to fully integrate our campus resources and align them with external research partners and stakeholders to strengthen our training and research infrastructure while increasing the biomedical pipeline of URS.

CSULB offers 86 baccalaureate degrees (139 programs), 67 master's degrees (92 programs), and four joint doctoral degrees. *The Princeton Review* ranked CSULB as the third best value public college in the nation in 2007 and designated CSULB a "Best in the West" in 2013 and one of "2012 Best Colleges: by Region." The *2008 Survey of Earned Doctorates* for 1997-2006 ranked CSULB first nationally in master's-granting institutions producing graduates who continue to the doctorate. *The Chronicle of Higher Education* ranked CSULB second among master's degree-granting institutions in producing Fulbright Awards for students in 2008-09. CSULB ranks in the top five public master's universities in the West by *U.S. News and WorldReport's* "America's Best Colleges Guide" (2005-2014), with one of the top undergraduate engineering programs in the nation. Continued recognition of CSULB's outstanding academic quality has attracted more than 83,000 new student applications for fall 2014, third only to UC Berkeley and UCLA in the nation.

CSULB is the second largest campus in the CSU system and the third largest university in California. Excluding non-resident aliens, over 75% of the undergraduate student population is non-white. Based on self-reported data, the largest ethnic group on campus is Hispanic, who represented 40.6% of resident undergraduates in fall 2012. African Americans, Pacific Islanders, and Native Americans represented an additional 12.4% of undergraduates. Over half of CSULB students are first generation-educated, lower-income, and Pell Grant eligible. CSULB also has a large proportion of URS Southeast Asian groups (e.g., Cambodians, Laotians, Vietnamese, and Filipinos) in the biomedical sciences. Underscoring this diversity, Long Beach is home to the second largest Cambodian community outside of Cambodia.

In *Diverse Issues in Higher Education* (2013), CSULB was ranked 13th in the nation among universities conferring bachelor's degrees in 2011-12 to URS, including 11th nationally among those conferring bachelor's degrees to Hispanics and 13th in bachelor's degrees to Native Americans. Overall, CSULB's campus-wide graduation percentages for URS mirror their enrollment percentages, suggesting a positive and high retention and completion profile. In departments representing the biomedical sciences in 2012, the graduation rates of URS were higher than the national average (~34% at CSULB vs. 14% nationally; see Table 1). As these data demonstrate, CSULB has been a leader in preparing students from traditionally underserved communities in obtaining higher education. According to the *Western Association of Schools and Colleges Accreditation Report*, "CSULB is keenly aware of [it's] core responsibility for teaching a diverse population of students." CSULB's exceptional commitment to diversity has been recognized by the U.S. Department of Education, which named CSULB as an HSI in 2006 and an AANAPISI in 2011.

Table 1: Undergraduate Degrees Earned in Biomedical Sciences at CSULB by Ethnicity (2010-2012)

Biomedical Degree Area/ Year	Hispanic American	African American	Native American	Caucasian American	Asian American	Total Degrees
Health Sciences						
2010	44 (18%)	16 (6%)	9 (4%)	65 (26%)	113 (46%)	247
2011	44 (17%)	3 (1%)	4 (2%)	59 (22%)	154 (58%)	264
2012	56 (19%)	14 (5%)	9 (3%)	82 (27%)	137 (46%)	298
Biological Sciences & Chemistry/Biochemistry						
2010	40 (19%)	6 (3%)	10 (5%)	64 (31%)	87 (42%)	207
2011	38 (16%)	3 (1%)	5 (2%)	77 (33%)	114 (48%)	237
2012	58 (25%)	3 (2%)	4 (2%)	57 (25%)	109 (47%)	231
Psychology						
2010	106 (37%)	11 (4%)	18 (6%)	109 (38%)	45 (15%)	289
2011	113 (40%)	19 (7%)	12 (4%)	91 (32%)	50 (17%)	285
2012	106 (39%)	13 (5%)	8 (3%)	95 (34%)	53 (19%)	275

References

1.   *U.S. Census Bureau. Annual Estimates of the Population by Sex, Race, and Hispanic or Latino Origin for the United States: April, 2000 to July 1, 2006. 2006; http://www.census.gov/popest/data/historical/2000s/vintage_2006/index.html.*

2.   *Hurtado S, Chang JC, Saienz VB, Espinosa LL, Cabrera NL, Cerna OS. Predicting transition and adjustment to college: Minority biomedical and behavioral science students' first year of college. Research in Higher Education. 2007;48(7):841-887.*

3.   *National Science Board. Science and Engineering Indicators. Arlington, VA: National Science Foundation;2012.*

4.   *Nelson DJ. Nelson diversity surveys. 2004; http://cheminfo.chem.ou.edu/~djn/diversity/top50.html.*

5.   *National Center for Education Statistics. Education Statistics Quarterly. Alexandria, VA: National Center for Education Statistics;2001.*

6.   *National Research Council. Research Training in the Biomedical, Behavioral, and Clinical Research Sciences. Washington, DC: The National Academies Press, 2011.*

7.   *ACD Working Group on Diversity Diversity in the Biomedical Research Workforce Working Group Report. Bethesda, MD: Advisory Committee to the Director; June 14, 2012.*

8.   *Center for Institutional Data Exchange and Analysis. CSDRE 2001 Executive Summary 2000-01 CSDRE Report. Norman: University of Oklahoma;2001.*

9.   *Griffith AL. Persistence of women and minorities in STEM field majors: Is it the school that matters? Economics of Education Review. 2010;29(6):911-922.*

10. *McCarron GP, Inkelas KK. The gap between educational aspirations and attainment for first-generation college students and the role of parental involvement. Journal of College Student Development. 2006;47(5):534-549.*

11. *Anderson EL, Kim D. Increasing the success of minority students in science and technology. American Council on Education Washington, DC; 2006.*

12. *Alon S, Tienda M. Assessing the "mismatch" hypothesis: Differences in college graduation rates by institutional selectivity. Sociology of Education. 2005;78(4):294-315.*

13. *Chang MJ, Eagan MK, Lin MH, Hurtado S. Considering the impact of racial stigmas and science identity: Persistence among biomedical and behavioral science aspirants. The Journal of Higher Education. 2011;82(5):564-596.*

14. Trent W, Owens-Nicholson D, Eatman TK, Burke M, Daugherty J, Norman K. Justice, equality of educational opportunity, and affirmative action in higher education. Compelling interest: Examining the evidence on racial dynamics in higher education. Standford, CA: Stanford Education; 2003.

15. Cole S, Barber EG. Increasing faculty diversity: The occupational choices of high-achieving minority students. Harvard University Press; 2003.

16. Bonous-Hammarth M. Promoting student participation in science, technology, engineering and mathematics careers. Advances in Education in Diverse Communities: Research, Policy and Praxis. 2006;5:269-282.

17. Grandy J. Persistence in science of high-ability minority students: Results of a longitudinal study. Journal of Higher Education. 1998;69:589-620.

18. Vogt CM. Faculty as a critical juncture in student retention and performance in engineering programs. Journal of Engineering Education. 2008;97(1):27-36.

19. Walton GM, Cohen GL. A question of belonging: Race, social fit, and achievement. Journal of personality and social psychology. 2007;92(1):82.

20. Kinkead J. Learning through inquiry: An overview of undergraduate research. New Directions for Teaching and Learning. 2003;2003(93):5-18.

21. Lopatto D. The essential features of undergraduate research. Council on Undergraduate Research Quarterly. 2003;23(1):139-142.

22. Chang MJ, Cerna O, Han J, Saenz V. The contradictory roles of institutional status in retaining underrepresented minorities in biomedical and behavioral science majors. The Review of Higher Education. 2008;31(4):433-464.

23. Hurtado S, Cabrera NL, Lin MH, Arellano L, Espinosa LL. Diversifying science: Underrepresented student experiences in structured research programs. Research in Higher Education. 2009;50(2):189-214.

24. Sabatini DA. Teaching and research synergism: The undergraduate research experience. Journal of Professional Issues in Engineering Education and Practice. 1997;123(3):98-102.

25. Estrada M, Woodcock A, Hernandez PR, Schultz PW. Summary of research and practical findings from the annual NIGMS Efficacy of Interventions Conference to Accelerate Research to Practice. A white paper prepared for the National Institute of General Medical Sciences. 2012.

26. Yeager DS, Paunesku D, Walton GM, Dweck CS. How can we instill productive mindsets at scale? A review of the evidence and an initial R&D agenda. A white paper prepared for the White House meeting on Excellence in Education: The Importance of Academic Mindsets, Washington, DC. 2013.

27. Smith KA, Sheppard SD, Johnson DW, Johnson RT. Pedagogies of engagement: Classroom-based practices. The Research Journal for Engineering Education. 2013;94:87-101.

28. Cole D, Espinoza A. Examining the academic success of Latino students in science technology engineering and mathematics (STEM) majors. Journal of College Student Development. 2008;49:285-300.

29. Darling E, Molina K, Sanders M, Lee F, Zhao Y. Belonging and achieving: The role of identity integration. In Maehr M, Karabenick S, Urdan T (Eds.), Advances in motivation and achievement: Social psychological perspectives (pp. 241-274). New York: Elsevier Press. 2008.

30. Greenhalgh T, Seyan K, Boynton P. "Not a university type": Focus group study of social class, ethnic, and sex differences in school pupils' perceptions about medical school. British Medical Journal. 2004; 328:1541-1547;doi: 10.1136/bmj.328.7455.1541

31. Thoman DB, Brown ER, Mason AZ, Harmsen AG, Smith JL. Seeing how science can help: A motivational factor in enhancing the participation of underrepresented minority students as biomedical researchers. Manuscript under review. 2014.

32. Curtin N, Stewart AJ, Ostrove JM. Fostering Academic Self-Concept Advisor Support and Sense of Belonging Among International and Domestic Graduate Students. American Educational Research Journal. 2013;50(1):108-137.

33. Clark CR, Mercer SH, Zeigler-Hill V, Dufrene BA. Barriers to success of ethnic minority students in school psychology graduate programs. School Psychology Review. 2012;41(2):176-192.

34. Geis S. Long Beach Awaits Hate-Crime Verdict. Washington Post website. Retrieved May 11, 2010. (January 23, 2007).

II. Methodology

Recruitment Methods

Research mentors and faculty with a track record of mentorship in the biomedical and behavioral sciences were identified and invited to be members of the AHORA Network Consortium. Through programs led by the PIs (such as Bridges to the Baccalaureate and the HSI-STEM Summer Research Program) relationships with local community colleges (e.g., Long Beach Community College, Cerritos College, Cypress College) had been established and key representatives from these institutions were invited to become members and participate in the assessment. Additionally, we sought input from first generation-educated undergraduate and graduate students, as well as CSULB alumni who have successfully completed doctoral degrees. From this process, a pool of candidates was developed. Through formal email invitations and follow-up calls, all participants were recruited from each of the key stakeholder groups to participate in either in-depth interviews or focus groups. Semi-structured interview and focus groups guides were developed by a doctorate level internal analyst and the PIs.

Key Informant Interviews

Program directors and faculty mentors (i.e., diversity leaders) who have played key roles in creating mentorship programs for underrepresented students in research were recruited to participate in in-depth interviews. The PIs, internal analyst, and a doctoral trained researcher followed up invitation emails with telephone calls and scheduled all interviews.All interviews were conducted by telephone by experienced doctoral level researchers and the PIs. A brief survey was developed to obtain demographic information. The survey was emailed to all interview participants and in most cases the completed surveys were emailed back to the interviewer. In very few cases the survey was administered over the telephone.

Focus Groups

Underrepresented undergraduate and graduate students who were intending to pursue, were pursuing or had pursued a doctoral degree were recruited to participate in one of two focus groups. The first focus group was conducted with the graduate students and a second focus group was conducted with the undergraduate students. Both focus groups were conducted by the internal analyst who has extensive training and experience with qualitative data collection and analysis. The PIs purposefully selected former CSULB students (doctoral students were CSULB alumni) who

represented diverse ethnic groups, with some being first generation-educated students (i.e., first person in their families to complete a college degree), and diverse areas of study in the biomedical and behavioral sciences. Many of these students had also participated in underrepresented student development and research training programs at CSULB.

Academic advisors with experience working with community college, graduate, and undergraduate students pursuing or are intending to pursue a doctoral degree were recruited to participate in one of three focus groups. The initial pool of candidates was developed primarily from the PIs contacts and members of the AHORA Network Consortium. Academic advisors who had substantial experience in working with underrepresented students in the sciences were purposefully selected to participate in the focus groups. All three focus groups were conducted by the internal analyst.

AHORA Conference

A conference was held for AHORA Network Consortium members, key faculty and CSULB administrators, pipeline partners, and students to garner feedback on the AHORA preliminary findings. Specifically, one of the goals of the conference was to utilize the feedback and finalize the AHORA Charting a Path for Underrepresented Minority Success in Biomedical and Behavioral Research Careers report. The conference was organized to provide attendees time to read the preliminary findings prior to the event (and time was allotted for reading during the conference). Feedback on the preliminary findings was gained via two semi-structured breakout session groups. In terms of process, conference attendees observed a presentation of the overall preliminary findings (i.e., themes) by the PIs. Subsequently, attendees were pre-selected (based on group size) to participate in one of two theme topics per breakout session (i.e., four total theme topics in two total breakout sessions). Each breakout session was digitally audio-recorded and moderated by an experienced doctoral trained researcher, a note taker, and a whiteboard note taker. The breakout sessions (and group interview guides) were designed to elicit discussion and comments regarding major themes that emerged from the preliminary data analysis. More specifically, four themes were discussed: 1) Barriers to Academic Success (morning breakout session); 2) Diversity and Role Models (morning breakout session); 3) Discrimination (afternoon breakout session); and 4) Experiences of Diverse Students (afternoon breakout session). At each breakout session, groups were asked to select one representative from the group to take notes and present their group's key reactions, findings, and recommendations. Lastly, a brief evaluation form was administered to all conference attendees. The evaluation form was designed to capture basic demographic information and self-reported assessment of the conference and its activities.

Qualitative Analysis

All interviews, focus groups, and conference breakout sessions were digitally recorded. Each recording was transcribed by a team of graduate students supervised by the internal analyst. Each transcript was checked against the digital recording for errors, grammar, and context. Each transcript was reviewed by the PIs and the internal analyst. Prior to any coding, each transcript was read completely to obtain a global understanding of the interview/focus group. A content analysis was conducted by the PIs and the internal analyst on each transcript. This process identified several themes that considered potential and existing strengths, weaknesses, opportunities, and threats in the doctoral trajectory to the biomedical and behavioral sciences. Constant comparison methods were utilized to allow for the integration of all categories and themes as they were encountered in the data. Following the process of coding all the transcripts, a matrix of themes was developed. Following the feedback gained and transcripts from the AHORA conference breakout sessions, the PIs conducted further analysis which led to a refinement of themes and integration of all data sources. (i.e., transcripts, surveys).
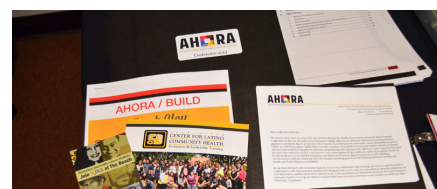
III. Description of Participants

Diversity Leaders and Faculty

Eight (8) program directors and faculty mentors (i.e., diversity leaders) who have played key roles in creating mentorship programs for URS in research were recruited to participate in in-depth interviews. We purposefully selected men (50%) and women (50%) representing white (37.5%), Asian (12.5%), African American (12.5%), and Latino (37.5%) leaders who had substantial experience in diversity-related academic programming. All diversity leaders had doctoral degrees and 50% were first generation-educated. In terms of rank, 37.5% reported being Associate Professors and 62.5% are full Professors; 12.5% of the diversity experts are administrators, and 50% are currently serving as Center or Division Directors. When asked about the number of years they had spent in academia, 25% reported 9-10 years, 12.5% 10-20 years, and 62.5% over 20 years. Responses were similar when queried regarding the number of years they had worked in diversity-related projects with 12.5% reporting less than 10 years, 25% reporting 10-20 years, and 62.5% reporting having worked in diversity-related issues for over 20 years.

The eight (8) program directors and faculty mentors were also asked to prioritize the importance of the following diversity-related concerns at their respective institutions. The following table represents their responses:

Concern	Lowest Priority	Medium Priority	High Priority	Highest Priority
Hire more underrepresented minority faculty (8)	12.5%	12.5%	50%	25%
Develop a sense of community among students and faculty (8)	0%	12.5%	50%	37.5%
Hire more underrepresented minority administrators (8)	12.5%	37.5%	25%	25%
Create a diverse multi-cultural campus environment (8)	12.5%	0%	37.5%	50%
Create a campus free of gender bias (8)	0%	12.5%	25%	62.5%
Create a campus free of bias regarding sexual or gender orientation (8)	0%	12.5%	25%	62.5%

Students

Thirteen (13) underrepresented students (URS) (3 doctoral students, 3 masters students, 7 undergraduate students) who are currently pursuing, or are intending to pursue, doctoral degrees were recruited to participate in one of two focus groups. The first focus group was conducted with the doctoral and masters students and a second focus group was conducted with the undergraduate students by a doctorate level researcher with extensive training and experience with qualitative data collection and analysis. We purposefully selected former CSULB students (doctoral students were CSULB alumni) who represented diverse ethnic groups, with some being first generation-educated students (i.e., first person in their families to complete a college degree), and diverse areas of study in the biomedical and behavioral sciences. Many of these students had also participated in URS development programs at CSULB.

Academic Advisors

Twelve (12) academic advisors (2 community college, 4 graduate, 6 undergraduate advisors) who are currently working with community college, graduate, and undergraduate students pursuing, or are intending to pursue, doctoral degrees were recruited to participate in one of three focus groups. We purposefully selected men (33%) and women (67%) representing white (33%), Asian (17%), African American (17%), and Latino (33%) advisors who had substantial experience in working with underrepresented students in the sciences. Most of advisors had at least a master's degree (83%) and 42% were first generation-educated. In terms of rank, approximately 41% reported being a tenure/tenure track professor, 25% reported being program coordinators, and 8% reported serving as Center or Division Directors.

Conference Participants

Of the 20 attendees that completed the evaluation forms, 13 were female (65%) and 7 (34%) were male and on average were 44.9 years old (SD = 14.4, range 21 - 74). In terms of ethnic background, the majority self-identified as Latino/Hispanic (11), White (6), African American/Black (1), Asian American (1) and both Latino/Hispanic and Asian American (1). Regarding their educational background, most reported possessing a doctoral degree (12), master's degree (5) and bachelor's degree (3). In addition, most reported that they were first generation-educated (16) whereas 4 were not. The conference attendees occupied various positions in academic settings such as professors, and administrators, or students. Specifically, they reported Professor (6), Assistant Professor (2), Associate Professor (2), Administrator (2), Program Coordinator (2), Program Coordinator/Lecturer (1), Full-time Lecturer/ Academic Advisor, undergraduate student (1), graduate student (1), and graduate student/academic advisor (1).

AHORA Conference Evaluation Results

Of the total conference attendees, 20 completed the evaluation forms. Attendees were asked to report on the number of years they have been involved in diversity-related programming or worked with underrepresented students. On average, they reported 16.3 years (SD = 9.0, range 3 - 30). Subsequently, we sought to gauge the extent of the effectiveness of the conference in addressing barriers of underrepresented students. Most of the attendees reported that the conference was "very effective" (80%) or "somewhat effective" (20%) in addressing the barriers that underrepresented students experience. In addition, the content of the conference discussion was also evaluated. Conference attendees either indicated "strongly agree" (75%) or "agree" (25%) with the statement: The content of the conference discussions was appropriate and informative. Relatedly, the attendees felt very comfortable sharing their thoughts at the conference. Conference attendees either indicated "strongly agree" (60%) or "agree" (40%) with the statement; I felt comfortable sharing my experiences with others today. Lastly, most of the conference attendees either indicated "strongly agree" (50%), "agree" (40%), "neither" (5%) or "no answer" (5%) with the statement: I will use the report that results from this process.

IV. Themes

Barriers to Academic Success

The literature shows that the baccalaureate attainment rate of first-generation, low-income students is lower than their advantaged peers.[1] Underrepresented students face multiple barriers in their college trajectory including under-preparedness, family obligations, financial concerns, no program support, and a feeling of isolation.[2]

BARRIERS TO ACADEMIC SUCCESS – DIVERSITY LEADERS & FACULTY

Participants highlighted their experiences with institutional, social, and individual factors that serve as barriers to academic success for students.

• Interviewees highlighted how UR students approach ethnic minority faculty, regardless of their area of research, for guidance on professional development.

• Recruitment of UR students can be difficult given institutional barriers, such as registration fees and covering travel for students interviewing at graduate programs.

• UR students who go to graduate school out of state often are not prepared for the culture shock they are about to experience being in a different environment.

• Interviewees highlighted the importance of UR students understanding how to navigate through the academic environment to lead to successful outcomes.

• Student research experiences and opportunities are critical for their success.

• Interviewees highlighted the importance of students acquiring strong writing and quantitative skills at the undergraduate level.

• Academic counseling is vitally important to help prepare UR students to become strong graduate applicants.

• Student factors, such as financial and family difficulties, serve as barriers to academic success.

• Sense of belonging as an important indicator for student retention in graduate programs.

• Need for peer mentors (doctoral students mentoring undergraduates).

• Importance of changing the culture of academia so there is more work-life balance.

Perspectives on Barriers to Academic Success

Diversity experts discussed the need to **focus extensively on expectations associated with student development in general**, often regarding simple skills and behaviors such as how to: formulate an email, approach a professor, and acquire substantive research experience. *"This student [interested in social psychology] couldn't quite tell me why she contacted me [professor in neuroscience]. She was like well 'I thought maybe talking to you about the process will give me a little bit more of [information] to formulate how to contact other professors. And then I understood that a lot of these students don't have an understanding of how to go about it. Many of them are told to go to class and fourth or fifth year they may have heard about research and it's 'oh, it's good to do research' but they are graduating the next semester and now they're hurrying to get that experience."* (Latino male) Experts underscored that the **procedures that comprise our academic culture are well known to us, but not to first generation-educated students** and that mentorship to help students acquire basic skills is absolutely essential for their success. *"I have a young woman of an underrepresented minority background applying to grad school and who needs research experience, her e-mails to the other faculty are not well written and I have to help her re-write them so that she can get research experience."* (White female) Participants highlighted the importance of **mentoring students in areas often unrelated to professors' content areas.** *"I think a lot of minority students that I come into contact with, they just don't have the knowledge, the information of what to do or how to approach professors, how to write an email. You'd be surprised, but I think you can relate to this. But they might send an email, saying 'I am so and so and I'm interested in research' and then they send it to 10 faculty members and everybody sees the name of the professors. Who is going to reply to that person? Nobody replies."* (Latino male) Participants also underscored the **increasing lack of student preparation that occurs when less funding goes to overcrowded schools.** *"It never fails, every semester, every year, it seems like students come in less and less prepared. Not necessarily in academics, even though they could be better in academics, but even less prepared on how to navigate the system. How do you navigate the system? How does a good email look like? How do you write an email that would at least give you a 60% chance that a professor is going to reply or get an appointment? And a lot of students that come to my office and say 'I emailed so and so and I haven't gotten any replies, you were the only one that replied' and I replied because I noticed that you are doing it wrong."* (Latino male) After learning the basic skills needed to successfully communicate, URS **need to be taught how to effectively navigate the environment.** *"If undergrads aren't informed about that [number of openings in a graduate research lab] and they don't know how to find out whether particular people [faculty] they might like to work*

with have openings in their lab. So that's the kind of inside knowledge of how the system works [that might hinder students]." (White female) One expert summed up perceptions regarding what is needed to ensure URS academic success. *"A lot of ground up type of work [is needed]. It goes back to…How do you write a good essay or a good email? How do you ensure that your email is being taken seriously? It may sound weird, but it's almost like programs that ensure the success of minorities in academia in science, it's not a matter of only saying we are going to make sure you are funded for five years. You can have all the money in the world, but if you are not educating this person as to how the system works, how they can get around it, and how they can understand certain things… we fall back into the same thing over and over again."* (Latino male)

Participants also emphasized the need to **provide welcoming opportunities to bolster students' writing and quantitative skills without focusing on remediation.** *"Students need to be given the opportunities to get the state of the art science in their courses, writing experiences, research experiences, working one-one-one with faculty and others in groups so that they learn from other people and they need to apply with writing skills and quantitative skills and research skills and be competitive with others who come out of other programs."* (White female) Some **experts underscored certain content areas for additional preparation,** such as statistics. *"I would make sure that all of them [students] had a first rate statistics teacher and watch them if they need help so that they can do well in their stats course and take additional stats courses if it is not their forte Because statistics is one of the key success in the sciences and students who are not strong in math are going to struggle. So either there needs to be compensatory programs for them that get their quantitative skills stronger before they go to grad school or they'll get admitted and not do well, which we see a lot."* (White female) Programs that fortify qualitative and quantitative skills should be seen as integral to their success and worthy of extensive time commitments from doctoral trained faculty or research fellows. *"If they don't come with strong writing skills then they either fail or somebody at the doctoral level has to spend a lot of time trying to help them speed them up so that they can become academics who can succeed."* (White female) Diversity experts also said that faculty need to unmask the difficulty associated with their research areas and **emphasize that tutoring is a normative process** that everyone engages in to succeed academically. *"So if people have some difficulties in chemistry, or whatever, we have tutoring over here. So it's normal, but we've got to let them know that it's (getting help is) normal, 'you can overcome this.' We have effective people and programs in place that will give you assistance."* (African American male)

Other barriers discussed by diversity experts were the **importance of academic counseling for graduate school applications** and the extent to which success is predicted by familial experience and previous knowledge. *"If you don't have somebody that's ever been to college in your family or you don't have a faculty member who takes some interest, how are you going to figure how to get that application in?"* (White female) Participants stressed that graduate school admission procedures have substantially changed over the years. An interviewee said, *"What I see these days is a lot of minority students applying to doctoral programs and many of them do not appear to have the qualifications to get in. I think there might also be a counseling piece missing in helping them understand that is not a shot in the dark, you know, you just don't sit down and fill out the application. You need to really work hard on making sure you got the key components to apply to the best universities and you've worked hard on your essay with help and all that stuff."* (White female) **Students need assistance with developing their academic success plans and periodically assess achievements, needs, and changes.** Diversity experts also underscored the need to have very clearly articulated expectations of students and what they are expected to accomplish to facilitate the development of responsible leadership in academia. *"What I want my students to do is to be able to assess what's going on and have a sense of where they are and then develop an individualized plan to figure out how to reach their goal. It's about a relationship where there is conversation, there's debate, and I don't think we do students a service by handing them things on a platter, without them having to meet us half-way. And so with all those things students are expected to for example be prepared for tutoring. They're expected to do their homework. They're expected to participate and share what they know with others in the study group versus coming and getting the answer to their question. With advising they are expected to be prepared, they are expected to be on time, they are expected to do all these things. And so there's a responsibility on the part of my staff but it's a shared responsibility with what students are responsible for. It's about developing independent, problem solving, leaders who know how to ask that questions to get the answers to realize their goals."* (Asian American male)

Expert interviewees highlighted the importance of working with students to help them understand progressive goal setting and that when an objective is met it leads to future goals and achievements. Participants agreed that this needs to be articulated throughout each stage of academic development and that students need to be guided and rehearsed through each process. *"Two minority students in our program right now failed their prelims… I talked to one of them, she's in biology and she had no clue. This is something I do [with the students I mentor]… when they are preparing for the prelims, I may give them a question and give them five days to come up with a written answer. We discuss it, 'you missed this here, or this doesn't make sense, this, this and this…' Then when it's time for them to go through*

it [prelims], they have already had an experience. They already are prepared." (Latino male) Completion of a substantial goal, such as graduation, should automatically lead to the subsequent objective. *"What a lot of Latino students don't understand is that just because you got a Ph.D. you got it made. No! You need to publish, you need to do this and that and put yourself as strong as you can on the job market. And that's what is frustrating to me… [many] Latinos are graduating sometimes with no publications at all and to me, personally, that is a problem."* (Latino male) Experts underscored that the **progressive growth of students as scientists should include a healthy dose of applied opportunities** so that students can make informed decisions about their future careers, whether in service or academia. *"I believe, really, that one of our jobs is to make early career students and professionals true scientists in their own way. They can be discharging or implementing differently, but they really should be scientists; because science is really discipline-thinking, careful thinking… and making the right call when it comes to therapy, doing services, or conducting research… and so that critical capacity - to be critical consumers of knowledge and then generators of knowledge - is really important. And I really think it comes when best represented in labs and in places where students go beyond the textbook and they really learn how to do things that can make them stronger individuals - whatever the discipline that they pursue."* (Latino male)

Diversity experts discussed the many institutional barriers students experience when applying for graduate school and how criteria must be changed to better address contextual differences in students' backgrounds. *"GPA is obviously one indicator, so don't get me wrong. You want to have a good GPA. But then you've got to look at a person's background, the environment from which they came…. you have to look at language; you have to look at a whole lot of factors. You have to look at income. In order to look at getting access to a lot of people you must consider what I call the 'castaways.' A lot of people who might not look good on paper, but if you put them in certain programs they can perform well. If they get in the right environment, they can perform as well as a person with a 'B' or 'A' average. Stop calling these 'remediation' cases. Call it something else. Nobody wants to be in a special education situation. People associate 'special' education with kids riding in the short bus with helmets on…"* (African American male) Another expert stated, *"Numbers are important because they tell part of the story, but the story behind the numbers, the narrative, is really critical. I don't think many of my colleagues really quite understand that. And they are also very insulated from the larger society, they'll hear about the economic downturn but they don't realize the differential impact on students from under-resourced communities and how that plays in the classroom and laboratory."* (Asian American male)

Participants expressed their frustration with the institutional resistance experienced when departments are considering UR applicants, even with minor issues such as application costs. *"There is resistance even though we don't get many minority applicants. For example the university doesn't waive the application fee. I have talked to the provost, I have talked to the vice presidents for academics and they all say they're going to look into it. The response that I've gotten is, 'that's why we keep the application fee so cheap so they can afford it.' But they don't understand it is the message that we send. It might be cheap, but the message you are sending is that other schools charge $90 per application and will waive it, but we charge $30 and we won't waive it."* (Latino male) Another shared her experience with **merit based testing procedures that are costly and often prohibitive for UR students.** *"I'm probably going to divulge too much, but sometimes I feel that the admissions feels… very much focused on the analytical and GRE scores, I mean we are at a university in the south. I was somebody who did horribly on the GRE scores and I did fine in my stats courses. But it's like this sense of… who are we accepting? There is a gatekeeper feel to it, and I think that is something we need to talk about because the truth is that data show that underrepresented minorities do not do well on standardized tests like the GRE… and its $50 dollars, $100 to apply. Especially if you don't have good GRE scores, you need to apply to ten schools, right?"* (Latina female)

Experts also shared their perceptions with the 'lip service' given to minority student recruitment. *"Everyone here [at our university] really wants to recruit minorities but when it comes down to it, nobody really puts the real effort into doing it. For example I went to talk to my chair and I said 'I'm going to give a talk at Cal State Long Beach and Cal State San Bernardino, they are minority serving institutions. Why doesn't the department create a flyer and I can bring them to these places so I can give out flyers.' And she looked at me and said 'why don't you just write the department address when you're giving the lecture?'…I can't claim they [the university] are not interested [in recruiting minority students], because obviously on paper they are. But when it is time to do something about it, they just won't do it."* (Latino male) **Diversity experts stressed the role that forms of institutionalized racism play in applicant selection.** *"It's easier to identify institutionalized discrimination. For example, they want to recruit minorities but the university will only give us money to fly in the top 2 candidates and the minority candidate is #7. So they are not going to give us money to go down that far on the list. It's like yes they want the minority student, but they want a minority person who is sitting on top…but I don't know if we are going to get them…We need to change our approach."* (Latino male)

Diversity experts shared the need, not only for institutional change, but also commitment to creating pipelines to the doctorate. They stressed the need for

funders to keep universities accountable so that they meet their goals and graduate URS. *"The [institutional] commitment has to be there [to create effective doctoral pipelines for UR students]. It has to be a true commitment. I remember in the 80s it used to be that a lot of what the schools used to say is that they admitted 30% minority applicants. But they were never held accountable. What percentage did you graduate? Okay, so you brought in 20 students and you only graduated 2? A lot of these universities got federal funding… because they were admitting students. But once the students were in the system, they forgot about them. They didn't do anything…basically they [institutions] did not care."* (Latino male)

Cost was also seen as a prohibitive factor, not only because of GRE and application costs, but because of the long-term implications of loans and the need for URS to help support their families. *"I mean one of the major things that keeps a lot of the underrepresented students from being able to succeed is financial difficulties, long term use, family difficulties, lack of understanding by family you live or what you are up against, mental health needs because they are unmet, physical health needs because they are unmet, prejudice, all of the above."* (White female) Being worried about long term survival is paramount for many URS and a reality they have lived with throughout their lifespans. Having the luxury of time to study and conduct research without additional responsibilities is not normally part of the URS experience. *"Among my undergraduates these days many of them who are qualified don't go to graduate school for a Ph.D. Why don't they? Because they already have loans, because they already have invested a lot of years, because they are worried about making a living, so instead they go and get a two year degree that they think will give them a bigger and better income… So I view the financial side of their long term prospects as they perceive them, right or wrong, and their loans and their ability to go to graduate school as barriers to going to a Ph.D. program."* (White female) Another expert shared her experiences related to not wanting to ask for too much or be seen as imposing on the host institution. *"No one told me that I could ask for moving expenses. Maybe it's not appropriate… Then you go there and you realize that the other 3 students in your office got moving expenses except you. And it's not because they don't like you, or they discriminated against you, it's just that no one told you that maybe inquiring is okay."* (Latino male)

The lack of academic UR role models was also seen as prohibitive to URS academic success. *"I definitely think it [lack of ethnic/race or gender-specific academic role models] affects them because they are getting subtle messages that the expectation is that they are not as good or not as likely to succeed. And so when one sees successful people, I really think that it has an impact in helping to support beliefs that yes, I can succeed in this field because I can see here is an individual that's from my same circumstances and they have succeeded. And so I*

think that role models are critical for the self-confidence of students." (White female) **A lack of specific population role models on campus was seen to contribute to students' sense of belonging** and their subsequent academic success. *"If you are at a place where there isn't a lot of faculty diversity, I think that that's going to be an obstacle and I think that might be overcome by making sure that you can bring in that diversity in some other ways, maybe through workshops. But I really feel like the students are going to need to see successful underrepresented faculty so that they, I mean it contributes to their own beliefs and [sense of] belonging."* (White female) One participant shared the perception that diversity will continue to decline in academia if programs are not created that open opportunities to URS. *"Yes, there is a lack of role models. And there will continue to be as long as earlier stages of the pipeline are constricting and there's a loss of diversity." (White female) Gender specific barriers in the sciences were also seen as inhibiting institutional success. "The sciences are well below parity for both minorities and for women."* (White female)

Participants agreed that there is a **definitive need for peer mentorship programs** with the majority stating that these programs should be specific to the populations they are intending to impact. *"I think you need to have programming where we have graduate students [that] mentor undergraduates. And we would try to pair those students with like groups: African American graduate students with African American undergraduates and so on. Then you have a role model ahead of them and you can talk with them about their experiences… having the doctoral students helping out the undergraduate students will also be helpful to the graduate student."* (White female) One participant felt that peer mentoring should not be restricted to URS. *"We should actually expand it [peer mentoring] beyond just the underrepresented students. I think that it should be anyone who is a supporter of diversity. And you can be a White male and be a supporter of diversity... it's important to expand this concept so that everyone on campus is a supporter of diversity."* (White female)

Culture was seen as positively and negatively contributing to academic outcomes among URS. *"If I can pinpoint one thing that I think minority students, especially Latinos, have as an impediment to their progress in their education is the fact that they want to stay close to home. That is not always beneficial because staying close to home doesn't give you a different perspective on things. And two, it limits their options as well."* (Latino male) The impermanence of the graduate study trajectory is something that should be emphasized within the Latino family so that parents and students alike, understand that the move is temporary and for school purposes. *"I tell my students, 'I know it's hard, I know it's difficult, you are missing your family, but think about this… you're not here to stay. If you came here to stay, you came for the wrong reasons.' You have to be strong enough to get through*

your 4-5 years. What are the things necessary for you to stay strong and for you to weather the storm?" (Latino male) Experts emphasized the need to help students understand the temporal nature of the move. *"A minority student needs to understand that 'I'm going away, this is the goal, this is the purpose, and I'm not going there to stay.' I'm going there to achieve a goal and then I'm coming back."* (Latino male)

Diversity experts also discussed the **isolation and longing for familiar and culturally-grounded elements** that URS experience when they attend school in a different part of the country. *"Students from Long Beach, they have no idea how isolating it is to go to a Ph.D. school in Washington State, even though it is next door to California…it is a different world. It's totally different and that, I think, is where the problem is."* (Latino male) They stressed that URS need to be culturally fortified and strong to be successful. *"The barriers are more about educating and preparing the students to understand the environment they are going to go into… not everyone from California can go to a California school. When you get an offer from [an out-of-state university] and you come here and you don't get your pupusas, you don't get your tamales, then it doesn't matter how academically strong you are if you are not culturally strong. If you are not culturally or mentally prepared then you feel isolated and suffer."* (Latino male)

Experts also reported that academia is often insensitive to family-oriented students and their responsibilities and desires. This is particularly focused on women, who are still not expected to be the breadwinners with high priorities placed on academic success. *"There has to be a change in culture as well with more of an appreciation for work life balance. And the fact that people should be allowed to have families and be successful scientists. So the example of my student who was told 'look, you can't have a child and being going for a Ph.D.' that's not, I don't think uncommon in the STEM disciplines, and that really has to change.."* (White female) Another shared a sense of optimism regarding the shift that needs to take place to promote URS success. *"I think it will take time but when I talk to students on this campus, you can actually create change. Faculty do listen to students and students should use their voice and believe that there's not enough diversity among the faculty. Once faculty are convinced that there is an issue, then they actually will try to change things and they will embrace [diversity] programs."* (White female)

RECOMMENDATIONS FOR ADDRESSING BARRIERS TO ACADEMIC SUCCESS – DIVERSITY LEADERS & EXPERTS

Steps to Address Institutional Barriers for UR Students

• Focus on helping students meet general students development expectations to ensure that they understand how to approach faculty, formulate concise and persuasive emails.

• Educate students about the political and logistical environment of academia to facilitate their understanding of the route to educational and professional success.

• Provide welcoming opportunities to bolster students' writing and quantitative skills without focusing on remediation.

• Emphasize that tutoring is a normative process and underscore that almost all successful students need tutoring at one time or another.

• Provide extensive academic counseling for graduate school applications.

• Utilize GRIT and other non-traditional ways of measuring student success to highlight the accomplishment, resilience, and cultural capital brought to the educational institution by URS, and thereby facilitate their admission.

• Provide students needed regularly-scheduled assistance with developing their academic success plans and periodically assessing goals and goal setting, achievements, needs, and changes.

Steps to Address Faculty Training in Mentorship

• Train mentor-friendly faculty in effective mentorship skills and ensure their understanding of the need for mentorship beyond the research laboratory and environment.

• Ensure that faculty mentors clearly understand that many mentees come from overcrowded, underfunded schools wherein students have had little personal mentorship.

Steps to Address Institutional Barriers

• Proactively and honestly address historical "lip-service" given to URS faculty and student recruitment, hiring, and admission and ways to avoid continuance of faulty practices in the future.

• Develop peer support mentoring and tutoring networks for URS to support academic achievement and facilitate the development of their identity as researchers in behavioral and biomedical sciences.

• Develop a strong and active commitment to creating pipelines to the doctorate that also addresses the cost barriers for both application and admission to graduate school.

• Create programs and activities that help students become involved while honoring family-oriented students and their responsibilities and desires.

BARRIERS TO ACADEMIC SUCCESS - STUDENTS

Participants highlighted their experiences with institutional, social, and individual factors that serve as barriers to academic success for students.

• Lack of support from family and friends.

• Lack of academic role models.

• Financial difficulties.

• Lack of awareness and knowledge of careers, opportunities, research programs, and other factors and skills related to pursuing graduate school training.

• Lack of support from academic advisors and university.

• Factors related to student research programs that negatively impact experience or access.

• Personal characteristics and living contexts that negatively impact the ability to perform well at school and conduct research.

Students from both groups spoke at length about their experiences with institutional (e.g., lack of support from faculty), social (e.g., unsafe neighborhoods), and individual (e.g., financial difficulties) factors that serve as barriers to academic success. Barriers reported by the participants generally reflected the lack of support in many arenas and highlighted the challenges that many students face as they intend to pursue research opportunities and/or graduate training. **For many first generation educated students, they experienced difficulties associated with their families not always understanding or supporting them through the process on their respective**

career paths. For example, a student shared, *"I think for me a big barrier was just not really knowing anyone in my family that had kind of gone down the path that I went down. So it was tough. A lot of people didn't understand what I was really going through."* (African American female) Similarly, some participants reported feeling pressure from friends to quit school and friends not understanding why they are conducting research. **Some students reported the lack of role models in academia and finding mentors for graduate school as barriers.** Lack of role models in academia makes students feel as if they are going through their career paths alone. As one student highlighted, *"In my case I was thinking in terms the application process. I had a really hard time finding mentors at my doctoral program so I was calling around trying to talk to faculty members who would be interested in working with me for research. I think that was a definite setback because I felt like if I can't find a mentor or advisor then I probably won't get accepted. So I felt a lot of pressure in terms of preparing and finding people that would be interested meeting with me. So you have to do a lot of cold calling and e-mails and trying to get people to meet with you and I felt like it was a full-time job."* (Latina female)

Lack of awareness and knowledge of careers, opportunities (e.g., networking, research programs), and other factors (e.g., GRE prep) and skills that can help getting into graduate school were reported as barriers. **Lack of awareness of training opportunities and health science careers is critical early on** (e.g., from academic advisors in high school or community college) to engage students in the sciences. Students expressed need for better dissemination of campus resources and programs for students not involved in campus organizations. A student said, *"I think one of the things that I would emphasize is resources. A lot of contact information for other organizations, so if they can't help, they can refer me to other organizations. Maybe they can form part of a network. Like I was part of H2OLA and HSI-STEM and they work together and exposed me and other students to more information, other programs, and resources that we can use in our academic fields."* (Latino male) In addition, students talked about specific barriers with participating in research programs that included strict eligibility criteria, need for clearer goals, need for faculty buy-in, guidance on spending resources by provided by research programs, and exclusion of students with undocumented status. A student remarked about the need to expand pools for research programs, *"Definitely if we had like pre-MARC programs or something like that because it was really few students. It was eight students like in the whole school. That was a very small pool and that was usually like the top students, like 3.8, 3.9 GPA. So they don't need the boost, but it's mostly the students who are struggling that need it the most."* (Latina female)

Another area that was discussed was the lack of support from academic advisors and the university in general. Some students reported receiving discouraging

messages about pursuing graduate school from academic advisors. For example, a student noted, *"There are other ways besides, you know, a traditional route, which unfortunately that counselor didn't give me options at the time. They didn't even say, 'Maybe you should be a nurse practitioner or you know you could be an RN or you could be a physical therapist.' None of that. They just said, 'No you're never going to get into medical school.' It was really discouraging."* (African American female) Some students felt that some academic advisors solely focus on classes vs. getting involved or continuing research even though being involved in research keeps students engaged in school. Furthermore, they reported that institutions did not view students as investments that have the potential to enrich the scientific fields and academic environments. In addition, they noted that universities needed to improve recruitment and retention for research programs and for URS entering graduate programs that historically have not had a diverse student population and needed to be more cultural sensitive to help diverse students. A student said, *"Because we can offer a lot to the university too, you know, in terms of future faculty positions or being able to offer different ideas and different perspectives on things, not just as students but having different backgrounds and things like that. But I don't think [the institution] is really seeing it like that. It is more like that school is doing us a favor but we are doing the school a favor as well."* (African American female) Other barriers included financial difficulties in supporting their education and difficult home and living environments, such as living in a noisy neighborhood, being surrounded by gang-activity, drug users, or people who argue/fight, and taking public transportation to school from long distances that make it difficult for students to study.

RECOMMENDATIONS FOR ADDRESSING BARRIERS TO ACADEMIC SUCCESS – STUDENTS

Steps to Address Barriers for UR Students

•   Focus on educating URS family members and support systems about the importance of undergraduate research experiences and graduate school application, admission, and academic success.

•   Proactively address the lack of UR faculty and student role models in research.

•   Work with high schools and community colleges to educate URS about biomedical and behavioral research opportunities and paths for academic success.

•   Create research enhancement programs that do not only target the most academically prepared.

• Develop programs that are focused on certain groups of URS to create a sense of achievement and development of community.

• Conduct "auditing" with university advisors to ensure that their messages with URS and non-URS students are consistent and to avoid the prevalence of discouraging messages regarding graduate school to URS.

• Honor students' cultural capital and contributions to the university environment by creating opportunities for recognition of cultural capital throughout the university community.

• Acknowledge and recognize the many barriers URS have to overcome to attend college such as unsafe environments, gang-activity, overcrowding and noise, and extensive commute time needed to attend university.

BARRIERS TO ACADEMIC SUCCESS – ACADEMIC ADVISORS

Participants highlighted their experiences with institutional, social, and individual factors that serve as barriers to academic success for students.

Institutional barriers at CSULB

• Unrealistic expectations and messages for advisors in engaging and retaining URS in the sciences.

• More staff support and resources needed for advisors.

• Unit cap policy and performance-based funding changes at CSULB becoming a barrier for students who switch science majors later in their college trajectory, limiting their ability to graduate with their bachelors degree in the sciences and limiting their ability to have a double major or minor that would make them more competitive applicants for graduate programs in the sciences.

• More collaboration needed between Colleges to assist URS in the sciences.

• Increasing the visibility and knowledge of student resources on campus for both students and academic advisors.

• Need to engage URS in the sciences earlier in their education and connect them to campus and research opportunities.

Community college level barriers

• There are many community college students in the sciences that need remedial classes.

- Community college students have difficulty enrolling in the science classes they need because of high demand and limited number of class sections provided.

- Miscommunication between 4-year colleges/universities and community colleges on pertinent information (e.g., admissions) that affects the quality of advising that students receive at the community college level.

Individual and social barriers

- Students are interested more in applied/clinical careers vs. research careers.

- Need to address student misperceptions of career paths in the sciences.

- URS lack of understanding of all the factors that influence successful entry into doctoral programs in the sciences.

- Students experiencing a 'sophomore' slump in their academic performance.

- Difficult home and living environments, such as having to work to help support one's family and taking public transportation to school from long distances make it difficult for students to study.

- Lack of family support or understanding when students need to study or work late on campus.

Academic advisors spoke of several institutional barriers to the academic success of URS pursuing degrees and careers in the behavioral and biomedical sciences. In particular, there seems to be a growing sentiment that **administrators set unrealistic expectations for advisors to increase the recruitment and engagement of students into the sciences, despite existing institutional barriers,** and demonstrate that the majority of these students will be retained through to graduation. *"Do you want more people retained or do you want more people in the medical field? Do you want more people in the engineering fields or more people in the academic teaching level? We each have different advising requirements, needs, etc. Do you want us to attract more people, retain more people, both?"* (White male graduate advisor) *"The only reason these things [students needing to take science classes to be competitive for graduate school] get identified and assisted is because there are actually advisors that have the time to meet with students and do this…so if advisors have five hundred students each, that's not going to happen versus having a more manageable number of students."* (White male undergraduate advisor)

Several advisors also identified **CSULB's course unit cap policy,** where students are forced to graduate once they reach their allotted number of course units (e.g., 144), as **a major barrier for URS success in the doctoral pipeline** because many students develop an interest in science careers late in their academic trajectory (e.g., junior or senior year) and, therefore, are not permitted to take core science classes that are required to enter graduate programs. Other URS are interested in taking additional science courses to make them more competitive for graduate programs, but are denied by the university. As one advisor shared, *"I graduated with 234 units for my undergrad. I did three majors and a minor, I had a high GPA and that helped me get into a really good grad school. So in my case a 144 unit would have been terrible and I wouldn't have gotten into the grad school I did. I had a student in my lab this semester where the administration made him graduate in the Fall because he had all his core biology courses and he wanted to stay in the Spring to take microbiology and an anatomy course to prepare for nursing school, but they actually wouldn't let him. They said you have too many units, you finished your degree, you graduated. That is not the best thing for his career or his future, but it looks good on paper for the university [in terms of six-year graduation rates]."* (White male undergraduate advisor)

Advisors spoke to possible solutions to institutional barriers experienced on campus, including the **need for increased collaboration between Colleges to improve engagement and retention of URS in the sciences.** As an advisor from the College of Health and Human Services (CHHS) stated, *"I think collaboration needs to be improved… COE [College of Engineering] has very intentional interest in advising, so they pull the students that are approaching probation. I am generalizing here, but when I went and I did a workshop [for COE] I couldn't help but notice that every student in the room looked Latino. There was one African American student and one white student so I think it is safe to generalize that sometimes students that are underperforming tend to be underrepresented students. So, thankfully, I have a good partnership and good relationship with the [director of the] Engineering for Success Center and he reached out to me and said, 'Hey I am having this workshop you should come. You should present your program and that's where I can get students and they are at the freshman level.' That's very intentional. That's collaborative. And it's open."* (Latina female) A community college advisor stated, *"I wish CNSM would support more of our [student] organizations. I feel like they don't support us enough."* (Latino male) Other solutions include **increasing the visibility and knowledge of student campus resources for both students and academic advisors that could help with their academic progress, degree completion, and career pathway.** *"I think knowledge of their resources that are on campus sometimes is critical. I mean I had a fourth year senior, a 4.0 student say, 'Hey, I want to be a doctor and I was told you could help point me to medical school.' I said, 'Where have you been?' So*

when I talk to them and I start going through my routine questions, I ask them 'Why do you want to be a doctor?' because that is a guaranteed question at a medical school and they can't answer it. And so sometimes they say, 'I didn't even know you [SAS Center] were here.'" (Latina female graduate advisor) Advisors mentioned that campus resources are particularly difficult to find for students who do not have a major in natural sciences. *"I am not trying to say get the health professions office out of the SAS Center, but sometimes I get questioned whether our office was appropriately placed there in terms of visibility because for medical school you don't have to be a science major."* (Latina female) Finally, advisors stated the **need to engage URS in the sciences earlier in their education through different campus resources,** particularly since there is a perception from some faculty that URS are not interested in science careers: *"I mean are the Hispanic students interested in that earlier on in high school? Are they getting that kind of education that gives them that spark that wants to go into the STEM stuff because that's usually not the easy thing to do. People shy away from that."* (White male graduate advisor) Some advisors recommended institutionalizing informational sessions on science programs and resources for CSULB freshman and transfer students through existing student orientation programs. *"I think it is important to catch students as early as possible. We have mandatory orientations, we have mandatory freshmen advising, mentoring transfer advising, for those first semesters. So somehow instituting something early on that is about opening their [students'] eyes to bigger possibilities [in the sciences]."* (White female)

At the community college level, there are many URS interested in pursuing careers in the sciences, however, **students are usually not prepared or understand the types of classes they need to take to pursue a science career.** As one community college advisor described, *"What I am noticing is that there are students that are quite underprepared and they want to become doctors and work in the health profession but they are completely underprepared. A lot of them are starting with remedial courses and so their long term goal is very spread out and if nothing, they can get there, but there is going to need to be persistence on their side because they're starting with such a deficit in a way. But we are there to help them remediate, we're there to help them get to the next level."* (Latina first-generation female) Given the level of student interest in science careers, community college advisors spoke of the need to offer more sections of science classes to address the high demand. Often, **URS are thrown off of their academic timeline because they are not able to enroll for their basic science classes in a timely manner.** *"I think what I am struggling with probably more so than anything is the availability of science classes. At the community college, those classes are going like wild flowers and are the first to be snatched up…When I make an educational plan and present [career] pathways, as well as how long it would take for them to start at [the community*

college] to get to Cal State Long Beach or UC Irvine in the sciences, one of the things that we are assuming is that they get their classes. So these pathways mean nothing if they don't get the classes." (African-American female) Although advisors stated that CSULB is "ahead of the curve" in emphasizing the major prep classes that community college students need in order to be competitive to transfer to the school, they indicated that other **universities are vague or do not communicate with community college advisors if there are changes in their admission requirements and course prerequisites,** which makes it very difficult to advise students adequately for science majors. *"If there's one thing that really drives counselors at the community college crazy is when something is changed and no one tells us. It just drives us absolutely nuts. Because that's how we get our reputation [from students] of 'you don't know what you're doing and you misadvise me'. Even though we have a disclaimer usually telling students, 'please try to see us every semester, sometimes things change mid-semester, so what we are writing down on your educational plan may change'. So current information, updated articulation, and an open line of communication between the university and the community colleges are very valuable for us, particularly [when] we're seen as a partner."* (Latino male)

In addition to institutional barriers at CSULB and at the community college level, advisors spoke of several individual and social barriers that URS experience along the doctoral pipeline. One common barrier to engaging students in research science careers is that **the majority of students are more interested in pursuing applied or clinical careers paths in the sciences, such as becoming a medical doctor, due to family pressures.** *"For the undergraduate to get into a [Ph.D.] program, they're not usually people from first generation that are thinking, 'Oh, I want to get into research.' They're usually thinking, 'I want to go into the health field' because that is what the families kind of understand more. They want to be a doctor or a lawyer or something like that, not a lab technician, a Ph.D., or along those lines… There's not many that actually want to become scientists. It's not an easy path and the rewards take a while and may never completely come. So they've got to absolutely love that field to go into a research academic type field."* (White male, graduate advisor) *"I knew another student whose parents just told her that's what you need to do, is you need to be a doctor."* (African-American female, community college advisor) For other students, they do not have a clear idea of all the different career options that one can earn with a science degree. Therefore, **a lot of advising consists of educating students about different science career pathways** so that they are aware of what classes they need to take for their area of interest. *"Students come in and see me and say, 'Well I want to do something in medicine'. Usually it's, 'I'm going to be a Doctor'. They don't know anything else. They don't know physical therapy, they don't know anything about nursing, health care administration, or they say, 'I want to be an engineer' and they don't know the different types of engineers.*

So, they're sitting with me with a very broad spectrum of things that they don't know about that is very different depending on which way you're going. So they usually just pick the most popular things and then it's me trying to educate them on the different avenues you can take, including biomedical research, and how they're different in terms of requirements." (Latino male, community college advisor) Other **students show lack of understanding of the different factors that can influence successful entry into graduate-level science programs,** including the importance of internship experiences, being able to articulate one's motivation for entering that particular science career path, and grades in relevant course-work, including most recent pattern of academic performance. *"A lot of students think if they have just a 4.0 that's good enough. It's not. I have seen 4.0 students get turned away from medical school, even though we told them over and over that you have to be a good person, you have to care about people, you have to get to know your patients, what are [your patient's] problems. A lot of that takes resources and manpower and a lot of intentional and truthful advising with students."* (Latina first-generation female, graduate advisor) Some advisors also talked about students experiencing a **"sophomore slump" that affects student retention in science majors.** As one advisor described it, *"It's usually that second year. It's that second year where things just start to fall apart. The sophomore slump. You start to get into your more difficult courses. You come out of your basic GEs, you really have to start putting more time in your schooling, which is taking away from your family time. As you are moving into your second and third year, that's where you see people start to fall out of their major. Because they don't have the time, they are working, they don't have the family support, the pressure. I feel like we do a good job in the first year because we do have the mandatory advising sessions but it's that second year where students start to go."* (African-American first-generation female, undergraduate advisor)

Lack of family support was also listed as a barrier for many URS, with **family members not understanding the need for their child to spend long hours in school doing research or school work** for their science classes. As one advisor put it, *"Sometimes it was their own family [being a barrier]. Unfortunately, it comes from not understanding the process of higher education because they were not college educated. So particularly with the Latino students, I think that coming from a traditional family, we are supposed to be home by a certain time. I experienced this myself going through college. I wasn't home at a set time anymore. I'd come home at 10, sometimes I would come home at midnight and that's because the*

students are going through the college experience and they are on campus, they are studying trying to be efficient with their time and so they get some pressure from home with them asking, 'What are you doing? Why are you not at home?'" (Latina first-generation female, graduate advisor) Advisors also mentioned **URS' difficult living or home environments (e.g., long commutes to school, family pressure to work off campus, not having a place to study at home) commonly serving as barriers to academic success.** *"The environmental factors. They [students] have to work and be home. I've had some students telling me, 'I don't even have a place to study'. They share a room with several siblings and they're running around, and you know they can't study, so it's many, many social issues, family issues."* (Asian-American first-generation female, graduate advisor)

RECOMMENDATIONS FOR ADDRESSING BARRIERS TO ACADEMIC SUCCESS – ACADEMIC ADVISORS

Steps to Address Institutional Barriers at CSULB

- Prioritize hiring of diverse faculty and administrators.

- Provide more staff support and resources for academic advisors.

- Modify CSULB's unit cap policy for students (in good academic standing) commencing a behavioral or biomedical science major later in their academic careers (i.e., junior, senior, transfer student), or for those who need an extra semester to strengthen their graduate school application with more science courses or prerequisites by creating a one-year science certificate program.

- Create cross-college orientation sessions to educate campus diversity directors and leaders, as well as academic advisors, regarding different campus resources and diversity programs to enhance cross-college collaboration and efforts to promote URS engagement and retention in the behavioral or biomedical sciences.

- Utilize existing campus orientation programs for freshman and transfer students to improve recruitment efforts in different science career paths.

Steps to Address Community College Level Barriers

- Create cross-campus partnerships with community colleges to address needs for more behavioral and biomedical science course offerings (e.g., instructors, teaching space, etc.) and to provide up-to-date information on admissions requirements.

- Send CSULB representatives to community college partners to recruit URS to behavioral and biomedical science majors and to participate in early science courses or research opportunities that would count towards their major course units if they were to transfer to CSULB.

Steps to Address Individual and Social Barriers

- Host culturally- and linguistically-tailored campus events for URS and their families to discuss different career options in the behavioral and biomedical sciences that highlight course requirements, potential income earnings, internship opportunities and campus tours of research labs, classrooms, and the library.

- Develop peer support mentoring and tutoring networks for students during their sophomore year to support their academics and to help develop their behavioral and biomedical science research identity.

- Provide dedicated space on campus for students to study and work on their research.

- Develop and offer online resources for students to be able to conduct some of their school work remotely from home.

Findings from the AHORA Conference Regarding Barriers to Academic Success

Conference attendees agreed wholeheartedly with the findings in the AHORA draft report but recommended that we further address gender issues as well as implicit bias. Although gender issues were discussed by the experts, advisors, and students throughout the interviews and focus groups, and gender was recognized as a barrier to academic success, we did not have an additional data collection opportunity to further explore issues of gender in the biomedical and behavioral sciences. In regards to implicit bias, attendees recommended environmental analyses of our respective academic settings to determine what tools or processes we use to communicate implicit bias so that we can alter these practices immediately. Attendees also suggested using theater as a tool to address implicit bias and the ways in which women are placed in traditional gender roles despite being in a scientific and academic environment. Attendees also recommended that we address particular barriers experienced by disabled as well as lesbian, gay, bisexual, transgender and queer individuals, who also remain gravely underrepresented in the biomedical and behavioral sciences.

Diversity

Ethnic minorities continue to be underrepresented in the behavioral and biomedical sciences. Compared to the general U.S. population, African Americans, Hispanics and Native Americans are severely underrepresented in the science, technology, engineering, and mathematics (STEM) fields and, consequently, the biomedical research workforce.[1] A significant body of evidence has indicated that diversity strengthens the STEM talent pool and ultimately contributes to greater innovation and productivity in research settings in which team members engage in cooperative problem-solving.[1] A study by Park revealed that regardless of a student's background and prior attitudes, the heterogeneity of an institution's enrollment influences student satisfaction with student/faculty diversity.[2]

DIVERSITY IN HIGHER EDUCATION – DIVERSITY LEADERS AND FACULTY

Participants highlighted their perceptions of diversity and how it adds to the educational experience.

• Diversity programs should not be viewed as only beneficial for minorities because diverse perspectives and experiences benefit us all. Interviewees highlighted the need for diverse perspectives in the biomedical and behavioral science if we are to solve contemporary problems associated with health disparities.

• Diverse students add a great deal to the institutional fabric of colleges and universities and help attract other underrepresented students to the sciences.

• Leaders committed to diversity in education will stay in universities and target populations where they can make a difference because they see their commitment to good science as intricately tied to diversity among underrepresented students.

• Diversity in job hiring affects how different perspectives and understandings can help inform educational experiences for students and decision-making in academia.

• Diversity programs and teaching subject matter associated with diversity serves to facilitate faculty involvement in mentoring underrepresented students and recruiting them into their research laboratories and projects.

The Importance of Diversity

Participants illuminated several rationale regarding diversity's importance, while underscoring the essential nature of diversity; not just for the underserved, but for humanity in general. **Better decision-making** was viewed by several of the participants as being one of the major benefits of diversity. Multiple participants, due to their prolonged exposure to diverse environments, commented on their preference for diverse environments. These perceptions were illustrated by quotes, such as: *"When you have a group decision to make, and you have diversity in the decision-making process, it will lead to more accepted and better decisions. We have to understand why we want diversity. We don't know why but data show that better decisions are made with diverse groups."* (Latina female) Participants reported that all students experienced an enhanced environment due to the enriched classroom interactions that result when diverse students are present. They found that students who had experienced diverse environments were able to socialize more effectively and were more reflective of society at large. Because boundaries are stretched when exposed to diverse environments, students' ability to deal with complex problems is augmented in the process. In the words of one participant, *"You would try to bring in as many different people from different cultures and different walks of life and lifestyles as possible because I do believe that people's personal experience really contributes to their perspective and way of approaching a problem and that science improves when we have diversity andpeople from many walks of life looking at the same problem."* (White female)

Participants discussed reaching out to diverse students so as to enhance the experience of all students and underscored the **benefits of having a diverse student population.** A professor said, *"I seek out diverse undergrads to work with me because I work in disparities and I need diverse undergrads to share their perspectives and be part of the [research] team… they've been instrumental in many ways in understanding and thinking through the work theoretically and translating materials and conducting interviews and making sense of our data… in terms of cultural sensitivity and in lots of ways."* (White female) Participants emphasized the importance of **supporting diversity in the sciences** and how diversity programming contributes to better science, to create a more just and humane society, and attempts to rectify prior travesties in science. Health disparities, and the social and behavioral sciences, were reported to be particularly positively affected by the diverse perspectives of underrepresented students. *"If we can bring in people of color…underrepresented minorities, then obviously they can go a long way, especially in research, in the sciences, in the STEM program in general... as well as improving some of the medical outcomes because people who have those issues sometimes are people of color; so obviously we need more people of color working in these*

areas to improve some of the outcomes, given some of the lack of trust issues that we've experienced in the past." (African American male) *One participant stated that diversity provided a type of "index of institutional accessibility."* (Asian male) Another said that greater diversity created a chain of accessibility. *"I think the importance of having diversity within neuroscience is that by having more minority students, it attracts other minority students to neuroscience."* (Latino male)

Participants underscored the need to openly teach diversity-related issues so as to attract diverse populations. *"In social psychology I teach about racism, ethnicity, and prejudice; in health psych I teach about health disparities and HIV. I think for those reasons students have sought me out."* (White female) Finally the **significance of diversity to the accuracy of science** was underscored. *"Diversity means a breadth of viewpoints to [examine] any academic or research question. So we need people from a wide variety of backgrounds but with different cultural view points and quite different socioeconomic backgrounds. I think that we are strengthened by having a variety of perspectives and that this stops us from being focused on the wrong things and it strengthens our academic perceptions."* (White female)

Diversity Programming

Participants discussed several **best practices** that have enhanced diversity programming within their respective institutions. "In our department we have 'diversity science' wherein our graduate students can take courses in diversity and scientific topics. They have social events, educational events, and guest speakers." (White female) Several participants underscored the **need for hiring and retaining diverse faculty, staff, and students, and building activities and curriculum that responds to cultural and societal contexts.** *"I think the things that are recognized in a diverse institution are having faculty that are diverse, having programs to recruit them and retain them; having sufficient numbers of diverse students so they don't feel like they are alone, having diversity-related activities and programs on campus, and having diversity issues be integrated skillfully into curriculum. The second best way is having people at every level that appreciate and understand the importance of diversity and offer it without prejudice."* (White female) Another participant concurred, reporting *"If we are going to mentor and develop underrepresented minorities, they have to see that there are other people in those positions….There are some that are doing it effectively and succeeding; and that's what diversity in education means to me, is that you do have faculty members that are also from diverse groups."* (Latina female)

Several individuals discussed ways to improve the delivery of effective diversity-related programming. One in particular emphasized the need for underrepresented students to feel confident in their abilities to succeed. *"I think the key to success for some minorities is instilling a sense of confidence in them. Unfortunately a lot of Latinos - and a lot of women in particular - are told that they can't or won't be somebody. I think in the STEM field that's very common. The point is that that as a minority and as a female, you're told these things. So I found the secret to a lot of success for students is instilling in them a sense of confidence that they can do it. Once a student feels confident in themselves, it's a different day. Fellowships are very important because they say to the student 'you are worthy of this investment by an organization.'"* (Latina female) Another participant reported a similar result when working with diverse, underrepresented student populations in the STEM fields wherein he found the environment in a leading R-1 institution to be **highly Darwinian** and **antithetical to student success.** To create a safe and nurturing environment, he **rejects traditional modes of student selection** and develops the talent among the underrepresented. *"I believe in providing the right environment for students and helping students [who] we don't consider to be science material [to] excel in the sciences. Given what I know about their sending high schools, their communities, and their lack of opportunity, these are the students I'm most interested in. I think what the Biology Scholars Program has done is to provide a safe place where students can actually compete with the material and not one another. The cooperative nature of the program helps students more fully express their potential. One of the things I've been really sensitive to are the metrics of success or predictors of success. I don't think that SATs and high school GPAs or GREs are the best predictors. Because I don't test well, this is where the professional is personal. So rather than skimming the talent I actually develop the talent."* (Asian male)

Several participants highlighted the need to **educate administration and student advisors** regarding the challenges faced by underrepresented students. One participant said *"If you understand what the challenges are for underrepresented students, I think that they can be addressed. But in some cases people don't know what they don't know, right? So education [is important] not only for the students, but for those who are training and making decisions about career development and career opportunities."* (White female) The importance of diversity training from the top down was a high priority for several participants. In the words of one participant, *"To the extent that a particular institution or its leadership is not knowledgeable about the importance of diversity in education, they need to be replaced or educated."* (White female)

Several participants **discussed barriers to diversity programming** and shared their experiences in academic settings. In the words of one veteran diversity expert with over 30 years of experience, *"Every time you use the word 'diversity' people get a little nervous. 'Are you going to take anything away from us?' So it's always met with some resistance because they don't understand. Or in some cases, don't want to understand. Or [they] think there's some hidden benefit that a person of color will be getting, and it likely meets some resistance. Obviously, the power thing comes to mind right away…just like, 'oh, this person will be in power… this person is of different culture, of different skin color than me, and there can be some problems for me if that person is in that job.' It's all of those misplaced fears that we experience sometimes when you start talking about diversity. People get nervous, especially in the majority culture. When you try to implement programs, there is some resistance and some lack of people regularly taking action. You've got to always be on the forefront, encouraging, patrolling, promoting. In order to get things done, you have to have some stick-to-itiveness. It just won't happen on its own. It has to have a leader, it has to have a person who has a message, a vision to go forward; and even when you do sometimes you become… an issue… in that regards, because people see you as the advocate and sometimes that tends to not go well for the person in that leadership role."* (African American male) One participant discussed the **misunderstood objectives of affirmative action** and the difficulties these misperceptions have caused. *"Making people aware of the value of diversity and issues that are preventing it or challenging diversity is really key. There are people who don't even really think this is that much of a problem. That blows me away when I meet them. I think that there are individuals now who think that the ideas that we have in higher education are to give breaks to people of diverse backgrounds, which I don't see at all… just trying to dispel some of the myths around affirmative action that this doesn't result in breaks [for others]… trying to make people understand that things are not fair and that what affirmative action does is try to make the system fairer. So I think from a big picture perspective, it would be positive to try to address that misconception."* (Latino male)

Diversity in Hiring/Retention Issues

Hiring and retention of diverse faculty and students was seen as key to promoting long-term, successful, and sustainable diversity-related programs. *"I think that having more ethnicity or more diversity in the ranks will attract even more ethnic minorities into the areas of neuroscience, biology, and the other sciences."* (Latino male) He elaborated about his experience when attempting to persuade a hiring committee to interview a minority candidate, *"I was pushing for us to interview a*

minority candidate, but the candidate was #7 or #8 on the list of 10 and they were only going to interview the top four, which happened to be White males. I made the push for it but they said that the field was leveled." (Latino male) Others discussed their frustration when minorities do not succeed in academia while underscoring the **need for success stories to change perceptions** within institutions of higher education. *"I really feel especially sad when I see a Latino or a female not do well for tenure, for promotion, because it means that the stereotype is perseverated. 'Here is another Latino that didn't pass.' As a Latina I have the same reaction when a crime is committed; you are like, 'Oh God don't let it be a Latino!' We need those success stories so that we begin to tell people, 'why are you afraid of this?'"* (Latina female)

Other minority experts discussed the need for **high standards accompanied by a safety net to ensure that minority scholars are not perceived as second-class scientists** who were only hired because of affirmative action policies. He shared his experiences *"I think that one of the important things to do is to set high standards, but also provide a safety net. I've tried to do that because the issue for me is that minority scholars should not be seen as second-class citizens or people that got in through the back door because of affirmative action. I've started off with that even with my own colleagues and had to say 'I did not come in through the back door. I came in through the front door just like all of you. I take pride in having as much capacity as any of you.' That has to be said from the standpoint of teaching our students that we WILL be challenged… we WILL be seen as second-rate, unless we show that we are just as capable as all of our colleagues in the same department or institution. So, it IS a challenge, but we need to face it; because otherwise, we ARE marginalized and people won't value the hard work that we put into making it in this society or in academia or consider us as 'getting in through the back door' because of the pretext that, 'well, they were just they products of affirmative action'."* (Latino male)

Participants discussed the characteristics of **successful recruiting and retention strategies.** One reported that opportunity funds for diversity hiring were available through her institution and underscored that each hiring process involves workshops on recruiting, interviewing and hiring procedures. In her words *"We have opportunity appointments [through opportunity hiring funds] that are for diverse faculty [hiring] so that our deans, for example, might always be prioritizing hiring someone who is represents a need in our university and brings diverse background to the university. Those are independent lines of funding based on strategic needs."* (White female) Another discussed the need to **highlight types of diversity funding,** such as supplements, to enhance non-minority faculty's desires to recruit diverse individuals. She stated, *"I have found that different people at the university have different degrees*

of motivation and knowledge to engage in [diversity] programs, so another thing that we try to do is to educate our colleagues about opportunities that they might be able to take advantage of, like research supplements, student stipends, travel money, discretionary funds, with their minority students as a way to try to encourage them to recruit minorities into their laboratories…and to look [positively] at minority students." (White female)

Participants discussed the role of geographic setting and the needs of diverse faculty respective to their race/ethnicity. *"I was just invited to go to UMass Amherst where they are desperately trying to increase their diversity. Where, you can imagine, they have White rich kids. And they want to know how to hire [diverse faculty; so at the faculty level they can support minorities that do come in. What happens is they lose them; they get hired, but then they lose them. What I tell people is that if you are a minority, you know exactly what I am talking about. I felt this way when I went to Texas A & M. I missed 'mi gente, mi comida' [my people, my food]. I was like 'Where in the hell did I land-Mars!?'' And that was in Texas, ok? [laughter] So I think what happens when you go to places like UMass Amherst and you are a minority, you don't have your foods, you don't have your people, you don't have your language."* (Latina female) One participant reported **diversity as a motivator** for her to select the university wherein she is now employed. *"I was a post doc at Scripps Research Institute in La Jolla and at one point in time, I had four minority students as undergrads in my lab and I would look for them; … those were the ones I wanted to foster. So part of the reason I came to UTEP is that it is 85% Latino and being here affords me an even greater opportunity to work with those kinds of students."* (Latina female)

RECOMMENDATIONS FOR PROMOTING DIVERSITY IN HIGHER EDUCATION – DIVERSITY LEADERS

Steps to Highlightthe Importance of Diversity in Academic Settings

• Prioritize hiring of diverse faculty and administrators to enhance the educational experience for students in the classroom and to serve as role models to increase the recruitment, engagement, and retention of URS in the behavioral and biomedical sciences.

• Increase the diversity of students in the behavioral and biomedical sciences through diversity-related training programs in order to integrate the perspectives of diverse populations and enhance critical areas of research, such as health disparities.

Steps to Enhance Diversity Programming

- Create diversity-focused curriculum to introduce all students to best practices in behavioral and biomedical research.

- Prioritize diversity-related campus activities and programs that recruit UR faculty and administrators to leadership positions and promote the interaction between faculty and URS in the sciences.

- Improve the effectiveness of diversity-related programming by providing supportive academic mentoring to increase student confidence in the sciences and decrease Darwinian methods to student selection.

- Implement diversity workshops and trainings for administrators and faculty to decrease resistance in promoting diversity in the sciences, as well as aid in their understanding of barriers that URS face in academia in order to improve diversity programs, particularly in the areas of behavioral and biomedical sciences.

Steps to Increase Diversity in Hiring/Retention Issues

- Improve the diversity hiring process by hosting workshops on recruiting, interviewing and hiring procedures for UR administrator and faculty applicants.

- Create opportunity hires and funding incentives to prioritize and have an institutional commitment to diversity hires in the behavioral and biomedical sciences.

- Enhance the representation of UR faculty and students to recruit additional UR administrators and faculty to science programs.

DIVERSITY IN HIGHER EDUCATION - STUDENTS

Participants highlighted their perceptions of diversity in academic role models and how it adds to the educational experience.

- Diverse teachers add a comfort level for URS expressing their opinions in the classroom.

- There are benefits of students interacting with faculty who come from different backgrounds.

- Students highlighted the importance of having diverse academic role models who are culturally sensitive.

- There is a need to promote faculty diversity by training and developing more underrepresented students.

• Underrepresented students are concerned with future job prospects in the sciences given their minority status.

• Diverse faculty and academic role models are needed to increase sense of belonging among underrepresented students.

• Importance of having women role models in the sciences who can identify with balancing academia and having a family.

Students in both groups discussed perceptions of diversity in academic role models. Many students shared their perspectives on diverse faculty and the benefits that it produces for both students and campus climate. Students discussed the perception that **diverse faculty instructors allow students to feel more comfortable in expressing their opinions in the classroom.** As one student said, *"I think sometimes it's harder to relate, especially if it [involves] classes where we might have conversations. I know there was some of my classes were we would take the first fifteen minutes of class to talk about current events or things like that and I might be a little more hesitant to speak out about my position on abortion to an older white man versus someone that looks like me. Just little things like that. It's a bit easier to relate for me if I am talking about something like that [position on abortion] to another woman that might understand the thoughts that are going through your head if you're dealing with some kind of big issue like that."* (African American female, graduate student) Students also highlighted the **importance of having diverse academic role models who are culturally sensitive and recognize the experiences and cultural values of underrepresented students.** For example, a student said, *"I think for first generation students it is important to have someone that looks like you… And even if they're not Mexican or African American, I think it's important for them to be culturally sensitive and kind of know what you're going through as a minority student, maybe as a first generation freshmen or sophomore coming in, because I think when you're that young you don't really know what to expect and you haven't really been around people that you trust in terms of professors. So you don't know how to relate to them or how to approach them or what you're going to go through in the class."* (Latina first-generation female, doctoral student) Students reported on the importance of having women role models in the sciences that can identify with balancing academia and having a family. The students also mentioned that diverse faculty and academic role models could help students increase their sense of belonging at their university.

Some students felt that faculty did not have to share the same background to be effective. The student discussed what diversity meant to him, *"It doesn't have to be everybody looking like me. Diversity is where you don't want the same. For me personally, I don't want to go through the same experience I had with my high school. Almost everybody would have the same background coming up to some extent. So seeing or having somebody you can relate to or somebody you can connect with is a great thing, but it diversity means having different faculty members, different classmates and things like that"* (African-American male, doctoral student) Many noted that there is a lack of diverse faculty members and there is a need to promote faculty diversity by training and developing more underrepresented students. However, students also noted their **concerns with future job prospects in the sciences given their minority status.** A student said, *"I'm a woman of color because I'm Mexican. If I wanted to be a professor in the future; what is that telling me? Am I going to get hired? Will I have that chance? Are they even going to consider me? To develop a sense of community they can communicate with your parents. It also depends on how many Hispanic children or African-Americans adults are attending school. I think it does affect me, I think it affects everyone, we are minorities. Are we going to have that chance if they are not hiring minorities? That's the question. If we only see a certain ethnic group, the majority of them are being hired. Where are we?"* (Latina first-generation female, undergraduate student)

RECOMMENDATIONS FOR PROMOTING DIVERSITY IN HIGHER EDUCATION – STUDENTS

• Prioritize hiring of diverse faculty to enhance the educational experience for students in the classroom and increase sense of belonging in the behavioral and biomedical sciences.

• Implement cultural competency training for all administrators, faculty, and staff.

DIVERSITY IN HIGHER EDUCATION –ACADEMIC ADVISORS

Participants highlighted their perceptions of diversity and how it adds to the educational experience.

Importance of Diverse Leadership

• There is a perception of lack of institutional commitment from administrators to support the success of URS.

• Importance of hiring diverse staff and faculty that URS can relate to and see as role models. Concurrently, having cultural competence training for all staff and faculty, regardless of URS status.

- It is important to have academic advisors who are competent and experienced in working with a diverse student population.

Connecting with Diverse Campus Networks

- It is important to have and be aware of diversity-related student groups on campus that URS can identify with and be directed to.

- Introducing URS to a network of diverse students, faculty, and resources through diversity programming to increase their sense of belonging in the sciences. The presence of these diverse networks also attracts more URS to apply to universities that have diverse student groups and populations.

Advisors highlighted the importance of diversity in the academic setting in several areas. In particular, **advisors expressed concerns about whether the university has diversity leadership at the administrative level that is really committed to the success of URS in the sciences** in order to transform the doctoral pipeline. *"In my five years that I've been here [at CSULB] I kind of question our institutional commitment. Whether we are truly committed to diversity as an institution. Like in higher ups supporting students because sometimes I feel like it is a challenge and I have to dance around, 'Oh, I serve only Latino students' and I have to be careful with the politics. So, I think sometimes the politics stairs can be a barrier for us…I think if the university was more intentional about hiring people that are committed and have a proven track record of commitment to diverse students and underrepresented students, I think you could change culture."* (Latina first-generation female, graduate advisor) Several advisors also emphasized the **importance of hiring diverse faculty and staff** that URS can relate to and view as role models. *"Students don't see staff and faculty that they can identify with. They're less likely to see themselves succeeding and unfortunately, our campus is very diverse as far as the students, but I quickly notice that we are not diverse with the staff…I participated in the Latina Connection Conference and a student voiced this in the ballroom. How many Latino and African American faculty do we actually have?"* (Latina first-generation female, undergraduate advisor) Similarly, having all faculty and staff (regardless of URS status) **participate in cultural competency training** would facilitate positive mentoring and advising experiences, as well as recruitment and retention rates, for URS in the sciences. *"Hiring staff, hiring faculty of color, or more representation of who they [students] are is important because the faculty and staff interactions are so crucial to [student] retention and involvement…There is a lot of data that the faculty-student interaction creates that retention and creates that involvement. So I think it is important for the White or Asian faculty to be more*

culturally aware and culturally sensitive with trainings. So more representation. I think students may feel a little more comfortable and see examples of success." (Latina first-generation female, undergraduate advisor) A graduate advisor added, *"Having somebody [academic advisor] that is knowledgeable in working with different student populations is important too because I serve all students. I serve Latinos. I serve African Americans. I serve first generation and I serve white students. I serve the whole spectrum in that aspect."* (Latina first-generation female)

In addition to having a stronger presence of diverse leaders on campus, advisors underscored the importance of them **being aware of diversity-related student groups on campus** that URS can identify with and be directed to in order to enhance URS retention in the sciences. As one graduate advisor stated, *"I spent three years studying different types of student populations and [my training program] definitely had a social justice mission so we learned a lot about different student groups that are on campus – LGBT, Latinos, Native American, undocumented and international students. We have different Ally trainings on this campus too that focus specifically on [different student] groups…so there's AB540 Ally, there's LGBT, we have veterans…I found those [trainings] to be pretty helpful because then you develop a network of people that the students know. They usually put out a document of safe allies that somebody can contact, like if I have a [student with a] family issue."* (Latina first generation female) Correspondingly, advisors stressed the **importance of introducing URS to a diverse network** of students, faculty, and other resources in order to improve their sense of belonging throughout the behavioral and biomedical doctoral pipeline and **develop a science identity.** *"Through the Science and Math Enrichment Program (SMEP), we discussed what would help students take on that new identity as a science student. I said, 'Why don't we do a diversity session and introduce students to [people of] different ethnicities and people that you're going to be working with in different clubs?' We had about fifty students who talked to them about the academics stuff, introduced them to different faculty. It's bringing up an awareness…thinking about my racial identity process or thinking about how does it impact me? How does it impact the people I am around? When you start thinking about those things, it becomes a comfortable place vs. I am just uncomfortable seeing them that I don't fit. You are starting to process who you are to see how you do fit."* (White female, undergraduate advisor)

RECOMMENDATIONS FOR PROMOTING DIVERSITY IN HIGHER EDUCATION – ACADEMIC ADVISORS

Steps to Promote Diversity at CSULB

- Prioritize hiring of diverse faculty and administrators.

- Implement cultural competency training for all administrators, faculty, and staff.

Steps to Connect Students to Diverse Campus Networks

- Host an informational open house for academic advisors to connect them with on-campus, diversity-focused, student organizations and resources.

- Organize an interactive on-campus panel for URS to meet other diverse students and organizations.

Findings from the AHORA Conference Regarding Diversity in Higher Education

Conference attendees stated the need to require a diversity statement when hiring new faculty. This procedure has resulted in other CSUs tripling the number of applicants who value diversity. In terms of current faculty, attendees emphasized the need to offer workshops, trainings, or informational sessions that allow administrators and faculty to understand the need to increase the representation of UR tenure-track faculty in the CSUs. Given that the majority of mentorship opportunities involve UR faculty, it is important for universities to protect them from being over burdened with mentoring URS and to continue offering job positions to applicants who value diversity in the academic setting.

References

1. McGee R, Saran S, Krulwich, TA. Diversity in the biomedical research workforce: Developing talent. Mount Sinai Journal of Medicine: A Journal of Translational and Personalized Medicine. 2012;79(3).

2. Park JJ. Are We Satisfied?: A Look at Student Satisfaction with Diversity at Traditionally White Institutions. The Review of Higher Education. 2009;32(3):291-320.

Discrimination

Despite the increase of minorities enrolling in higher education, a daunting lack of racial/ethnic minorities advancing to the doctoral pipeline still plagues the U.S. educational system. According to the Council of Graduate Schools, the number of research doctorates among students from underrepresented populations is 12% overall and only 10% in the STEM disciplines.[1] Chang and colleagues report that a body of research has indicated that prejudice or negative racial experiences play a detrimental role in the quality of minority students' academic and social experiences in college and their commitment to degree completion.[2] In addition, Chang, Eagan, Lin, and Hurtado review literature that indicate that feelings of prejudice or alienation have also been shown to be negatively correlated with minority student persistence[2] and adjustment to college for high-achieving Latina/o[3] and African American students.[4]

DISCRIMINATION – DIVERSITY LEADERS AND FACULTY

Participants highlighted their perceptions of discrimination in the academic environment:

•   Academia presents a discriminatory environment due to unclear expectations, individual competition, un-level playing field, curve grading, and discriminatory practices that fail to allow for the creation of a sense of belonging.

•   Minority students and professors, even when they are the majority, often feel tokenized by leadership.

•   Gender biases leading to credit and opportunity given to male colleagues over female counterparts was reported by women as just as damaging as racism/ethnocentrism.

•   Lower expectations of academic achievement exist in academia for members of underrepresented groups by both faculty and graduate students.

•   Discrimination experienced as a member of two or more minority groups (e.g., minority women).

Participants shared several of their experiences with **discriminatory practices and perceptions and the impact these have on the development of diversity-related programs.** They affirmed that for diversity programming to be successful, **stereotype threat must be minimized** and that **diversity should be seen as central to science,** as opposed to a 'feel-good' activity that some professors do in their spare time. *"I have been told 'Don't waste your time or talent on a feel-good program for students who don't belong here in the first place.' We need to minimize stereotype threat to create a safe place. There is still the perspective that the cream rises to the top because of intelligence, on its own and that they [students of color] are only here because they are black or brown and the institution has cut them some slack. People still believe that institutions are doing as much as they can to actually work with students from diverse backgrounds. In fact one of the reviewers said, 'your school is already doing this, why are you proposing to do this.' It's bizarre; pretzel logic. They think we are already doing all we can and if students don't make it, it's their problem. Students are acutely aware of how they are being stereotyped. There is this whole back door notion around affirmative action even though we can't formally use affirmative action because of Prop 209 in California. But the back door sort of stigma still is attached, 'you're only here because you're Black or Brown; you're only here because this institution has cut you some favors, we need a few of you.'"* (Asian male)

Several participants illuminated that **discrimination ranged from passive strategies such as a lack of enthusiasm to active resistance by the creation of laws and policies,** such as witnessed in Arizona. *"I think in the early days, my work with minority issues was always seen as something you did as a side note. It wasn't seen as central to science and so it was marginalized for many years; until the last ten to fifteen years, when these issues have become much more prominent. And now, it's being seen as something you need to add to the curriculum. Although here…again… it is not as featured as maybe other aspects. I think what would be discriminatory, is more the lack of enthusiasm than active resistance or negativity. In some sectors, there is a lot of negativity because they feel that this is stuff that should not be taught and there could be resistance. Certainly, we've seen it in other sectors in Arizona. Taking textbooks away that are seen as minority because they pretext that multicultural education is divisive when in fact it is inclusionary. But for political reasons, they lie about it and say 'this is ruining our country' or 'making our kids angry' when the opposite is the case; we are trying to find ways to create bridges. These are the political negatives that have affected me and still influence how I need to deal with these issues."* (Latino male) The eradication of discrimination and creation of diversity-related programming was seen as warranting both diligence and persistence. *"There is a tendency for people to think that, 'Oh, it's not our problem anymore so we don't need to fund things and we don't need to worry about it,' and*

that's so not true. I think that we have to fight against that tendency. People start to see progress [in a UR student program] and they think, 'Oh, problem solved'. But it's a very complicated problem, it's been around for a long time, and it's going to take a long time to change it." (White female) Participants discussed the ways in which discrimination and **diversity-related programming is misunderstood and trivialized.** One participant's response summed up these reactions, *"There are many subtle discriminatory things that only minorities can understand. It is the feeling that you do not belong. Some of the actions are implicit and others are intentional. Even in a minority-majority institution, biases raise their ugly heads. You can't just throw a dozen tamales on a table and say you are being sensitive to cultural diversity."* (Latina female)

Participants also described the **fear associated with diversity programming** and related it to historical segregation in the United States. *"People are a little fearful of bringing other folks that don't look like them. We still have a lot of that going on. Trying to deal with the cultural reality, the cultural differences, sometimes makes people a little nervous. 'That person doesn't look like me, doesn't speak like me.' And obviously, a big barrier always is, 'they don't live the way I live.' As you know, most American cities are still very structured in terms of separation of people in general. So, they don't get the chance to see us in our sort of cultural realities… where we live; because we live so separately in terms of location."* (African American male) Another concurred by stating, *"People are scared to have the demographics of our country reflected in our academic institutions. People are going to hold on especially if you are in the majority or in the privileged sector. If you are in the privileged group, you are scared."* (Latina female)

Gender Bias and Discrimination: Women's Experience and the Double Burden of Prejudice and Discrimination

Both White women and women of color discussed the **burden of sexism in academia,** particularly within the sciences. They illuminated issues regarding giving **undue credit to male colleagues over their female peers, perceptions regarding minorities' and women's inability to succeed in the sciences,** and the need to accomplish **twice as much and work twice as hard** as their male peers. *"Most women in sciences will tell you 'you have to be twice as good, and work twice as hard' in order to be similarly successful."* (White female) In the words of one Latina female, *"I can't tell you how many times in faculty meetings that me or another*

woman or minority would say something - again, it's more about being a woman - and then later in the conversation a male says the same thing and the conversation shifts…. and… 'Oh! You know, John brought up a fabulous idea. Let's look at what John just said.' What I just described to you happens all the time." (Latina female) Participants discussed the origins of **implicit biases and their damaging effects** on one's ability to persevere in the sciences. *"Unfortunately, we are hard on each other. Right now I am sort of obsessed with implicit bias and I am reading books and trying to understand where this comes from. And I think it is the fact that as a young person you are told these things and taught these things and so you actually believe because you hear the language of 'Latinos are not engineers; they are not scientists; women are not good at math.' Especially when they are implicit biases that you are not cognitively aware of, it is a slippery slide into it [bias]. 'Oh, OK. That fits into what I believe and what I was told as a young person.' Unfortunately, academic advisors - there are some really stupid ones - that say things like that."* (Latina female) One White woman shared a comment that was given to a Latina graduate student who was also a mother of a young child, *"Minorities and women are more likely to have experienced [discrimination], particularly minority women… I've been hearing from students some of the opinions that are overtly voiced by faculty and the Department Chair that are horrible. For example, one of my students, a Latina who has a five year old child, was told by her Chair 'Why are you here? You should go home and take care of your child.'"* (White female)

Women discussed having to overcome the **stress of sexism** to achieve in the sciences. *"I had to constantly fight the idea that 'no you can't' and the frustrations of sexism. I mean it's kind of hard enough, but when you are in an underrepresented group you have that added stressor. I would like to know some ways to increase one's resilience to that kind of stress. I think that what would have helped me are people acknowledging the successes of women. I think trying to let people know not to be their own worst enemy in buying into these biases that are out there. That's the key to overcoming some of the obstacles that are out there. Just don't buy into it. If it's something related to my own personality that if somebody tells me I can't, I act the opposite. I tend to go, 'Oh yeah! Wow! Stand back 'cause I am going to [do it].'"* (White female) Women discussed their male colleague's surprise at their success and that **males perceived female success as attributed to their 'good' personalities.** One woman reported, *"Our prior Chair actually convinced a wildly successful senior faculty colleague to retire because she was only successful because she was a nice person according to him. My personal experience as a woman in my college, and certainly in this department, [is that] you are viewed as inferior. And there's not much you can do. I have been very successful both as a scientist and as an administrator. I think my colleagues are shocked; they don't understand why I am so successful."* (White female)

These biases were ultimately seen as contributing to a discriminatory environment wherein **female students are viewed as inferior.** In the words of one scientist, *"When I first started my laboratory, I had three women and somebody made the comment that '[my] lab is all women but they're good too.' I think they meant well but, you know, obviously that reflects that they're surprised that women would be doing a good job."* (White female) This belief was confirmed by another participant, *"All my students are Latino or Latina and definitely considered to be lower class. They get the message that they are academically less qualified."* (White female) Women discussed this common male perception. *"That accomplishments that are made by those that are different than themselves are because the system has been easier on them."* (White female) One university conducted a survey to examine faculty and graduate attitudes towards diversity in an attempt to assess and address any issues found. *"It was disappointing to see that particularly males - majority male students and faculty - were more resistant than females and minority students and faculty. The concept that excellence and diversity cannot coexist. If you increase diversity, you have to decrease excellence. We saw this all across the campus. We have quite a diverse undergraduate population. How are our graduate assistants transmitting those views to the undergraduates? We are actually incorporating some diversity programming into our TA training now which we hadn't expected to do as part of this program."* (White female)

DISCRIMINATION – STUDENTS

Student participants highlighted their perceptions of discrimination in the academic environment:

- URS experiencing derogatory and discriminating remarks directly from faculty.

- Experiencing subtle forms of discrimination in graduate school.

- Faculty sharing discriminatory remarks about URS with each other in front of students.

- Students feeling lack of support from same ethnicity/race faculty who don't agree with their career path or area of study.

Students across both groups shared experiences with **receiving discriminatory remarks by professors** and in some cases experiencing subtle forms of discrimination by both "in" group and "out" group faculty members. Most tended to share experiences were faculty made discriminatory remarks and appeared generally unsupportive of

the student's academic progress. For example, a student noted, *"At [a UC school] I was pre-med too, I was just thinking about this one professor who once told me to not study and go on welfare and marry a gangster… the funny thing was he was Hispanic too, but he was like, 'You just don't have it in you. You don't, you can't get a Ph.D.'… I just brush it off because, I don't know, I can't let that get to me."* (Latina female) The student also made a **connection between professors' discriminatory and disparaging remarks and her gender.** She noted, *"Especially being in physics, some professors couldn't take me seriously because I am a girl… they just really kind of put me down sometimes. They wouldn't say I am not smart enough, but they would say it in other ways. I got that a lot at [this UC school]. I am not going to apply there for my Ph.D. I didn't like it."* (Latina female) Other perspectives of subtle discrimination were reported by graduate students that involved receiving differential treatment from a faculty member. The student noted, *"I don't know if it was just my perception of it, but it actually happened in my graduate program. It's my first semester and this really old-fashioned white lady teaching a course. And you know a lot of people were asking her questions and I went up to her and asked a question and I mean, I am the only minority in my cohort, and she told me to look for the answer in my book so I was like, 'OK, I'll go reference my book.' So the next two people that go up [to the professor] are these two white girls that go up to her and ask her the same question and she gives them the answer. I don't know if that is really discriminatory or not, but I picked up on it and noticed. I never brought it up but I should have."* (Latino male)

In contrast to the subtle forms of discrimination, overt **disparaging remarks made by faculty regarding the ethnicity of students** were shared in one group students. One student shared an experience that negatively impacted his ability to perform well on a final exam. He noted, *"My professor allowed me to take my final in the Electrical Engineering Department, which was kind of distracting because I had to listen to two professors talk about how Hispanic students don't know how to do much more than cheat in their classes, and that's because we weren't raised properly and that's all we know how to do. So while taking a final [exam] that's kind of distracting, right? Yeah. So I'm trying to focus on my test…it was just frustrating so I kind of just gave up on the test halfway through it and I just sat there until time ran out. So my professor (asked) 'How was it?' [I said] 'It wasn't that bad [being sarcastic]. I'm going home and watching cartoons.'"* (Latino male) Lastly, a student shared an experience were a same ethnicity/race faculty member did not support her because she disagreed with her department affiliation and area of research. She noted, *"For the psychology honor's program, we are required to write a thesis and for my thesis, I am doing self-esteem research and I'm using a sample of African-American women for my study… I was trying to recruit students for my study and I spoke to my mentor and she told me I should talk to the African studies department.*

So I had to contact them multiple times to even get a meeting, and when I finally got the meeting, I had basically a sample of a consent form to give to the students and I went around and talked to them for about 15 minutes or so and answered their questions and they all seemed very interested. But one of the professors asked me why I was doing psychology instead of African studies because she was like, 'You're an African American so why don't you do an African studies project. I don't understand, like have you taken an African Studies class?' And I told her I want to do psychology, sure I'm interested in it but that's not my focus. As soon as I wasn't receptive to it, I could tell the energy changed and I didn't hear back from any of the professors so I had to recruit the participants on my own and I didn't get as many as I had hoped I would. It was just eye-opening. I figured the faculty should've been more willing to help, given that I'm trying to conduct research and I have no other way of contacting students, especially within the psychology department, it's really limited, the number of African-American women. I rarely see them in my classes, so I figured I would have help from the African Studies Department but I didn't."
(African American female)

RECOMMENDATIONS FOR ADDRESSING DISCRIMINATION – STUDENTS

Steps to Address Discriminatory Practices at CSULB

• Create opportunities for faculty and staff to actively address and eliminate their discriminatory perceptions and attitudes.

• Create mandatory cultural competency trainings for administrators, faculty, academic advisors, and staff that focus on examining the impact of discriminatory comments, as well as implicit and explicit discriminatory behaviors, on students and other members of the academic community.

• Ensure that ethnic studies departments are integrated within diverse departmental efforts so that students who want to combine majors or conduct projects integrating ethnic studies encounter a welcome and facilitating environment.

DISCRIMINATION – ACADEMIC ADVISORS

Academic advisors highlighted their perceptions of discrimination in the academic environment:

- Elimination of students to help retention and graduation numbers look good for certain programs.

- URS receipt of discriminatory messages from faculty and advisors related to lower expectations for academic achievement.

- The importance of mentors not using or taking advantage of URS and treating them as mere technicians in their laboratories.

- The creation of hiring community appointments for those who believe that hiring diverse faculty is important to help support URS.

Academic advisors shared their observations of discriminatory practices and perceptions and the impact these have on URS and faculty. In particular, advisors described how some **administrators of student programs get rid of URS who are struggling in the sciences to help their retention and graduation numbers look better.** As one graduate advisor stated, *"I've seen some administrators trying to keep the numbers good. Say, 'oh, you're not good', you just got to get rid of them and so our program looks clean and our students graduate on time. But I think that is the wrong approach. We have to help students. That is what we are here for, right? We are here to try our best to help students get along even if it takes longer. Some students have problems, they have to work. They have all sorts of things. Not everybody is from a very fortunate family…Think about these kids as your own kid."* (Asian-American first-generation female) Advisors also discussed how **URS are given messages from the outset by instructors, faculty, and administration that they are not going to make it in the sciences** stating, *"I get really passionate about this but I just feel like it's wrong. It's wrong because they're using numbers to statistically say that you're probably not going to make it and I feel like approaching the student that way is already a deficit and they are already being told the minute they step on this campus, they're already scared, they already know what is going on and they are already being told, 'By the way, you aren't going to make it'. But what if they could?"* (Latina first-generation female, undergraduate advisor) Another undergraduate advisor added, *"Some of the messages on there, the staff are not culturally sensitive and so some of the little comments. It bothers me and I am older. I can imagine an 18 year old who it took them courage to go and seek help and they hear this little underhanded comment. They're going to feel like, 'I can't do it'. They're*

going to internalize that and they're going to think, 'I cannot do it'. The counselor is telling me, 'I can't do it.'" (Latina first-generation female) Several advisors also spoke of **stereotype threat experienced by URS** with faculty and advisors having lower expectations on URS' academic ability. *"Sometimes the bar is set too low for them [URS]. Sometimes you'll have an advisor that says, 'Take all the easy classes.' Why? 'I am not stupid.' Some of my students don't like to be singled out. They're wonder, 'Why do I have to be singled out? Why can't I be treated like everybody else?' But then the other thing is, just like you're pushing a high achieving student, 'Why am I not being pushed that way?' So sometimes the bar is set too low for them. Sometimes they need that push, they need that motivation. If other people are looking at you thinking you're not going to make it, then why would I think I am going to make it?"* (African-American first-generation female, undergraduate advisor)

Advisors also discussed the importance of making sure that students are not in a situation with a faculty researcher where **URS are just being used as technicians in their research lab without getting the mentoring needed to progress through the doctoral pipeline.** A graduate advisor stated, *"The main jumping block or the main person who has their [the student's] career in their hands, what they're going to do next, is the PI. And we try and make sure the PI doesn't damage students. That's part of our job as well is that the PI is not abusing the students. So that's part of our mission as a grad advisor. So the person who is doing the main mentoring overall has the most influence over how that person gets a career is the PI in the lab that they are working under. You know, the other people can have some influence and can make them excited and what not but it's how much support the PI gives."* (White male, graduate advisor) Finally, advisors spoke of experiencing **resistance in hiring ethnically diverse faculty and administrators,** with several members of hiring committees in the sciences dismissing the importance of having diversity hires. As one graduate advisor stated, *"I think hiring diverse faculty administrators is important, too. I have often heard, 'oh they're not applying.' The top people saying, 'show me the research that says hiring diverse faculty is better for underrepresented students.' I can only offer my annotated information and personal experiences, which is…it helps. It does help, so…I know that's a touchy, political subject…But it needs to happen and I really don't feel like the university, at least in the sciences, has really made a true effort."* (Latina first-generation female)

RECOMMENDATIONS FOR ADDRESSING DISCRIMINATION – ACADEMIC ADVISORS

Steps to Address Discriminatory Practices at CSULB:

• Provide incentive programs for departments that demonstrate improvements in URS retention and graduation rates in the behavioral and biomedical sciences.

• Create mandatory cultural competency trainings for administrators, faculty, academic advisors, and staff that focus on examining the impact of discriminatory comments, as well as implicit and explicit discriminatory behaviors, on students and other members of the academic community.

• Prioritize hiring of diverse faculty and administrators.

Findings from the AHORA Conference Regarding the Impact of Discrimination

Implicit bias and gender discrimination are two necessary items that need to be further addressed as both barriers to academic success as well as discriminatory practices and, to the extent that they are reinforced by the campus environment, including institutional barriers and faculty attitudes. Discrimination was found to be related to diversity in that general diversity promotion can sometimes reinforce the subtle and overt practices of discrimination among those who harbor racist attitudes and suffer from racism. Participants reinforced the perception that diversity is regularly equated with lower quality and probability of academic success. Participants also recommended that we address the impact of discrimination towards the LGBT and differently-abled. Discussion also centered on the difficulty researchers experience when attempting to measure discrimination in general and among distinct racial/ethnic groups. Participants underscored the importance of recruiting diverse faculty who can serve as role models and facilitate the elimination of discrimination and engrained perceptions of underserved minority abilities within academia.

References

1.   Council of Graduate Schools. Overview of Research on Underrepresented Populations in Graduate Schools. 2012.

2.   Chang MJ, Eagan MK, Lin MH, Hurtado S. Considering the impact of racial stigmas and science identity: Persistence among biomedical and behavioral science aspirants. Journal of Higher Education. 2011;82(5): 564-596.

3.   Hurtado S, Carter DF, Spuler A. Latino student transition to college: Assessing difficulties and factors in successful college adjustment. Research in higher education. 1996;37(2):135-157.

4.   Cabrera AF, Nora A, Terenzini PT, Pascarella E, Hagedorn LS. Campus racial climate and the adjustment of students to college: A comparison between White students and African-American students. Journal of Higher Education. 1999; 70(2):134-160.

Experiences of Diversity Leaders and Students

Understanding underrepresented minority (URS) students' experiences of diversity in higher education is imperative in determining URS's success in graduating from STEM, biomedical or behavioral science programs and progressing to doctorate degrees or professional careers. Campus climate has been commonly expressed as a contributing factor to URS students' success. Figueroa, Hurtado, and Eagan indicate that campus climate consists of four interrelated components: structural diversity (the number of minority students, faculty, and administrators), historical legacy (history of racial discrimination), psychological dimensions (student perceptions and attitudes toward diversity), and behavioral interactions (relationships and encounters between groups and individuals over diversity issues).[1] Furthermore, McGee, Saran, and Krulwich indicate disparities in college readiness and that many URS students from lower SES have experienced fewer educational advantages from K-12 education, which have resulted in fewer opportunities to fully develop their potentials when pursuing graduate education.[2]

EXPERIENCES OF DIVERSITY LEADERS – DIVERSITY LEADERS AND FACULTY

Participants highlighted their experiences in academia

•   Getting tenure means getting the top students, not necessarily mentoring minority students, in establishing one's faculty career.

•   Being an ethnic minority faculty member increases UR student engagement in the sciences.

•   Interviewees highlighted the importance of their institution valuing their student outreach and mentorship activities while maintaining an active research lab.

•   Being a member of an underrepresented group in the sciences as a source of stress during one's career development

•   Having peer support as a faculty member is important in terms of training and promoting diversity within one's field of research

•   Needing resilience as being important in one's career development to remain in the science fields.

•   It is difficult to have sense of belonging in academia when you are the only member of your minority group in your department, institution, etc.

Diversity experts illuminated the difficulties they had in establishing their careers. They often found themselves being **stereotyped by both students and faculty** members as being the minority, and thus less-desirable members of their respective departments. In the words of one expert, *"As a new faculty member recruiting graduate students, I wanted to recruit the top students and I wanted to make sure I brought them into my lab [with] high GRE scores, that they had high GPAs. But, the problem was that given that I was so new, the top students didn't want me at all. My intent was, I'm going to establish myself, I'm going to make sure I get tenure and then I'm going to start mentoring minority students. The main thing was that I would establish myself and that was the kind of advice I was given by programs I participated in when I was a minority student in outreach programs. I was told make sure you secure yourself before you help out others. It didn't quite happen for me like that. I had to start from the beginning recruiting minority students and I haven't stopped."* (Latino male) Given the difficult environments that exist, experts **underscored the importance of mentors** maintaining frequent communication with newly minted tenure track UR professors. *"And so we can't forget that there is not just one or two steps, there is three, four important steps. We forget about them. We put them in tenure track positions and we forget about them. And I am not sure what the answer is there, but I like to think backwards in the sense that I have my goal and I think, okay, how do I work backwards from that goal, and so if we put the goal on the table, which is equal representation in academic biomedical fields, then you are talking about a full professor, right? An NIH funded full professor? Ok, fine, but that means that there are associate professors, that means that there are post docs, that means that they need to be writing publications, that means that they have to be writing grants, so not just getting them to apply and increasing our number of applicants, but moving them through an entire array of steps."* (Latina female)

Experts shared the **important role that diverse faculty play in student engagement,** particularly related to URS success, and especially given the few UR faculty that exist in academic environments today. The **weight of being the "token" minority** in a department resulted in a considerable amount of additional stress. *"In my department I'm the only person that identifies as an ethnic minority. You'd be surprised to know that I get a ton of emails from people that are not even in my [line of] research. They just feel like they need to contact someone. And I'm answering questions about other areas [of science] or the field even though they are not related to me. I think that says a lot that seeing a face or a color, per se, that you may feel like you can contact, it makes a big difference."* (Latino male) Diversity experts stated that they are often sought out by other students in other disciplines because they are **perceived as being more understanding and willing to mentor students** than the traditional, white male faculty member. *"A lot of times other ethnic*

minority students say to me that other professors are so busy and sometimes I say 'but I'm [ethnic minority faculty] busy too and you contacted me even though I'm not in the area?' And they [say] 'no, no, no, it's that I figured you would understand and at least reply to my email.'" (Latino male)

Female diversity experts also expressed **stress regarding gender-based discrimination** and perceptions and how important grit was for success. *"I am a female and we are highly underrepresented. For me, there is no question that [the difference for me in my trajectory to my doctoral degree] it was natural grit. I didn't ever initially attempt to be a faculty member or even a scientist through a variety of personal reasons, but once I had reached a level of post doc, and I thought of dropping out, and again for a variety of personal reasons I didn't, but I decided that I had invested too much to walk away now and I wasn't prepared to quit."* (White female) Women experts, regardless of race or ethnicity, reported gaining a better understanding of what it would be like to be a person of color or of a different sexual orientation via their treatment as women. *"When I entered into graduate school, being an underrepresented woman in the neurosciences and biological and behavioral sciences, especially at the higher levels, it became an issue for me and kind of a source of stress during my own training. I realized that there's lots of different ways a person could experience those challenges during their career development, not just gender but race and sexual orientation etc."* (White female) **Women shared the difficulty and isolation experienced** being the only woman in a male-dominated environment. They linked survival within the environment as being intertwined with creating support systems. *"I was the first women faculty member in my department and I'm back to being the only women faculty in my department. There are cultural differences and so I don't feel necessarily that I belong. Yes of course belonging is important and you have to create your own support networks in order to feel like you belong. Which is why I think to be the first woman, the first African American, the first anything is hard. You don't have a network within that cohort to create sense of belonging necessarily… You just need to look for support where you can find it. And that will give you the strength to, if you have sense of belonging that will give you the strength to be different in the professional setting and academic setting. I just do my own thing. I focus on what I want to do and I'm my own support group. So I've listened to the opinions of people that are close to me and that I respect. But everyone else I have learned to ignore basically."* (White female)

Experts discussed the **need to redefine what makes a good mentor** in academia, and underscored that mentoring should be defined by more than having funding to support students. *"Yes, exactly, you know some people would go after this guy as a mentor because he has six RO1s. Well that's lovely but, does that person have the time? Does that person have the sensitivity? Do they have an understanding of diverse*

issues?" (Latina female) Redefining mentorship also translates to re-envisioning what mentorship within the realm of academic responsibility and tenure translates to in terms of the retention, tenure, and promotion as well as institutional funding allocation processes. **Faculty committed to diversity outreach have to manage balancing the recruitment and training of URS with fulfilling their research agenda** to ensure that their lab remains funded, and URS have funded opportunities to work as research assistants. In other words, participants stressed the need for institutional support and political will for URS engagement and programs. *"Think about this, I don't get credit for outreach. I have to make sure to continue publishing, have to make sure to continue getting grants so I can support my students. So then it's tough, what do I do? Do I focus my efforts on outreach or do I just focus my efforts on my research? And whatever minority student that happens to be in my periphery I can recruit, then I will. And that's how I've been doing it. Identifying students and recruiting them… My institution is not going to give me credit for outreach. Once I run out of money, they will close my lab. And then I'm not going to be able to train any students."* (Latino male) Another expert shared that a **university's commitment to diversity can be measured by its willingness to hire diverse, UR faculty.** (Latina female) *"If we're going to be serious about getting these kids and maintaining those kids… not only do we have to have the role models, and role models can be colorless. However, it also helps to have people on that campus who look like you…students can see a person, whether it be Latino, Black…and if you've got those Professors… if the kids saw professors of color like them, then they think, 'if this guy can do it…' and that gives them some incentive to do it. They have to see themselves… they have to see themselves in that vision going forward… 'Hey, there's a Black guy and he has a Ph.D.; and he's a biomedical research scientist; oh man!' Encouragement because if they don't see themselves, [they will ask themselves] 'Why would I be in this program? This is for white people only'. The lack of role models is a major problem."* (African American male)

Diversity experts underscored **the need to coalesce with like-minded colleagues to facilitate prioritization of diversity-related programming** within their respective institutions. *"Right from the very beginning [as a faculty member] I was fortunate because I had a colleague, he was at the same level as I was and he was a Hispanic researcher and felt the same way [in terms of training and promoting diversity in the field], so the two of us were very proactive and engaged ourselves in various work to enhance diversity."* (White female) **Coalition with others to promote diversity programming was viewed as essential to establishing real change** within academia. *"We need to have people and communities that are really willing to stand up, to say 'we need this. We want it.' It is very clear that people that are affluent get all these chances and opportunities simply because they have money to pay for things that otherwise they would never have. Minorities don't have the*

money, so they need these programs to help bridge opportunities to go forward. And of course given the opportunity, the students need to be advised that they are very lucky to be here because – 'through the sacrifices of many, this opportunity was provided for you' – but… 'It may not be here in the future, because the political – you know - negativity, will try to wipe it out.' And so telling them that they DO need to take advantage of this opportunity and work very hard - not only for themselves but also for what they could be doing on behalf of their communities. These political mindsets are very important. When I teach students to be critical thinkers, I teach them not to be deceived by inflammatory and negative politics that demonizes the very efforts that are needed in order to help our communities, because they don't want to see them. Many people in power would rather have our community be ignorant, and pregnant, and barefoot. We need to be able to have: countermeasures to say, 'no, these programs are not injurious to our community…they build it; they add diversity - which is necessary,' … and people that have the support and the courage to speak up in that regards - because otherwise, what happens is: no one says anything and those lies are re-edified into reality. And the next thing you know, there's rules or regulations or legislation that says, 'these programs should be forbidden because they are detrimental to our society' - which is certainly not true. But people can play that card, and they can win, unless our community and others say, 'No… no, it's just the opposite - and we have evidence - ; data-based evidence to show they help and don't hinder our society.'" (Latino male)

Participants emphasized the **protective nature of cultural values and resilience** in terms of facilitating retention among URS and alluded to the importance of mentors who actively reinforce these values, skills, and mindset. One diversity expert expressed the need to **openly reinforce and place value on resilience** so as to help students 'toughen up' to ensure their academic success. *"I think that cultural values and resilience add another aspect that needs to be developed. Cultural values like being proud of your heritage and not being ashamed to exhibit it. And resilience - the capacity for persistence and to bounce back in the face of adversity are a mindset, but also skills, that students of color need to obtain through mentorship and through their own thinking -because they are going to need it. Things are challenging; and to the extent that they don't have that where-with-all to deal with adversity, or challenges, or difficult times is critical. Of course, it's aided by social support from others that are similar; and that is where networking and group support, is very important. But I would say that it is important for our students to toughen up - they have to be capable of either succeeding or looking for social support too… so that they can ultimately survive a difficult situation. And in mainstream too, you know… you have difficult days and challenges - and it's the capacity to find a way to unravel those challenges and forge ahead. Resilience is a skill that needs to be taught… and a mindset that needs to be taught. It is not something that you get out of a textbook. It comes from relationships and folks that give you the inside information on what it takes to survive."* (Latino male)

Participants stressed the **importance of reaching back through diversity program efforts to access those students most in need.** *"I think one thing we need to do is…. spend some time looking for those 'diamonds in the rough.' … The kids who don't come from that same family structure… the kids who don't come from that same socioeconomic or educational structure. We need to get them in the pipeline to give them an appetite for what they're going to be doing…let them see it, feel it, touch it… That's when you stimulate some creativity and I guarantee you, you'll hire some high performing kids in what they call the C, C minus area … who are just waiting to be discovered as soon as someone shows some interest in them. We need to reach out to those students in those communities. We need to redefine the cream, so that's one thing. We shouldn't feel like we can't talk about stipends or summer jobs, all of that kind of thing…and so, economics is always a reality and - in some cases - obviously, we get the same old thing…people don't have transportation. How do we get them there and back home safely? We've got to be concerned about their health and their issues? Some kids don't eat three meals a day - because they can't afford it. We've got to get those kids in and deal with some of their 'where they are' issues."* (African American male)

Several diversity experts reflected on their experiences in school as first generation-educated students, several of whom were UR minorities. They discussed the **lack of support and the unspoken rules that impeded their development,** despite their eventual success. One expert shared, *"It never occurred to me that I could go talk to dean or that I could go talk to someone in my committee. Even though it now sounds so obvious. Back then it never occurred to me. I saw all the students graduate and I thought it was just going through the motions and going through the steps. For example, what do you do if your advisor has a draft of your paper and he/she hasn't given you feedback in four months? So that's huge. What do you do? Not only wasn't I getting the right support but I didn't know how to get support myself. After going through that [not getting advisor feedback on a paper] and talking to people… 'This is something I can do without getting my professor in trouble.' Okay, but unless you know how the system works, it's not going to occur to you."* (Latino male)

RECOMMENDATIONS FOR PROMOTING URS ACADEMIC SUCCESS – DIVERSITY LEADERS

• Develop formal and informal mentorship networks/support systems, career development workshops, and other resources for UR faculty in order to help them navigate through the academic requirements to tenure and promotion.

• Conduct cultural competency workshops for administrators and faculty, particularly as they relate to gender-based discrimination and increasing the understanding of the unique role and additional pressure that UR faculty face in being approached by URS of all disciplines for mentorship.

• Integrate an informational panel within diversity research programs to educate URS on how to choose an effective research mentor and how to develop effective mentorship relationships at the undergraduate, graduate, and doctoral level.

• Formalize institutional support (within the retention, tenure, and promotion evaluation criteria) to heavily weigh and recognize faculty work with URS outreach, engagement, and retention in behavioral and biomedical research.

• Prioritize diversity hires in the sciences to increase the number of faculty role models for URS and to have UR faculty who can work together to prioritize diversity-related programming for URS in the behavioral and biomedical sciences.

• Increase the recognition and promotion of cultural capital among administrators, faculty, and URS in diversity research training programs to increase the retention of URS throughout the behavioral and biomedical doctoral pipeline.

• Expand the selection criteria and outreach of URS for diversity research training programs to consider other factors that may be better predictors of academic success, such as measures of GRIT and levels of student resilience.

EXPERIENCES OF DIVERSE STUDENTS – STUDENTS

Participants highlighted their reasons and motivation for earning a doctoral degree.

• Positive benefits associated with earning a doctoral degree.

• Being passionate about their respective scientific and health-related research fields.

- Students' motivation stemming from family motivation and the need to meet their families' expectations of success.

- Need to further develop their research skills through continued training.

- Need for increased opportunities to conduct independent research and mentor other students.

- The importance of being a role model and mentor for other URS.

- Emphasis on earning a graduate degree to have professional careers in their respective majors.

- Students' reflection on their personal experiences influencing their motivation for pursuing a doctoral degree.

Participants across both groups expressed both practical and personal reasons for their desire to obtain doctoral degrees. Some participants expressed **practical considerations such as financial benefits, higher level of job security** that can come with positions that require advanced degrees and the realization that an **advanced degree was necessary to have a career** in their field. As one student noted, *"Well, money… I mean you have a secure job. That's the theory. I think initially if you think you have more education you can get a better more secure job"* (Latino male, doctoral student) For many students obtaining degrees in the sciences, there was a realization that an advanced degree was necessary for a career in that field. A doctoral student said, *"For biology, I feel you can't get that good of a paying job with just a bachelor's degree. So if you want to pursue a career in biology, you have to get higher education to get paid more"* (Latina first-generation female) In another group, an undergraduate student said, *"In psychology, it's basically geared as a continuation kind-of degree; your bachelor's isn't typically where you stop, so its kind-of expected since the beginning that you will go to graduate school. But then now doing research as an undergrad, I'm seeing the benefit and how it can make you more competitive, career-wise later. I want to in the future, come back and teach in a college setting, so it's necessary."* (African American first-generation female) In contrast, a student described that money should not be the sole motivator but **passion for their research career.** The student said, *"Well, I think grad school should be also for people who are passionate about what they're going to grad school for, not really for money 'cause there are other ways to get money"* (Latina first-generation female, graduate student) Relatedly, another student noted that **more opportunities to conduct research are possible with a doctoral degree.** The doctoral student said, *"If I have a Ph.D. and I am a faculty member, I have a lot*

more opportunities in terms of conducting research, applying for grants, something that I don't have now as a staff person at a university at a Masters level. So you can't be a principle investigator on a grant unless you're a faculty like Ph.D., tenure track, or [along] those lines. So [getting a doctoral degree] definitely opens up more opportunities to conduct research." (Latina first-generation female) Other reasons shared by the students included the prestige and respect that comes with earning a doctoral degree. One graduate student said, *"The higher the education you have the more prestige that you do have, the more respect that you sometimes get depending on your situation, especially in the academic field."* (African-American male)

In contrast to practical reasons, many students shared personal reasons **motivated by their family and the desire to contribute to society and humanity.** One graduate student noted the connection between their cultural background and the **importance of family,** *"As a Latino, coming from a culture that really emphasizes family obligation and familism, it's not only about myself but about my family and being able to [help them] get ahead."* (Latino first-generation male) Another graduate student mentioned being motivated by her parent, *"I kind of owe it to my mom to do it [get a graduate degree]. When I really feel like giving up, which is not often, I think of her and it's like pushing you know. It's my motivation to keep on going."* (Latina first-generation female) Similarly, another undergraduate student commented about his immigrant parents and their hard work to help him achieve his goals. He noted, *"So I'm going to take my parents' sacrifice, their help, and work in helping me afford college…so I'm going to use that, what they've given me, to go higher in education; climb up the ladder. And just set the bar high."* (Latino first-generation male)

Emphasis on collectivism, helping one's community, and wanting to be role model for other students was reported by the students as motivation for earning a doctoral degree. A graduate student described her cultural background and her desire to obtain a medical degree, *"Culture definitely plays a role in my academic track and why I chose medicine. I was working in a community health study in Black barber shops. We were trying to lower blood pressure in the guys in barbershops that we were teaching and barbers had to take their clients' blood pressure and I was literally there every day for months on end in the community. It was a low income community, and just being around my people and getting to know them and seeing what they were going through-we were trying to refer them into care and seeing the issues they were having with the clinic that was down the road-it really influenced me and made me say I want to do something… so I can give back and I think about that experience whenever I am having a hard time at. It reminds me that this is why I am doing this. I want to be able to give back, I want to be able to help."* (African American female) Another participant (who recently earned a Ph.D.) commented on his personal development in terms of wanting to help people

by treating disease through his research. He said, *"It's about human health. I want to treat disease. I want to develop chemistry for treating disease to help mankind. I don't know [if] when you're going out for a Ph.D. that you have that vision. I guess it's what I am today and who I was when I was an undergraduate at [California State University] Long Beach."* (Latino male)

RECOMMENDATIONS FOR PROMOTING URS ACADEMIC SUCCESS – STUDENTS

• Host formal workshops and social events to recruit and engage URS in the behavioral and biomedical sciences that include current URS and alumni who can share their experiences on the benefits and career options for students interested in pursuing these career paths.

• Create formal and informal support networks between URS in the behavioral and biomedical sciences to promote cultural capital and motivational factors for completing their degrees, such as family, helping one's community, and reducing health disparities.

EXPERIENCES OF DIVERSITY LEADERS – ACADEMIC ADVISORS

Participants highlighted their experiences in academia and factors that led to their success.

• Advisors highlighted the importance of URS getting connected to a research lab in order to get a solid foundation in the sciences.

• Having diversity-related programs are important to help provide URS with a roadmap and resources to the sciences.

• Emphasizing the importance of URS to network at professional development conferences in order to get the information and contacts needed to get into graduate/medical school.

• Highlighting the importance of supporting transfer students from community colleges as part of the doctoral pipeline to science careers.

• Having a good understanding of the experiences needed to pursue different career paths in the sciences.

• Understanding the obstacles in obtaining a graduate degree among URS and learning how to overcome those obstacles.

Diversity leaders in academic advisory roles highlighted factors that led to their success in academia and in obtaining graduate degrees in the behavioral and biomedical sciences. One factor that was emphasized was the **importance of URS getting connected to a research lab** in order to become involved in a scientific community that would help them receive a solid foundation in the sciences. *"When I took on this [advisory] role I was really curious how I can help students be successful, especially underrepresented students. My sister-in-law went to Yale, got her degree in biology there, and I asked her, 'Why do you think you were successful?' She said that she was part of a research program and she did it every summer, having a sense of community with that research program. I read a lot of articles about URS students and how they're successful in the sciences and it was having faculty--that faculty mentorship."* (Latina first-generation female, undergraduate advisor) In addition to working in a research lab, advisors identified **undergraduate research mentorship programs as being essential to providing URS with academic resources and a roadmap to behavioral and biomedical research careers.** *"When I started, I found out about MAPS [Minority-Focused Alliance of Pre-Health Students] and they helped me a lot. They created a roadmap for me as an undergrad and what I had to do and they even gave me many resources off-campus. They also helped me a lot because you get to network with other people. Here in Long Beach a lot of people want to go to medical school, and a lot of those people go to UC Davis and UCSF, which are top medical schools. And you get to talk to them and they tell you everything they know and it fuels you. It really helped me out."* (Latino male, community college advisor) In addition to talking with URS alumni about their experiences, advisors also underscored the **importance of URS to network at professional development conferences and settings** in order to get the information and contacts needed to get into graduate school. *"Going to those professional development conferences really helps because that's where all of the admissions people are, the deans, and all the different workshops which helped me, taught me pretty much everything I know… If you want to do the M.D./Ph.D., it's highly competitive. You have to have X, Y and Z, a lot of publications, a lot of research."* (Latina first-generation female, graduate advisor)

Another factor that was emphasized was the need to strengthen the doctoral pipeline for URS in the sciences by **supporting the professional development of transfer students from community colleges.** *"A [guest] speaker was brought in and he mentioned that 42% of applicants that apply to medical school have some type of community college background. Our community colleges have more first generation, more Latinos, more women, more minority [students than other institutions]. I was very surprised. The data were from the National Medical Association. He also said that if we didn't have community colleges that were pipelines, we would be back in the 1980's in terms of the level of diversity in the medical schools. So that's a*

key relationship, to not only have that connection, but to inform and support those transfer students. They are only here for a year or two." (Latina first-generation female, graduate advisor) Given the various career interests of URS in the sciences, advisors spoke of an optimal mentorship environment where **faculty mentors tailor students' professional development opportunities** based on their interest area. By receiving this form of mentorship or advising, URS will have a better understanding of the experiences needed to pursue different career paths in the sciences. As one graduate advisor stated, *"I will push them in different directions. If this person wants to get into industry with a master's degree versus this person who wants to get into Ph.D. program, those are two different pathways that require different thinking. I will push the one who goes into the Ph.D. to do more meetings, to present their data more often, versus the other one where I will push them towards programs that get them into industry in the laboratory. It takes away from them doing their work in my lab but it gives them experience in the real world where they want to be."* (White male) An undergraduate advisor added, *"Personally, I thought I was done after my bachelors degree, but somebody planted that seed to pursue a Master's and I actually believed it. So I always remember that, planting that seed with my students. They tell me, 'But I don't want to do a Master's' and I respond, 'Maybe now you don't want to do a Master's, but maybe lay that foundation if you decide later on that you want to do it, it's there for you.'"* (Latina first-generation female) Finally, advisors highlighted the **importance of URS being perseverant and resilient in their pursuit of behavioral and biomedical careers,** with mentors/advisors helping them to understand the obstacles that exist to obtaining a graduate degree and learning how to overcome those obstacles. *"I was very intentional about getting my master's degree…That took a lot of development for me to get to that point, which is why I think I was so successful in getting accepted into my program."* (Latina first-generation female, graduate advisor) *"Whether you are an underrepresented [student] or not, you go into a Ph.D. program, it isn't easy and you are going to be pushed and you know they are going to make you work on your weaknesses and act on your strengths. I don't know if there's any special thing you can tell an underrepresented student. One of my first honor graduates was brilliant, Hispanic, went to Columbia [University]. He was smart. There wasn't anything other than telling him, 'You know, it's going to be tough.' And that was somebody who I took to the neuroscience conference who would just go off and find things that he was interested in."* (White male, graduate advisor)

RECOMMENDATIONS FOR PROMOTING URS ACADEMIC SUCCESS – ACADEMIC ADVISORS

• Engage URS in research opportunities early in their academic careers (e.g., freshman year and at community colleges) to strengthen their interest in behavioral and biomedical science.

• Design formal research training programs that provide faculty mentorship, research lab and professional development opportunities, and financial resources to help solidify URS' science identity and career trajectory.

• Provide travel costs for URS to attend professional development conferences that address the criteria needed to successfully enter graduate programs in the sciences and that offer networking opportunities with other students, faculty, and administrators.

• Create formal partnerships with community colleges that provide the curriculum, research opportunities, and foundation needed to strengthen the pipeline of URS pursuing science careers.

• Host multidisciplinary campus events for faculty, academic advisors, and students that provide forums to discuss different career options and requirements in the sciences. These events could include faculty, staff, and student representatives from graduate programs to help URS get a well-rounded view of all the factors that influence successful navigation through academia.

Findings from the AHORA Conference Regarding Experiences of Diversity Leaders and Students

Conference attendees highlighted the perceptions in academia that UR faculty and students are "inferior" in their academic ability and quality of their work. These negative perceptions can create barriers for student entry into the doctoral pipeline and career progression for faculty. These perceptions also result in UR faculty often mentoring and taking on a larger volume of URS, which may slow down the progress of their research programs because of the time it takes to provide one-on-one mentoring to so many students, as well as the devaluing of student mentorship by universities for tenure and promotion. Therefore, some UR faculty choose not to mentor as many students prior to receiving tenure, thereby limiting mentoring opportunities for URS. Conference attendees also spoke of the lack of URS in specific science areas. For example, the lack of women in physics but yet, being the

majority in science disciplines such as psychology. Across science disciplines, Latino students experience competing family demands that may influence their willingness to pursue graduate degrees. There was also consensus that university systems need to do a much better job engaging and mentoring African-American students in the sciences with their being a general lack of trust of non-UR administrators and faculty by African-American students given the university's poor track record in reaching out to the African-American community. The lack of UR faculty role models cause URS to contact these faculty regardless of whether their specialty is in the same discipline area that the student is interested in pursuing. Long-term this affects URS' ability to get letters of recommendation from faculty in their own discipline which may hinder their graduate school applications. Other UR student populations that need to be examined more closely are students with disabilities, LGBT students, and multiethnic students. In addition, it would be helpful to assess the viewpoints of administrators and faculty that do not value the need to increase UR representation in the sciences and determine what factors are associated with their resistance in moving forward diversity initiatives in order to examine whether we can change the dial to get them to participate in these initiatives.

References

1.   Figueroa T, Hurtado S, Eagan K. Making it!... or Not: Institutional contexts and biomedical degree attainment. 2013.

2.   McGee R, Saran S, Krulwich TA. Diversity in the biomedical research workforce: Developing talent. Mount Sinai Journal of Medicine: A Journal of Translational and Personalized Medicine. 2012;79(3):397–411.

Successful Program Components

Given the disproportionate number of minorities that complete their college degree, it is imperative to implement effective intervention programs. This is daunting given that Latinos, African Americans, and Native Americans comprised 30% of the US population 4 years ago.[1] A number of scholars have expressed numerous recommendations to be adopted by institutions of higher education if they wish to benefit from a diverse academic body. According to researchers, underrepresented students would benefit from university programs that provide financial aid, mentoring, research opportunities, academic advising, recruitment, and community building. [2,3] According to McGee et al., biomedical and STEM intervention programs must contain three elements: 1) raising an interest in STEM careers among students; 2) increasing the number of STEM students that complete their B.A; 3) ensure that students have the necessary skills to be successful in post-baccalaureate careers.[1] If they are to fulfill their goal, intervention programs require proper resources from universities to ensure the success of underrepresented students in the biomedical and STEM fields.

SUCCESSFUL PROGRAM COMPONENTS – DIVERSITY LEADERS & FACULTY

Participants highlighted examples of effective programming to promote academic and professional success of UR students.

- Summer research programs that bring together UR students from different institutions helps create sense of belonging and retention of UR students in the sciences.

- Exposing UR students to researchers that they have read about or heard of increases their interest, engagement, and retention in the sciences.

- Creating and supporting faculty role models and peer mentors in student development.

- Implementing workshops on cultural sensitivity and diversity training.

- Having frequent communication with and good support systems for UR students.

- Having students invite faculty members in their scientific field, from outside institutions, to visit our campus and meet with these students.

- Using a student research conference on campus to bring faculty from other institutions to promote student research and to provide faculty development activities such as challenges faced as a faculty mentor.

- Having members of UR groups share their experiences of overcoming challenges in academia to students.

- Using summer programs to support graduate preparation for undergraduate students.

- Pipeline partner program specifically designed for students from other campuses.

- Providing fellowship money for campus programs to develop a 'diversity climate' project to be presented across campus.

- Using GRIT (measure of resilience construct) vs. GRE scores as predictor of academic success in graduate school.

- Having a summer preemptive immersion program for UR students before starting their doctoral program.

- Addressing implicit bias among faculty and students through targeted activities.

- Providing students with formal feedback on the quality of their research.

Perspectives on Successful Program Components

Diversity experts underscored the need for **summer research programs** for UR students to ensure that they are provided the experience needed to make them competitive for scholarships and graduate school. *"We have summer programs where students come from other campuses with federal funding to do a summer internship. Many of the faculty are involved in both of them. And those are at the graduate and undergraduate level. Our graduate college organizes the various summer programs and has all the students in the dorms, they have workshops, they have lunches, they have an awards ceremony."* (White female) Participants also stressed the **need for students to be with other UR students,** particularly if they are coming from an institution with few UR minorities. *"When I went to graduate school [out-of-state], I was the only minority in the whole program. By my 3rd year of graduate school, I was totally done…I was quitting graduate school. Then I got a small scholarship to go to a summer research program for six weeks and when I went I felt I was so impressed with all of the minorities in graduate school. The fact that they put a bunch of us together and we talked, we shared our experiences… I realized, 'Oh man, I'm not crazy! You are also having the same difficulties…and how are you coping? How do you cope and so forth?' The point is, I went back to my institution and things didn't change, but my thinking changed. My summer research program didn't give*

me the tools to write a better dissertation, but it gave me a different way of thinking. And I think that was what made a big difference for me. I stuck with it [graduate school], it still wasn't very easy. I got through all the bull**** but then I graduated. If it hadn't been for that change in thinking, I would have probably quit." (Latino male) They also emphasized their experience with minority students as reinforcing their passion for research. *"I went to the [summer research lab] and [felt] like 'oh man, people like me doing research!' People excited about talking about their work. It was exhilarating… Being surrounded by other minority students going through the same difficulties that I was going through! It gave me a sense of camaraderie. Finally, someone was understanding me. I realized things are not going to change [in my graduate program], but I'm not alone, and whatever that is, that made the difference for me."* (Latino male) Experts also stated that **summer programs can serve as check points** to enable students to make decisions regarding whether or not their current institution and program is the right place and discipline to study and then make changes accordingly. *"I realized [after participating in a summer research program] that my school wasn't me. It wasn't that I didn't have what it took [to succeed]. It was that I was not getting the right support [at my graduate program]. Also, I wasn't looking for it [support] either."* (Latino male)

Interviewees reinforced the **significance of summer preemptive immersion programs** prior to starting commencing a graduate degree or doctorate. *"We have continued the program here called 'Competitive Edge'. It's a preemptive summer program for diverse graduate students. We bring the students to campus in June rather than late September. They get their housing and they do workshops but they also start doing their research in their home department. We found that that has been a great way for students to form broader relationships. So because the program starts before the campus, they form a cohort. It's not just an individual program, they basically have all these support networks all across campus. And the students tell us that that has been really good for them… Students certainly tell us that they really appreciate getting to know one another, the support groups, we also bring in graduate student peer mentors to work with them who already are students here and sort of understand the campus. And so every student tells us that that is really beneficial for them."* (White female) Another participant shared perceptions regarding the importance of **using the summer to transition students more effectively.** *"The graduate division hosts a graduate preparation summer program for students… diversity students from other campuses who want to get some graduate preparation. So we partner them with faculty on our campus to do a summer research project and they live on campus in graduate housing and we do a series of workshops for them on what to expect in graduate school and how to prepare for graduate school. We have graduate student mentors who work with the students and we also have some students go through GRE Prep… They*

take the GRE at the end of the summer." (White female) They also accentuated the false perceptions many faculty have regarding a students' transition between their undergraduate and graduate programs. *"Faculty seem to think students undergo this transformation between undergraduate and graduate school. They understand that undergraduates need mentoring and need help and support and they need to be taught things. But when they go to graduate school, all of sudden they need to know it all and being able to be independent. That's just not true. So I think providing appropriate resources to support students when they get to the doctoral programs is a critical factor."* (White female)

Diversity experts also stated that **exposure to high level faculty role models,** whether or not they share their minority status, makes a substantial difference in the success of UR students. *"[Describing a summer laboratory course outside of their graduate institution] – "A lot of people, Nobel Prize winners, and so forth do research there. Imagine when I was there and talking to the person you only read in a book. The person that discovered proteins… And you're like 'holy cow, and here is this guy and I thought he was taller'–and it humanizes them to you. This is just another human being like you. I remember meeting a Nobel Prize winner and he brought his medal and we all touched it. It sounds hokey… but honestly, all of us there… It's not that I dreamt about one, but it was like 'how cool is this!'… It wasn't like they were lecturing me on how difficult it is to be a minority, there were other activities that reshaped my thinking [about graduate school] and then I stuck with it."* (Latino male) They also emphasized the need for population-specific UR role models. *"Well, I think having them [students] interact with successful people in fields that are from their particular underrepresented group is really important having those role models there."* (White female)

Participants reinforced the need for **mandatory and ongoing workshops on cultural sensitivity** and diversity training. *"I had a [white male] graduate student in my lab who was very insensitive to diversity and just very insensitive period. He'd put on Howard Stern in the lab…who would say some very racist comments. I had an African American technician who was actually feeling threatened and so I was able to call in some help [at our university] and we had like a lab workshop on sensitivity, trying to make this particular individual [white male graduate student] aware that this is not funny. At the heart of it though was that this person really had no clue how to look at things from a perspective beyond being in the mainstream. So it was really helpful that our university will actually send somebody who is trained to hold workshops in diversity training."* (White female) Another participant further emphasized the **importance of diversity training.** *"I think that enhancing sensitivity regarding diversity issues is really important… I do think that if at the university level or program level if there were a way to educate the participants as well as educating*

the mentors and the other more administrative level participants, that would help to make the program succeed." (White female)

Program elements that were found to be specifically effective were varied but largely involved **mentorship and individualized planning.** In the words of one expert, *"I would say start with where the students is, individualize the experience, this is where an IDP comes into play. [I: please say that again?]. Do you know what an IDP is? It's an individual development plan. IDPs are all the rage right now in STEM education. You individualize the experience. You create a critical mass of students who not only want to benefit from but also want to help each other benefit from the experiences. And you take a strengths-based approach."* (Asian American male) Another expert stressed the **incorporation of mentoring.** [Interviewee discussing a BRIDGE program at another institution] *"When students come, they give them the wraparound mentoring. If necessary, they'll do remedial programming. So he said students who come from these poorer HBCUs may not have had the best academic preparation, so they may need remedial programming, let's say in math, etc. And that is actually something that Carlos Grijalva emphasized saying, 'Okay so what if someone has a poor quantitative GRE score let's just give them some remedial programming in math to improve their skills?' So it's this sense that we can continue to work with students to benefit them, and develop them."* (White female)

Experts also emphasized the need to **provide a supportive environment beyond the recruitment phase.** *"Programs that are concerned with the recruitment phase but not so much the follow through are not going to be particularly successful and just, you know, in a way it's great to have these resources but you have to have good support systems for the students, good monitoring, and for identifying any challenges that they have."* (White female) They also underscored that problems cannot be solved simply by allocating additional economic resources, but rather by a combination of **committed faculty working in programs that are carefully monitored and evaluated.** *"Simply throwing money at a situation is not going to, it can have some short term benefits, but it's not going to be as successful as the programs that are really following through and monitoring and intervening [with students] or, you know, have strategies and knowledge of how to help a student work through certain challenges. I think that you have to have those [program components] in place for success."* (White female)

In terms of admission, experts discussed the **use of GRIT vs. GREs as predictors of academic success** in graduate school. *"I think they [the GREs] bias against minority students, in this context, [the idea that] they are not academically qualified as majority students or Asian students comes from the GREs. Most graduate deans will tell you that the GREs have very little predictive validity in terms of academic*

success. However, most faculty are very tied to GREs. A graduate program in the southeast decided to eliminate the GREs in terms of a factor in identifying students for a particular [BRIDGE] program. Instead they went with a personality construct called GRIT which is a term created by Angela Lee Duckworth. GRIT refers to the ability to overcome difficulties and challenges and to keep going… the most important factor determining success is GRIT. And so they actually do a structured interview of their students based on Angela Lee Duckworth's criteria for defining GRIT and they make admission decisions based on GRIT rather than on GRE. And 80% of the students have gone on so far to earn doctoral degrees. This graduate program director is absolutely convinced that the GRE is actually a barrier to even the admission of a diverse graduate student population and I completely agree with him." (White female) This expert later reiterated and illuminated **GRIT as an important construct in measuring resilience to predict academic readiness.** *"What they do is they eliminate the GRE as a factor for consideration and evaluate GRIT. So it's the resilience of the student and not just personal resilience. It's my understanding they look at the support network that the student has as a factor contributing to that resilience."* (White female)

Experts also underscored the need for **students to participate in academic decision-making processes.** *"I was a speaker once for a MARC program where the students got to identify the faculty member that they wanted to invite and then during my visit there each of the students interacted [with their invited faculty member]… so that means that these students are talking to a number of different faculty and its very diverse faculty, not only diverse in terms of the diversity that we are talking about, but in terms of fields of study. This is so clever to have them [outside faculty] meet with the students, one-on-one and throughout the whole day. I really enjoyed it as a visiting faculty member. That was a feature of their program that I thought was very resourceful."* (White female) Experts also emphasized the need for **student preparation to meet with faculty** and to be schooled in how to engage in professional dialogue. *"I met with all the students in the MARC program and I thought wow! That is fantastic. And I'll tell you, those students were sharp. They were very well prepared to speak to faculty, so that's the kind of thing that I am talking about where you have some follow through or activities that are specifically geared towards their professional development."* (White female)

Experts stressed the use of **student research conferences to promote both student and faculty development** as well as provide an opportunity for students to learn from faculty who share their personal experiences. *"We have a big poster symposium for undergraduate and graduate students from underrepresented groups. They bring in people from other universities because it is the Mountain State Alliance so there are several participating universities and they have workshops. It was*

fantastic… It's widely advertised and faculty could come and they had lunch and we heard from various different speakers about the challenges that they faced and what you can do as a mentor. It was just a very excellent educational opportunity. I remember I was sitting next to one of my colleagues who hadn't ever attended anything like this and I go to them all the time because I continue to learn. I remember the speaker was saying that in order to get them [students] to tell you about the challenges that they are having they have to feel really comfortable with you and there has to be trust, which is why I do think that it's really great that we have faculty from these underrepresented groups. They gave faculty information about how to get them [students] to open up and I just remember that my colleague had no idea how you could do that. I just said, 'well, start telling them your own story tell them about your own family life and get to know them at a personal level'. That was what the workshop people also said. I think that having these kinds of workshops are really helpful." (White female) **Faculty vulnerability and sharing of personal stories is crucial in helping URS feel comfortable and confident in an academic setting.** Experts also highlighted the **need for faculty to be understanding of the experiences of diverse racial/ethnic groups** outside of their own so as to be better mentors to a diverse group of students. *"The most effective [approaches] I've seen are when they [students] see people like themselves talking about their own hard times and saying, 'don't give up,' and talking about the challenges and biases they faced, and how they've dealt with it. I think that that's really important and I like to go and hear people from various groups because what I hear is a little bit different depending on the specifics of ethnic background… I try to remember those stories so that I can share them since I am not from that ethnic group. Having examples helps students know that other people face these challenges and overcome them. Reassuring them that there is bias, but that bias is not necessarily the reality and trying to build their confidence is important."* (White female)

Participants stressed the need for a great **number of specific pipeline undergraduate diversity programs** in the sciences. *"We have a lot of undergraduate diversity programs for the sciences. We have a community college transfer program, a summer program, and we also have Minority Science Program, and MARC [Minority Access to Research Careers] which support undergraduate students. We have CAMP [California Alliance for Minority Participation] in the UC system. So we have very strong undergraduate research programs in general and they're very strong in diversity programs for undergraduate researchers. Some are for students who are on campus and some are for students from other campuses. UC Link is another program run through the graduate division and collaborative program across the UC system for undergraduate researchers who are interested in STEM disciplines. The SURF program that I described, that's a graduate division program that we bring in only, we don't support students from our own campus. There are*

other programs to do that. The purpose is really to bring in students from off campus and they come from all over the country to get experience in doing research and graduate preparation. The [SURF] program is for two years and each campus identifies and supports undergraduate researchers. The first summer is for research on their home campus and the second summer they do research on another campus. It was originally supposed to be another UC campus but the students have gotten as far as the east coast to do their second summer research. That program is a relatively small program with less than six students a year but in the recent past we have a 100% record of placement in graduate programs." (White female)

One expert discussed a **creative approach to using funding to address the campus climate** in terms of diversity issues and expose common, but often unspoken, examples of racism and discrimination URS experience. *"We appointed DECADE mentors which are faculty advisors at the program level. I started a competition for the DECADE mentors in which they could win up to $30,000 per year in graduate fellowships for programs that improve the climate for diversity at their program level. So last year our department of drama won such an award and they created a play. The graduate students who were funded as part of this interviewed graduate students across the campus about their views of diversity and experiences and then created a play which was performed in spring quarter… the play was called diversity bill and then we created a [TA] workshop around that… the audience gasped, they could not believe that faculty would say stuff like this to the students. So we thought it would be good to start with our own students experiences and then create programming around that."* (White female)

Diversity experts stressed the **need for activities to address implicit bias** as essential for campus climate change. One participant shared several examples of how campus has shifted due to their activities. *"Everyone believes that the faculty run the university and students don't want to open themselves by contradicting the faculty and bringing up difficult issues of diversity and the experiences of a diverse university population… So what I suggested to break that barrier… was to prepare a talk in which we would talk about implicit bias and such. I always thought that my faculty colleagues would listen if it was based on the literature. So if you could cite data, studies, they would listen. It was targeted to women faculty in the sciences… and women experience implicit bias from other women… 'It's not just about chauvinistic males, this is basically a social phenomenon, a behavioral phenomenon.'"* (White female) Another example shared was having journal clubs to facilitate faculty understanding of gender bias and its implications. *"We have had a couple of journal clubs. And the first one, more faculty showed up than students. The faculty just flocked to talk about these issues when they were in a literature-based format. And so I think that is another way that may prove to be successful in*

breaking down some these barriers and getting multiple perspectives on the table. In fact the students who were at the very first journal club, the level of honesty, it was really fascinating and students said things that I don't think they ever would say in any other format. In one paper we did in this journal club basically it was a paper published in Science or Nature in which they took the same resume and it just gave it different names, male and female faculty, to evaluate this person as an applicant for a lab manager position. And even though it was exactly the same resume, they found highly statistically significant differences in whether they thought the person was qualified for the job, whether they would mentor them if they got the job, and how much they would pay them and of course it was all biased against the females. They were viewed to be the less excellent. Even the female faculty showed the same level of bias as the male faculty did." (White female)

The experts interviewed overwhelmingly emphasized the need for, and importance of, a **student research experience.** *"[Student research experiences and opportunities] are absolutely critical. We get a lot of graduate students here with 1400 – 1500 [GRE] scores… and 4.0 GPA, and they come in here and they are worthless, they are useless because they don't know that… you have to come in on the weekends and you have to stay late like the students that have worked in the lab before… The [research] exposure basically makes a big difference."* (Latino male) Another concurred with the perception that GRE scores are a poor predictor of success. *"We believe that research experience is a better predictor of success in graduate school then GRE or GPA."* (White female) One diversity expert stated that the research experience is essential for increasing UR students' research self-efficacy. *"I think that's huge because I think that when students have some research experience they will be exposed to individuals at different levels of career development within that field and they'll get to know those people and they will become informed about what it takes to become successful. They will start to have some experiences especially if they're in a good supportive lab. They'll start to already have some experiences that contribute to their success and that would serve to show them that, 'Yeah, you can do this.' So I think research experience for underrepresented individuals is fantastic and we really need to do that. That is probably one of the best ways of promoting diversity in the biomedical sciences."* (White female) Another agreed and further elaborated on the elements most important for URS success. *"Being in lab meetings where you hear people present and do research is good [important for students]. The summer programs are great, sitting in a grad class before you ever apply to grad school is a good thing. Going to professional conferences is a good thing. Doing a poster is also a good thing. Researching and knowing what you are fine with doing because you really have looked into it and you know what you're doing and why as opposed to somebody says, 'you should go do this.'"* (White female) One expert stated that research was so important to her that she requires a

thesis of all of the students working with her. *"I don't let my [graduate] students not write a master's thesis. Why? Because when it's time to write the dissertation, they already have an experience on how to do it. Versus seeing it for the first time… this is something that you need to prepare for. It is doable and people do it all the time and people survive. So they are not caught like a deer in the headlights."* (Latino male)

Providing students with **feedback on the quality of their research** was viewed as a critical element to ensure student success and faculty avoidance of such as perceived to result in the student's demise. *"One of the areas that students get the least feedback on is the quality of their research. Faculty are very reluctant to have this conversation with students about that. I find that all the time. [One program I'm aware of] has a rubric for the faculty member to fill out to evaluate the research of the student and the research performance... So in coursework, you get an A, or a B, or a C, or whatever so you tend to get feedback as to how well you are doing. But I've seen many instances of faculty recommending students for dismissal and they have given them straights As in research. They clearly are not giving them the feedback that they need. So it's one area that I think all students would benefit from. It's a much more standardized way of evaluating the quality of the research. And then once they have that feedback, give them the opportunity to improve."* (White female)

RECOMMENDATIONS FOR PROMOTING SUCCESSFUL PROGRAM COMPONENTS – DIVERSITY LEADERS & FACULTY

Steps to Promote URS Success at both Undergraduate and Graduate Levels

- Increase personal interaction with high-level faculty mentors, preferably early-on.

- Provide research experience and quality feedback on their research outputs.

- Monitor and evaluate programs.

- Focus on personalized mentoring.

- Engage students in all types of academic processes (e.g. conferences, interact with other researchers).

Steps to Promote URS Success at Graduate Level

- Establish summer research immersion program with cohorts of URS prior to graduate school entry.

Steps to Change the Institutional Environment

• Use GRIT in lieu of GRE for predictor of URS capability to succeed at graduate level.

• Address implicit bias.

• Provide diversity training or workshops for all (all students, faculty and program staff).

SUCCESSFUL PROGRAM COMPONENTS - STUDENTS

Participants highlighted examples of effective programming to promote the academic and professional success of underrepresented students.

• Increase opportunities to learn about research careers, develop skills and knowledge on what is needed to pursue career paths.

• Need to strengthen student networks and create more opportunities for peer support.

• Involvement of family.

• Need to link students with faculty for professional development, mentoring, and other positive outcomes.

• Need for financial support and other programmatic resources.

• Need for a strong mentoring component.

• Need for recognition of URS' cultural capital.

Students highlighted many effective programming components thought to promote the academic and professional success of students. **Students reported on needing more opportunities to gain a breadth of research careers and the knowledge needed to pursue such paths.** Students discussed how internships and research labs are needed because they expose students to research and career development opportunities, improved critical thinking skills, access to and development of strong mentorship relationships with faculty, and could have improve performance and confidence in the classroom. Other effective aspects included programs facilitating acceptance to, and participation in, pre-doctoral training programs and summer research programs to prepare URS for doctoral programs, hosting conferences that

focus on career development, and sending students to research competitions and conferences to get valuable networking experience in presenting their research and getting feedback. The students discussed how these activities help to build campus' value for student research while helping students develop their CVs and increase their confidence in presenting their work to faculty representing other science disciplines. One undergraduate student spoke about how her research program exposed her to many opportunities; *"I just would've never known any of the opportunities if I wasn't in the lab. I would've never considered doing research, I would've never applied to summer programs or applied to go to conferences, I would've been oblivious to it. So I guess I wouldn't have felt disadvantaged because I would've never known that. Now that I know, I'm happy that I know."* (Latina female) Another aspect that was raised focused on developing connections between students. Some students thought that facilitating peer networks served to reduce isolation, created camaraderie, long-term professional relationship, and could facilitate a "peer mentorship chain." A student commented, *"I was once in the position of where that [high school] girl was, so now I feel I'm going up. In a way it has become kind of like a chain, I was mentoring someone and now someone is mentoring me, we are in this together learning as a whole and we are benefiting from this together. And I think that is something that can possibly help other generations continuing that chain. Not only has it motivated me to go up in levels of learning in academia, because I'm not only doing it for myself anymore, I'm kind of motivating other students and proving to them that they could do this as well, it's possible. Not only creating a self-sustaining community, but it's empowering as well with this level of mentorship chain."* (Latino male)

Other effective components involved **financial support and other resources** (e.g., work space, access to computers and internet) that students need. Students from both groups discussed the need for financial support for application fees for graduate school and entrance examinations and paid research assistantships or stipends to facilitate on campus research opportunities and avoid off-campus employment that is unrelated to their career paths. For example, a student said, *"I was going to get a job at Outback [Steakhouse restaurant], you know what I mean, selling steaks or something, and then RISE [minority research program] put me in the lab and paid me to do research. It's like talking about a crossroads, right? I mean I could be selling blooming onions, right? Now I am doing pharmaceutical research."* (Latino male) Students in both groups also discussed the **importance of mentors in terms of their support in preparing them for graduate school applications by having them network with doctoral faculty.** For example, a doctoral student noted, *"I think I was lucky to learn it from other recent Ph.D. grads and just my mentors that said you have to make those [faculty] connections early, you have to make sure that you know someone so that we can list people in your personal statement and all of that. So I think that really helped me because that's really what helped me into my program, is that I found someone interested in working with me."* (Latina female)

RECOMMENDATIONS FOR PROMOTING SUCCESSFUL PROGRAM COMPONENTS – STUDENTS

Steps to Promote URS Success at both Undergraduate and Graduate Levels

• Provide resources that enable research and academic-related experiences over other paid work.

• Link students to peer mentor or cohort environment.

• Link students to faculty research mentor early on.

SUCCESSFUL PROGRAM COMPONENTS – ACADEMIC ADVISORS

Participants highlighted examples of effective programming to promote academic and professional success of URS at CSULB and other institutions.

Monitoring student progress

• Use of student progress reports to get them to graduate more quickly.

• Implementing a research project/portfolio vs. thesis, as well as a faculty mentorship model to help masters students finish their program more quickly.

• Using an early alert system for identifying students who are struggling in their science majors.

• Use of campus events and resources to promote engagement and retention in the sciences throughout the doctoral pipeline

• Encouraging students to invite their families to campus events to promote family support of academics.

• Having alumni, representing different science careers, return to campus as a panel to talk to students about their experiences.

• Using the University/Department Career Development Centers to guide URS to resources and career options

• Implementing an online computer program at the high school level that identifies what areas of science students have strengths and weaknesses in to provide them with more information as to what majors they might want to pursue at the college level.

- Using an online system and other resources to connect community college advisors to updated information and changes in admission for CSULB transfer students.

- Having CSUs/UCs visit community colleges or vice-versa to recruit URS into the sciences and research.

Academic advisors highlighted several examples of existing program components to promote URS academic success, including **effective strategies for monitoring student progress to help them complete their science programs/majors in a timelier manner.** For example, graduate advisors mentioned the use of student progress reports to help graduate students complete their masters thesis more quickly. *"We upped the prodding of students to continue working [on their thesis] because if they're just languishing in writing their analysis or final portion, and they are having to work outside [the research lab] too much, they are just not paying attention. We've put some stakes in there to move them along. They have to get progress reports to demonstrate that they are not just sitting there doing nothing and taking GSM 100… It has been an improvement to the time to graduation as well as retention in the system."* (White male) Other program components that have helped students complete their masters program more quickly include switching the requirement for a thesis to be a shorter research project or portfolio, as well as shifting to a faculty mentorship model so that new masters students are linked to a faculty research mentor from the outset of their program. *"For one [masters] program we have, [where they conduct] research to go on to the Ph.D., we now accept them into the program with a faculty mentor agreement. Sort of like a Ph.D. program but not quite as rigid, so we've already got a mentoring set-up situation right there."* (White female graduate advisor) At the undergraduate level, advisors spoke of an **automated early alert system that helps identify students who are struggling in their core science courses.** *"In our college we actually have the earlier alert system, so students in many of the core classes that don't do well on their exam now have to meet with an advisor… I pick up on some things early on and bring in the student and talk to them about why they are missing class so much, or what happened with this test, or whatever it is."* (Latina first-generation female, undergraduate advisor) *"We're working with students and telling them, 'Okay, you were in natural sciences. Move over to human development because maybe you can take the pre-reqs for PA schools'. So they're finding alternative routes [in the sciences]."* (African-American first-generation female, undergraduate advisor)

Advisors also emphasized the use of campus events and resources to help engage and retain URS in the sciences. For example, advisors spoke of the **importance of having culturally-competent events on campus designed for family members** to

come visit and understand the types of work and career options that their daughters and sons can have in pursuing science careers. As one graduate advisor stated, *"I think it's really important that the university holds some kind of open house and invite all the first generation parents because they have never been to college. They don't know what's expected of their children and then I think you might even come to understand the system so that students have the family support. That is really, really, important."* (Asian-American first-generation female) An undergraduate advisor added, *"We have the Bienvenida, which is a welcome. We invite the family and friends, and really educate them on what it means to be a student in STEM. What are the responsibilities that come with it and that way the parents and the family are more actively involved in what is happening with the student."* (Latina first-generation female) The importance of designing these events to be inclusive to different cultural groups and in different languages was also emphasized. One type of campus event that advisors mentioned as being very successful with URS is **having CSULB alumni, who represent different science careers, return to campus to participate in a panel** where they talk to students about their academic and professional experiences. *"One thing that worked for us last semester that was really successful was when I asked some of our alumni to come back who have various positions, one was a PA, we had somebody who worked for the FDA, for PHS, a community based organization, we had a nurse, and they sat as a panel and talked about their current position. They talked about how they got there and then things they wished they knew back then that would of helped them be more successful. It was really good. Students loved it."* (Latina first-generation female, graduate advisor) Another advisor added, *"Every semester we'll have maybe three of these workshops whereby we're bringing in persons that have been successful in different pathways…It works as a motivating factor too because a lot of people will share their path and how they weren't always the best student... It was standing room only."* (African-American female, community college advisor) Other campus resources that were identified as being useful included connecting students to university and department-specific career development centers and their websites to help guide URS to different career options and resources in the sciences.

Finally, advisors described successful strategies at the high school and community college level for engaging URS earlier in the behavioral and biomedical doctoral pipeline. At the high school level, advisors spoke of Ivy League schools **using an online course to help students identify what areas of science they have strengths and weaknesses in** to provide them with more information as to what STEM-related majors they might want to pursue at the college level. *"Some Ivy League schools [Brown, Stanford, Yale University] have an online course free for engineering or pre-med majors so that students in high school can see, 'Ok. I am good at math. I am going to do engineering'. It's not necessarily something that they previously [thought*

that they] would want to do." (White female, graduate advisor) At the community college level, advisors spoke of several online resources (e.g., www.assist.org) and events (e.g., CSULB annual counselor conference) that help them stay updated with the admissions criteria at CSULB in order to advise potential transfer students appropriately. *"Getting up to date information on admissions requirements from the schools are very important to me. For example, Long Beach State has their yearly counselor conference where they update us on what's going to change in terms of admissions requirements… We also have regional meetings [for community colleges] where we sometimes get guest speakers from Pomona, Fullerton, Dominguez Hills, and Long Beach coming and making announcements. But, because you [CSULB] are our main feeders and because of the relationships we have, I obviously have the strongest communication with CSULB. CSULB takes care of us."* (Latino male, community college advisor) **Community college advisors also stated how important campus visits from the CSUs and UCs are to help engage URS to science degree programs.** These visits create an image that these schools care about students at the community college level and are committed to their success. However, recent budget cuts have made it difficult to send CSU representatives on a regular basis, often requiring community college students to attend events hosted at the CSU campuses. *"They [the students] want to listen to folks from the universities a lot. In fact, that comes either from folks coming out here and doing workshops or representatives coming out and seeing students one on one, which is becoming less and less common because the universities don't have money to keep sending folks to see us… A lot more times we're [telling students] 'Here's the activities that you can go to over there, so get over there'. And part of that is useful because it forces them to get out of their comfort zone and actually go to the universities because they will be going there eventually."* (Latino male) The UCs have also reached out to local community colleges to engage URS in summer research opportunities at their campus. *"The group that's talking to us a lot is actually UC Irvine. They have done summer type research programs with us where [community college] students were taught about research, spoken to about research opportunities, and they actually get to present on something over the summer as well. They are actually doing their own research on a topic to get the juices flowing."* (Latino male)

RECOMMENDATIONS FOR PROMOTING SUCCESSFUL PROGRAM COMPONENTS – ACADEMIC ADVISORS

Steps to Monitor Student Progress

• Implement biannual progress reports for graduate students to make sure that they are progressing through their masters program in a timely manner.

• Provide more staff support and resources to help academic advisors meet individually with students who are identified early on as struggling in their behavioral or biomedical science major.

Steps to Promote Campus Events and Resources Designed to Engage and Retain Students in the Sciences

• Host culturally- and linguistically-tailored campus events (e.g., open houses, career panel workshops) for URS and their families to promote students' sense of belonging in the sciences, as well as increase family understanding and support for different science career paths.

• Implement cross-college orientation sessions to increase awareness of different campus resources and career development programs to promote URS engagement and retention in the behavioral and biomedical sciences.

• Create partnerships with local high schools and community colleges to help URS discover potential behavioral and biomedical science career paths through established online programs and to provide up-to-date information on admissions requirements.

• Fund CSULB behavioral and biomedical science programs to send representatives to high school and community college partners to recruit URS to science majors and to participate in early research opportunities through funded summer research internships.

• Partner with local UCs to have cross-campus research trainings and workshops, as well as provide funded summer research opportunities for faculty and URS.

Findings from the AHORA Conference Regarding Successful Program Components

Conference participants affirmed recommendations to increase personal interaction with high-level faculty mentors, preferably early-on; use a cohort model of peers to build success among URSs as a group; build programs that provide and require hands-on experiences such as conducting research, presenting a poster or writing a thesis; to provide consistent personalized feedback or individualized academic plans; to recognize and utilize alternative value scales to predict success, such as GRIT; as well as to provide diversity training for all. Participants emphasized that a personalized, invested, human relationship with faculty mentors is paramount, and more important than the race or ethnicity of the mentor. They noted that use of a cohort of peers reduces isolation, fosters camaraderie, and facilitates coping and shift in perspective to want to persevere despite "tough institutional climates". One aspect that conference participants underscored that was not as prevalent in the data is the need for program support across the pipeline including during doctoral programs and for faculty as mentors. While diversity leaders and faculty noted the need to provide continuous support beyond the recruitment process, conference participants extended that recommendation throughout the pipeline, suggesting that mentorship be institutionalized, funded and evaluated as part of the faculty role. A second aspect that conference participants highlighted was to place the individual student interests above the program goals, noting that "keeping student's interest at heart versus fulfilling program components" was critical to a successful investment in their future.

References

1.   McGee R, Saran S, Krulwich TA. Diversity in the biomedical research workforce: Developing talent. Mount Sinai Journal of Medicine: A Journal of Translational and Personalized Medicine. 2012;79(3):397-411.

2.   Whittaker JA, Montgomery BL. Cultivating diversity and competency in STEM: Challenges and remedies for removing virtual barriers to constructing diverse higher education communities of success. Journal of Undergraduate Neuroscience Education. 2012;11(1):A44.

3.   Vega I, Locks A, Oseguera L. Increasing Latina/o students' baccalaureate attainment: A focus on retention. Journal of Hispanic Higher Education. 2009;8(1): 23-53.

Cultural Capital and Assets

Cultural capital or social capital is a concept that has historically been used to study educational achievement and attainment.[1,2] Studies have found that cultural capital plays an important role in college student's success.[3,4] This effect seems to remain constant even in students of different racial ethnic groups who continue higher education.[4] A review of the literature shows, specifically, that extensive campus networks[3] and student-faculty contacts have a positive effect on students who plan to become college teachers[5] and research scientists.[6] However, research shows that differences in acquired social and cultural capital exist in students of different racial ethnic groups who are entering college.[4] Furthermore, cultural capital is dependent on the cultures themselves, as well as the historical experiences of diverse racial/ethnic groups in the United States, including immigration patterns and experiences, environmental and institutional contexts upon arrival, and societal expectations of diverse groups' abilities to integrate and achieve within a larger societal context. Due to a lack of understanding and integration of cultural capital within the academic setting, universities do not often engage in programming that potentiates cultural capital as an asset that can be utilized to undergird and facilitate URS academic success.[7]

CULTURAL CAPITAL AND ASSETS – DIVERSITY LEADERS AND FACULTY

Participants highlighted the importance of cultural capital and assets to enhance UR students' educational experience.

• Opportunities and threats related to integrating and potential clashing of a student's cultural beliefs and traditions with the academic expectations of their campus environment.

• Students using their cultural beliefs and traditions to enhance their educational experience.

• Recognizing the importance of resilience for a student's educational progress.

Participants highlighted the **importance of using and integrating one's cultural capital and assets to enhance the educational experience of UR students.** Experts discussed the **cultural dissonance students experience** when they attend college and the detrimental effects of cultural dissonance on student academic success. They also talked about the **cultural deficit vs. asset framework** from which many

administrators and faculty design academic programs. *"The closer the match that the student's culture has to the institutional culture of higher education, the easier it's going to be for that individual to function in the culture of higher education. The greater the difference, the more difficult it's going to be for the student to function. That's why when I talked about diversity as being a measure of the extent to which a discipline or an institution or higher education in general, has taken into consideration that match or mismatch. And so we all bring our cultures to the table with the extent to which those cultures, and stereotype threat-or the extent to which that difference is valued versus that difference is viewed as a deficit- will determine how an individual's culture may or may not act as an asset or barrier. I think it's important for individual students to understand and that's why I talk about stereotype threat and that's why cultural differences are valued within the program. I think that as institutions we have the responsibility to recognize that gap, not just the preparation expectation academic gap, but also these cultural gaps as well. And I'm not using cultural gap in a deficit way, I'm taking about difference rather than a deficit. And this whole deficit model, I think that's another barrier. Some of my colleagues here on campus make this mistake, they talk about what students need. This is about what strengths students bring. Need is very important because we have to start from where the student is, we also have to take inventory of what the student brings. And so this strength-based approach is something that I see– people will talk about resilience, people will talk about a student has overcome a lot barriers and so on. So they ask me, 'Why wasn't this student admitted to your program? They need it!' They weren't admitted because they may need the program but they didn't really talk about what they would bring to the program. They didn't talk about what they would contribute. They weren't either aware enough or they were so focused on me that they didn't really take a look at what they brought. It's flipping the situation and emphasizing what individuals with talent, what strengths, what abilities they have versus looking at what they don't have. And so the deficit model around diversity work I think is one of the barriers. And even those who in their hearts want to broaden access they focus on deficit and what people need versus what they bring."* (Asian American male)

The cultural capital vs. deficit model requires that university 'experts' learn about various cultures, which is often outside of their realm of expertise but essential to the success of the university's growing URS population. In the words of one expert, *"To the extent that culture is seen as capital - as personal or social capital - that gives it the importance that it's an asset rather than a side note or something which is kind of, again, peripheral in engaging the well-being of a student or community. So, the notion that 'this is capital that we should have' and that which we should strive to have or 'should be promoted' - I think is an important way to frame… and give it and credence and importance to cultural and minority issues."* (Latino male) One

participant discussed the **harmful effects that the cultural deficit model** has on URS success. *"I think that especially when there is a great disparity in terms of the culture back home and the culture of higher education, students think that back home has nothing to do with here. In fact, they divest themselves of the cultural knowledge that made them strong, and helped contribute to their individual identity back home. There's sort of a forced homogenization in many ways. You know you have to talk like, act like, dress like, and acculturate to the university because you don't want to be too ethnic. I think that one of the things I try to work with my students on is to help them see, to help them take inventory of what strengths, what abilities, what about themselves actually could be transferred to this environment with modifications. A lot of kids are lucky to be able to stay alive when they walk to school and back where they grew up. And they are great time managers because of all the responsibilities between family and work and academics and they got here. I've taken it upon myself to help them realize that the cultural capital that they do have with modification can, without giving up who they are, can be modified and applied here. I think that transferability, how things can translate here is I think often times missed. I think students feel like they have to leave that stuff out there because higher ed is really different than back home. I think they bring a lot."* (Asian American male)

Of particular influence was familism, which is many cases was seen as a barrier when students chose to study outside of their geographic region. *"Our current way of doing science isn't particularly family oriented and it's very individualistic. So given that mode of doing science, the expectation is that you leave home to get your education. And many of the minority students that I have met are much more place bound. They have very close ties to their family. They don't want to leave the area in order to get their education. And that may be another reason why faculty view them as less excellent because they are less prepared to sacrifice the family relationships and close ties in order to go to the Harvard's and the Yale's, etc."* (White female) Even when students live relatively close to home they are often expected or expect to be able to engage in all of the usual family activities, making **culturally relevant education for the support systems and families integral to student success.** *"I think [the cultural beliefs and traditions of UR minority groups] plays a huge role [in their educational progress]. It does. You have no idea how difficult it is for me, even with my own students, to say listen 'you can't go home every weekend, you can't. I know you're missing the tamales but no you cannot.' [They say] 'well, my grandma, my dad.' I think it plays a big part, and part of it is what makes it difficult."* (Latino male) Experts also underscored the fact that academic environments usually chose to hire individuals who have studied in a different geographic region, rendering UR academics who have not studied afar not as attractive as non-UR academics that have. *"I have noticed with regard to cultures that have a stronger family tie where*

there's resistance towards moving away from family and that the way the United States scientific seal is structured and the expectations do not favor that kind of a value, which is unfortunate and its frowned upon… people generally view it as a positive when people have gotten their training at totally different institutions even geographically different and so that makes it more difficult for some underrepresented groups where they're torn between other kinds of values that would keep them in a particular community vs. moving on." (White female) Women were also seen as being affected by **gender-based expectations that do not encourage women's independence.** In the words of one diversity expert, *"This idea that you need to be moving to different places for your training, I think is not only a detriment to cultures where there is strong family ties but often a detriment for women who are often the ones that compromise, in terms of staying at a particular geographic location. So my feeling is that should be less… I don't know how you affect that kind of change, but I think that that would be a way to promote diversity in the sciences."* (White female) **Sciences are perceived as not being family friendly** and conducive for women who want to have children, particularly among UR populations that often wish to start a family at a younger age. *"I think that [in the] Latino community there is still some push for women to have children early. And that was one of the cases with one of my students. Basically, she had one child and her family pushed very hard to have a sibling for that child even though it wasn't necessarily in her best interest academically. So those are cultural factors that I think can be a barrier for students for the current relatively anti-family mode of doing science."* (White female) One expert stated, *"I believe that truly for science to become more diverse, and that includes having female scientists, it needs to be more family friendly."* (White female)

One participant who had worked extensively with Native American students reported that **temporal differences and expectations need to be considered** as they may affect scheduling. *"When I interact with some of the Native American students that I've had in my lab… just the idea of timing, where you have to be in at a certain time was a challenge for some of them. I think that their culture is such that, you do things as they progress throughout the day, and they are not so tied to a clock as mainstream culture would be."* (White female)

While it was seen as a barrier for some students due to shifts in institutional placement, **familism was reported to be an asset** that can be used to improve academic support systems. *"I think cultural values for minority students include having closer familial networks than majority students. That's a tremendous support system. At the same time, when those students leave those support systems, which is a traditional way of doing things in science, 'oh you've got to go to the top university, etc.' but there is a downside to that in that you may lose your support network and*

that can be detrimental… I think any student from a cultural background in which family is important is a factor that needs to weigh. It could be the university they want to go to versus the distance from their support network is critically important." (White female) One expert discussed that close family ties mainly benefit the URS experience but that **academia has very few strategies to incorporate the family and/or the students' support system** because education is perceived as an individual process. *"I have an extremely supportive family and that is important to say because my mom was my number one cheerleader and when people said ugly things to me or I felt incompetent or insecure, my mom put me back on the horse. So I think, we've talked about this at UTEP, how do we engage families and community?… Because they are the ones that can make the biggest difference and I don't have an answer for you. I've done silly little things like one time I had a barbecue at my house and I invited the student to invite their parents because I wanted to meet them and I wanted them to know where all of their students are spending their time and I don't necessarily do that anymore, but I will say that if I have the opportunity one of my students is married if I can sit and talk to his wife then I tell her, 'gosh Joe is really working hard at work and it's great that you support him,' and make sure that their networks also understand what they are doing and that they that they are an important part of the process. At graduation I had the opportunity recently to speak because we are allowed to say something about our Ph.D. candidates and I made their parents stand up with them because that at the end of the day it's about who is going to support them, their families."* (Latina female) One expert shared the **collaborative nature of familistic cultures as being advantageous to the success of the group.** *"Most of the time if they are willing to use cultural background in a way to enhance their own and others education, I think it helps their educational goals and progress or at least it helps them… but it depends on the person. If they want to study diversity then it can be very useful."* (White female)

One expert discussed the use of **familism as integral to the creation of a joyful, healthy, hard-working, culturally-relevant environment in her laboratory.** *"At UTEP they are Latinos and I think in the Mexican culture there is also the hierarchy and the title thing, which is good and bad, but it comes along with a very deep respect for people's positions and titles. So what that means is that my students respect my time that I never get, you know, naughty responses from them that are disrespectful. They trust usually what I am saying… that respect, I guess is the right word. Umm there is also a strong work ethic, you know? A lot of students who come from low-income Hispanic working families, ready to work hard, pull up your sleeves and ready to work hard….In the Latino culture there is a very strong sense of community and friendship and I see that in my Latino students, so they're hungry for creating a lab environment that is like a family and I love that. When I've had my lab feeling like a family, that is the happiest I am… because they are getting along."* (Latina female)

Familism was also seen as something that warrants a great deal of attention in terms of its potential impact on academic success as well as health equity. The study of cultural phenomenon was perceived as being very difficult for those who are not of that specific culture, rendering these constructs largely exiled from current scientific developments. *"One of my doctoral students and I have studied familism and how to define it, how to measure it, and what effects it has on psychosocial and physical health function, mental health, wellbeing… I have had others students who studied disparities, health disparities. I think they would not understand what those disparities are from the inside out without being from an underrepresented group. The students who come from that kind of [Latino] family heritage, cultural heritage have an intuitively understanding of it [familism] and can think through the theory about it and the measurement of it and the ways in which we can make use of it and understanding health."* (White female)

Diversity experts also stressed the **importance of resilience** as a factor that warrants considerable understanding and incorporation into the academic success dialogue. *"Resilience is key… I do think that there are definitely cultural values that probably would be of value to resilience. I know that there is a strong work ethic among a lot of my underrepresented students that they bring to the table which I think is fantastic. So that would be an example of how [cultural] values are very effective at promoting their success. And resilience, you know, to me that seems like something that has to come from within, so hopefully everyone brings to the table some level of that resilience. In figuring out ways of honing that [resilience] in, it would be really helpful for their [student] success. When you think you can do it, that's huge. And if you don't, that's going to be very difficult. It is going to be very difficult to succeed if you don't believe in yourself and yet, you know, that is difficult to maintain sometimes with the stress and the challenges that certain groups experience."* (White female)

CULTURAL CAPITAL AND ASSETS - STUDENTS

Participants highlighted the importance of cultural capital and assets to enhance URS' educational experience.

- Family emphasis, pressure, and support to place education as a priority, including parents working hard to help put their children through college.

- Emphasis on getting an education to help others and to help one's community.

- Being a role model for other URS in the sciences.

- Students highlighted how the cultural value of respeto might impact Latino URS ability to speak up in classes.

- Latina women experience family pressure to get married vs. continuing with schooling.

- Family value of being hard-working as motivation to persist in school.

Students from both groups discussed various aspects of their cultural background and how it influenced their experience in higher education. Some of the perspectives shared highlighted positive characteristics that helped students in their academic activities. **Many students discussed the importance of their family in providing various forms of support** such as the family's belief that education is a priority, financial support, and sacrifice that parents make to support their children. As one student said, *"Coming from Nigeria, coming with one purpose which is to be educated and make money to be honest. So for me, my parents have always given me a platform to just go to school saying, 'Don't worry about anything, don't worry about work, we will support you anyway we can; just concentrate on your education.' So I think for me personally coming here from a different background with a different place, education is the most important thing in my parents' eyes but for me, I don't know. I mean I enjoy education but there are other things that I would probably want to do, but I am here doing my masters partially 50 percent because my parents and they wanted to support me in that avenue so for me it plays a huge role."* (African male) However, in some cases, **students highlighted cultural aspects that negatively impacted their academic experience, motivation for earning their degree or pursuing a research career.** A student nuanced her family's support and pressure to get married, *"Especially in my family all the women in my family, they got married at a very young age, so I'm not old, but (to them) I'm kind of old. They ask me, 'When are you going to graduate? You're already 25 and you don't have a family.' Even though they support me in going to school, they know I want to get a J.D. and a Ph.D. They're like, 'You're going to be 40 by the time you get married.' I'm just like, "Well…' So I feel like I get pressure at home, and I depend on my parents a lot financially. I still live there, and I'm their only child so they take care of me a lot, but I feel that pressure, you know. 'OK, you're getting older, what's going on with you? Are you a cat lady?' [laughing]. I don't know I just feel like, I don't know if it's just a Hispanic thing, you need to have your family and get married and all that—yeah it's a lot of pressure."* (Latina female)

Students also expressed a collectivistic desire to help people and to help one's community. Some students talked about wanting to earn their degrees to be role models for other URS. A graduate student noted, *"For me, I guess my number one goal is helping others and I want to help people who come from the same background as me and I think that the best way to do that is educating myself.*

Like helping myself before I help others." (Latina female) Another student discussed how being involved in research as part of an internship served as a way to be a role model as well. She noted, *"I've had the same experience where I've been involved in research and that's really shown me what my cultural capital is and how much I can give back to the community and how they can relate to me. Even working with Latino teen girls they would listen to me in terms of the health education I was providing but they would also come to me and say, 'Hey, how do you get to be part of this, why are you giving us the health education?' So I let them know, 'I am in psychology and I am doing an internship.' So they would also get excited about what I was doing so I just definitely started to see myself as a role model and I think that really helped."* (Latina female)

RECOMMENDATIONS FOR PROMOTING CULTURAL CAPITAL – STUDENTS

Steps to Promote Cultural Capital

• Work with diverse student groups to assess cultural capital and how it manifests in various ethnic groups.

• Collaborate with student groups to develop culturally relevant communication highlighting the benefits of cultural capital and ways in which it can be utilized to benefit and potentiate academic programming.

• Create support and educational networks to help students and faculty fully understand and appreciate the benefits of cultural capital in terms of URS student success.

• Host culturally-relevant events to promote family and institutional integration of cultural capital in the academic setting as well as promote family and support network understanding of URS student needs.

CULTURAL CAPITAL AND ASSETS – ACADEMIC ADVISORS

Participants highlighted the importance of one's cultural capital and assets to enhance URS' educational experience.

Promoting Cultural Assets

• Assessing URS' cultural strengths and driving forces behind their successes in the sciences.

• Empowering URS on how to navigate through the academic system in order to be competitive for graduate programs in the sciences.

- Students' motivation to succeed stemming from their family's sacrifice and expectations of success.

- Emphasis on what it means to pursue a career in the sciences in order to help one's society and help reduce health disparities.

Impact of Cultural Capital on Academic Experiences

- Balancing demands of spending time with one's family (familism) and concentrating on school work.

- URS' natural formation of same-ethnicity student cohorts can sometimes be a hindrance to their educational experience.

- Students feeling place-bound to stay geographically close to their family and limiting their options for if and where they apply for undergraduate and graduate school.

Academic advisors highlighted the **importance of understanding, promoting, and integrating one's cultural capital and assets to enhance URS' educational experience in the behavioral and biomedical sciences.** *"I was reading one research study done for African American males. How their percentages across the United States of them in college and universities is just, it's unspeakable, is so small. And one of the real basic things that was said was that it's weird because the African American males that were successful were never asked, 'Why were you successful? What did you use? What helped you?' Instead of going from the deficit mode of why are these African American males dropping out and why? Ask someone who is successful, 'What did you utilize to help you? What makes you feel more at home here? What do you feel would help you or what worked for you?"* (African-American female, community college advisor) *"We had a panel about African American students and one thing that did come up is that students felt more sense of community. They have upper division students reaching out to them through student organizations."* (Latina first-generation female, undergraduate advisor) Advisors also emphasized the **importance of instructing URS on how to navigate through the academic system** in order to complete their science degree in a timelier manner and be more competitive for graduate programs in the sciences. *"Many of our first gen students don't know how to advocate for themselves and those avenues. Is it ok to do an appeal [to take more classes] and go forward? So how do we arm them with the resources of what you can do as a college student to kind of figure out what you want?"* (White female, undergraduate advisor) *"It's important for them to know the backdoor, loopholes, like everybody else."* (African-American first generation female,

undergraduate advisor) **URS experience immense pressure to be successful and complete their degrees in order to help their families.** This pressure and motivation to succeed stems from their family's sacrifices to help them get to college to earn a degree and solidify their future, as well as that of their family members. *"When we're advising, this whole 'disappointing their families' is because they're carrying the weight of their family on their shoulders. They have to succeed because they have to help at home financially. They have to be the success story like, 'We came to this country for you to have your education. You have to succeed'. So that is what it has been like for students. That's why they hold on to things so much because they feel they can't fail their families… The parents have this investment in [them], especially if you're the first one. I don't think they [younger brothers and sisters] feel it as much, but if you are the first one, I know I did. My sister benefited from me being the trailblazer. I tell students, 'You're the trail blazer and you're going to have a hard time. But hey, once you succeed, then you can help your brothers or sisters and your cousins be successful.'"* (Latina first generation female, undergraduate advisor) Advisors spoke to the importance of **helping URS understand what it means to pursue a science degree** not only to help one's family, but to also help society and help reduce existing health disparities in their community. *"My job was basically to help that student develop from, 'I want to be a doctor because I want to help people' to 'let me look at what is happening in society.' What does it really mean to be a doctor? It's not all puppies and rainbows. There's a lot of disparities, I have to be really open and knowledgeable to what it means to pursue this career. That takes a lot of time, a lot of counseling skills."* (Latina female, graduate advisor)

Advisors also described how several aspects of a student's cultural capital may impact their experiences in the academic setting, as well as decisions they make for their career path in the sciences. For example, URS often have to **balance concentrating on their school work and research with competing demands from their family.** Often times, family members do not understand why the student is spending so much time on campus and it is a difficult tightrope for academic advisors to intervene without disrespecting the important cultural values that students and their families hold. *"Sometimes I think the family can be a hindrance…these students are first generation so the parents don't understand that when they come home they still have to dedicate some time to study and school. 'Why are you closing your door? You need to come help with the dinner or you need to come do dishes, or you need to watch your brother or sister'… Living at home and having responsibilities, but then wanting to dedicate themselves to school and some other aspirations that they might have, like going to med school or to a Ph.D. program. That's tough, they're torn… How do you get in the middle of that? I mean I tried once and it didn't work very well. I would say, 'Well that's not right, that's not fair.' Then they [the students] would look at me and say, 'Well, I'll be kicked out if I were to say that.' So part of it*

is you just have to play within the boundaries you have and you tell them to make the best choices. I tried to have them be more assertive to their parents and that doesn't always work for them." (African-American female, community college advisor) Another challenge for URS is the **tendency to create natural support networks with students from their same ethnicity or culture.** Although this type of network can be beneficial in many instances to provide students with support in an environment that they are comfortable in, it also can hinder their experiences in interacting with students from other backgrounds who may be able to offer additional tools, resources, and advice that can help them succeed in the academic setting. *"You still find that, 'Yes, we finally made it here. We finally made it to Cal State Long Beach.' Well, where can these students reach the right tools for them to succeed? They're trying to stay within their cultural unit, because that's where they feel most comfortable. They will sometimes not go away from that to try to find other tools that will probably help them. For example, create study groups outside of your cultural [group] and I'm just talking about Hispanics, because obviously I am one and that's what I look at closely, but I think you can also say that's true for the Cambodian groups, and also for African Americans."* (Latino male, undergraduate advisor)

Finally, several advisors indicated that URS often feel pressure to go to school locally in order to stay close to their families, which limits their options for graduate applications and their level of competitiveness to get into different programs. It may also limit their ability to work in research environments that ideally match their research interests, as well as limit potential funding opportunities. *"I had a student in my lab who was totally qualified to go to a Ph.D. program, get a Ph.D. in biology, stem cell biology, whatever she wanted to do. But there was no way she was going to leave LA because she had two younger brothers and because neither of her parents speak English, she was the one who went on all parent teacher conferences. She's basically tied to one geographic location in a way that I think a lot of regularly represented non-minorities have less often. That is not much of a problem for native English speakers… She's in the master's program at Cal Poly Pomona which is great and she's doing great work, but she didn't apply for any Ph.D. programs outside of LA because where would she go?"* (White male, undergraduate advisor) Another community college advisor added, *"I'm coordinating our Northern California tour, so we're going to visit Stanford, Santa Cruz, San Francisco State, and Berkeley. I've being doing this tour for about 12 years now and I talk to [my community college] students on the tour and I always hear… One, they think it would be a betrayal of the family because [the student explains] 'They rely on me for either moral support or financial support, so I'm turning my back on my family by moving up to Berkeley. I want to go to Berkeley, but I'm going to choose UCLA or Cal State Long Beach because it's closer for me.'"* (Latino male)

Findings from the AHORA Conference Regarding Cultural Capital

Participants recommended optimization of both cultural and navigational capital. Efforts to integrate these two forms of student capital were seen as integral to improving the institution's understanding of the benefits of cultural capital as well as increasing the navigational capital to improve student understanding of how to be successful and leverage a bureaucratic and often resource poor academic environment. Cultural capital was seen as an asset that few students understood they possessed, potentially due to academic environments that have relied heavily on remediation practices as opposed to creating supplemental instruction opportunities and activities that bolster URS student efficacy. Participants also underscored the need for faculty and administration to fully understand that many URS groups might be reluctant to approach faculty due to previous discriminatory encounters or historical expectations that have resulted in an unwelcoming academic environment for URS. Student cultural capital was viewed as a relatively new concept that warranted considerable exploration and potential for bolstering URS student success as well as improving the cultural relevancy of academic institutions.

RECOMMENDATIONS FOR PROMOTING CULTURAL CAPITAL – ACADEMIC ADVISORS

Steps to Promote Cultural Assets

• Conduct a campus-wide assessment with successful URS in the sciences to identify factors that helped them to succeed in their respective fields.

• Provide a forum (e.g., one-on-one advising, student panel) that shares pivotal information with URS on how to navigate through the academic system and culture.

• Create support networks (e.g., URS peer advisors, UR faculty) to help increase URS sense of belonging in the sciences and to help them have a safe environment for them to openly discuss family pressure to succeed in their career pathways, as well as other career development topics.

• Design and offer a course or workshop that teaches URS about different health disparities that exist in their surrounding communities.

Steps to Address the Impact of Cultural Capital on Academic Experiences

•   Host culturally- and linguistically-tailored campus events for URS and their families (e.g., open house, testimonials from successful CSULB alumni and their families) to help families understand the amount of time and work ethic required by students to be successful in their science curriculum, excel in their research internships, and to successfully be admitted to top graduate programs in the US.

•   Create URS cohorts of mixed ethnic backgrounds by having them attend similar courses and workshops to promote peer support and exchange of resources and information.

References

1.   Coleman J. Social capital in the creation of human capital. American Journal of Sociology. 1988;94:S95-S120.

2.   Bourdieu P. The forms of capital. In J. Richardson (Ed.), Handbook of theory and research for the sociology education (pp. 241-258). West port, CT: Greenwood Press. (1986).

3.   Martin N. Social capital, academic achievement, and postgraduation plans at an elite, private university. Sociological Perspectives. 2009;52 (2):185-21.

4.   Wells W. Social and cultural capital, race and ethnicity, and college student retention. Journal College Student Retention. 2008;10(2):103-128.

5.   Cole S, Barber E. Increasing faculty diversity: The occupational choices of high achieving minority students. Cambridge, MA: Harvard University Press. 2003.

6.   Astin AW. What matters in college? Four Critical Years Revisited. San Francisco: Jossey-Bass. 1993.

7.   Rios-Ellis B, Galvez G. Cultural assets and resilience among Latino students in higher education. Paper presented at the Western Psychological Association conference, Portland, OR. 2014.

Mentoring

Over the years, mentoring has been studied by researchers to understand retention, persistence, and educational achievement among college students.[1] A review of the literature shows that mentoring overall is associated with academic success,[1,2,3] adjustment to college, and persistence.[4] A study, for example, found that faculty-directed mentorship plays a positive role in preparing underrepresented students for graduate education.[5] Research also indicates that minority students perceive the mentoring experience as an important factor for their academic success.[2,6]

MENTORING – DIVERSITY LEADERS & FACULTY

Participants highlighted their perceptions of factors that affect effective mentorship for UR students.

• Good mentors are those who create a sense of belonging, programs that attempt to avoid underrepresented student isolation, and sincerely believe in the student's ability.

• Students often do not know how to choose mentors and mentorship is often undervalued by the institution and throughout the Reappointment, Tenure and Promotion process.

• Mentorship is often what professors are told to put aside to get tenure and promotion.

• Active racism exists among mentors and programs. Good mentors try to avoid matching their students with these professors.

• Effective mentorship programs work with the student's family and their support system.

• Effective mentorship programs support in-population and same race/ethnicity organizations, activities, and faculty mentors.

• Mentors must be leaders so that they have the leverage needed to create transformative change.

• Effective mentorship means to view students as graduate students vs. technicians in the lab.

• Providing students with opportunities to apply for national scholarships.

• Importance of mentors to help build student confidence and dismiss stereotypes.

- Mentors have an important role in checking in with their students to help during the student's adjustment to graduate school.

- Good mentors are not "good old boys" or insiders that reinforce the "political environments of science."

- Providing networking opportunities for students at national conferences.

Diversity experts stated that **students must be politically astute to the culture of science** that is only known by those in control. Students need to receive mentorship from faculty who sincerely care about the student's development and can help students navigate a climate filled with "unspoken rules" and an attitude wherein a **Darwinistic culture is exemplified by survival of the fittest.** They discussed these issues as not only important for students but also for UR incoming faculty or research fellows. *"There are unspoken rules and issues that are best conveyed by a mentor who really cares for the mentee or fellow. We all know that in various sectors, including academia, there are unspoken rules that you find out about later in your career that could be conveyed by a mentor - which is no different from those affluent youth or people with high influence that are taught that from early on, so they know how to play the game, so-to-speak, from the very beginning and they have the resources to do it. That is far different from people of color who don't have that kind of mentorship; they have to find out how to survive the hard way. Sound mentorship by people who really care is very important… because some of these political issues are sticky and hard to convey in a PowerPoint presentation. One has to simply understand how they apply in the unique setting or institution in which the scholar of color is operating. They might be data-related at some level, but they're not fully because they are political. They are institutional, interpersonal, local cultures - and all of the kind of things that a senior colleague that cares for an earlier career colleague can provide; that otherwise go unspoken and make the life experiences much tougher, and survival more difficult, for the early career professor or academician that doesn't know about things. They are never mentioned and remain well-kept secrets because some people feel that they don't want minorities to know."* (Latino male) Another diversity expert shared a similar perception regarding lower expectations for UR students and how this can affect UR student confidence over time. *"The biggest challenge for any underrepresented group comes from those more subtle expectations, the messages that they get from others that they're expected not to be as good and I think that that has some impact on their confidence level. Probably the number one priority for me as a mentor of an underrepresented individual is building their confidence because they certainly have gotten some messages from other avenues suggesting that that they are not going to be as good which isn't true. So there is that confidence building that I think it's very important."* (White female)

They also discussed **physiognomic and cultural differences as barriers to** acceptance of people of color in academia. *"People who are trying to recruit you have to accept the reality that you might look different, speak different, eat different things, and that that's a part of who we are as Americans right now. And my thing is just get over it! But in some cases it [discrimination] plays a major, major barrier and its keeping people in or out of certain elements. For example, if we're serious about having underrepresented minorities in the behavioral sciences then we have to look at mentorship. Mentorship is a very, very important thing if you want to get kids in grad school and the Ph.D. level. Absent that, those kids don't stay around long."* (African American male) Another participant linked the importance of constant contact and communication as essential to encouraging URS to attend graduate school. *"I think that probably more frequent monitoring and intervention is needed to provide the URS more support-this would be helpful in those cases. Working in the laboratories but is not where it [mentoring] stops. If this is a completely new world to them [students], then they are probably going to need to be monitored more closely with lots of communication [from their mentor], to find out if there are any [adjustment] issues so that they can be dealt with."* (White female)

Diversity experts believe that **mentorship as a practice must be embraced as a requirement of academic environments.** They stressed that **mentorship should be part of the tenure process** and faculty evaluated on the particulars of their abilities to successfully mentor not only all students, but specifically UR students. *"It's very, very important that we embrace [mentorship]. As a matter fact, I feel so strongly about this that most professors should be directed, as part of their evaluation, to talk about mentorship and to have these kids under their wings. That in addition to their teaching load, that they spend time mentoring kids who don't look like them."* (African American male) **Participants also expressed their fears about students accessing unprincipled and racist mentors,** underscoring the **need for cultural training in academia** for everyone regardless of race or ethnicity, particularly because racism and ethnocentrism are no longer defined as a white and black issue. *"The worst thing that can happen is that s/he goes to a racist mentor or somebody that is not going to create a supportive environment. You might as well scratch that student off your list."* (Latina female)

Participants agreed that **diversity-related leadership, mentorship, and advocacy should be viewed as essential and intertwined aspects of educational success.** They also underscored that the university administration has the responsibility to reinforce these efforts and ensure that these programs and individuals are woven into university leadership and programming, thus becoming part of the normative practices. They shared the resistance they have experienced when attempting to develop diversity-related programs and efforts. *"You know for a fact when you*

implement these programs there is some resistance and lack of action. You've got to always be on the forefront, encouraging, patrolling, and promoting in order to get things done. You have to have some stick-to-itiveness because it just won't happen on its own. It has to have a leader and a person who has a mission and vision to go forward. And even when you do, sometimes you become an issue because people see you as an advocate and that tends to not go well for the person in that leadership role." (African American male) Diversity experts reported that advocacy was key and often viewed as erroneously juxtaposed to the supposed objectivity that is research. Mentorship was seen more than just being supportive and as intricately linked to advocacy. *"You need to become an advocate. A supportive role just doesn't cut it. Think about how many years we have had of affirmative action… and we are still talking about how we can improve, how can we make it better? The system is huge and we are fighting the system… So the idea is to make sure the students learn the system, learn how to navigate it so students can use the system to their advantage. I don't mean by cutting corners, but I do mean so that students don't have to go around the field three times and end up in the same point."* (Latino male)

The importance of mentorship as providing students and faculty an **opportunity to access same race/ethnicity clubs and organizations** was also underscored. Participants discussed the fact that these organizations served multiple purposes such as: reinforcing cultural values and assets, providing a safe space with same race/ethnicity mentors and role models, and serving as cultural competence training for individuals who may be unfamiliar with that specific race/ethnicity. In the words of one participant, *"It takes organizations like the National Hispanic Science Network to allow you the opportunity to meet other scientists like you. For me it's made a huge difference."* (Latina female) They also shared the role these organizations play in workforce development and the importance of their funding at the federal level. One participant highlighted the fact that **race/ethnicity-specific organizations in biomedically-related areas serve to amplify the students' understanding of workforce options** and therefore have a critical role to play in broadening the nation's spectrum in terms of biomedical workforce development. *"Students are pretty much in default mode when they think about what to do with their interest in science and people. They default to medicine. We are trying to work on that right now with the NIH funding. We are trying to present the social relevance of research, intellectual excitement of research, and the fact that you can make enough money to raise a family pursuing a research career. Conferences like ABRCMS and SACNAS are really, highly critical and I'm glad NIH is funding both of those programs as they shouldn't have to worry about funding. That should be a line item in someone's budget, in the federal budget. We are talking about workforce development, we're talking about not having to go offshore, those conferences are critical…. But they are also there to support students. I think that's very, very different. It's almost a 180 [degrees] from what undergraduates, especially those from underrepresented populations, get at their institutions."* (Asian American male)

Diversity experts also accentuated the need for **UR minority hires to ensure that universities remain relevant to changing student demographics.** *"I think that if you are a young undergraduate from a minority background and you are looking into graduate programs you should be looking at programs that have minority faculty and you should be looking for a mentor in graduate school who is of your background or one of the people in the faculty who is of your background so that you have a role model."* (White female) They also underscored the perception of **university training as superior for minority institutions wherein the faculty population is diverse and representative of the students themselves.** *"I think that there are programs that have those [diverse role models] for many students and that those are going to be superior to universities that don't for training."* (White female) Another participant echoed this sentiment. *"I think that for an African American student to find a faculty where there is at least one or two African American faculty that's really important. How are you going to know what you are trying to do if you don't see somebody who has done it?"* (White female) Female participants also highlighted the need to have women role models in the sciences. *"I've always said to my female students, 'You know, when you are looking at Ph.D. programs, and this is not as hard to find now but it used to be, you know, make sure find a place that have some women on the faculty and maybe work with a woman who can understand the concerns and the needs that you have as a young woman, figuring out how you are going to balance career and, you know, work, children, and family."* (White female) Diversity experts also stressed the **importance of mentors getting to know the people within their mentee's support systems** so that first generation-educated families, particularly parents, better understand the educational process and student needs. *"Students tell me 'You know, what really made a difference is that you talked to my parents.'"* (Latina female)

One participant underscored the need to **train students to better understand the role they are playing within a laboratory or on a project,** to ensure that they are not just conducting office or technician-related work. *"The reality is that a lot of minorities are marginalized and left on the sidelines. I wouldn't be surprised that after [research] rotation to rotation, they produce data that they never see again. These data may be used in another student's project and they are never part of the publication. They were just being used as technicians. A student needs to understand when someone is treating them as a technician versus a graduate student."* (Latino male) The same participant shared the **difference in privilege and expectations between students who are well represented within the sciences and those who are not.** *"White students will not have a problems asking you 'what are you going to do with the data? What's going to happen? Is there anything I can do to ensure that if you publish this, that I'm on the paper?' But Latinos are supposed to be polite and whatever… and maybe not even ask questions. 'Oh, I'm just considered*

a technician, here's the data." (Latino male) This particular diversity expert reported serving on several committees and study sections and shared her experiences and she has **witnessed discriminatory decision making.** *"I kid you not, every NRSA application from a minority student, black, Hispanic, whatever… 'oh, this student, it took them 3 years to find a lab? Three years of [research] rotation-oh, he's not serious enough. Oh, it's a fourth year student and not even a single publication or not even a single poster.' And believe it or not, it's only happening to minorities in the study section. I have to say 'look, that's part of the problem.' The problem is that this institution accepts minority students, but they never guide them. So then there is a student doing rotation after rotation. Who is guiding that student? Is the student that much of a mess up? … The majority culture will see as 'this kid is not committed."* (Latino male) *"So I tell my graduate students, of course your grades are important, but the best currency that a graduate student has are publications… How are you going to get published? By working in the lab, collecting data and making sure… how do you position yourself to be a part of the publication process?"* (Latino male)

Diversity experts also recommended that mentors help URS find and facilitate scholarship opportunities for them. *"Our own graduate students we had, who were minority students, we had them apply for fellowships through different professional organizations and those organizations included the Society for Neuroscience and the American Psychological Association. They both had programs that were for promoting diversity and so we had our minority students apply for those fellowships and both programs were really good in terms of not just providing the fellowships but also opportunities for networking and travel etc."* (White female)

RECOMMENDATIONS FOR PROMOTING EFFECTIVE MENTORING - DIVERSITY LEADERS & FACULTY

Steps to Change Institutional Climate to Promote Effective Faculty Mentors

• Include mentoring requirements in the Reappointment, Tenure and Promotion process.

• Support faculty leaders who advocate for URSs and the programs that support URSs.

• Provide support for same race/ethnicity clubs and organizations.

• Hire faculty who reflect the student population.

Steps to Promote Effective Faculty Mentors

- Communicate frequently with URS and regularly monitor their progress.

- Provide URSs access to same race/ethnicity colleagues in biomedical and behavioral fields through conferences or other activities.

- Teach students to advocate for themselves and to understand the currency of the discipline.

- Build students' confidence in themselves to combat implicit discrimination.

- Identify and encourage URS to apply for scholarships and fellowships.

- Encourage students to consider graduate programs where URS faculty exist.

MENTORING - STUDENTS

Participants highlighted their perceptions of characteristics and support that influence effective mentorship for URS.

Characteristic of effective mentors:

- Culturally sensitive and can relate to their students' backgrounds.

- Supportive, approachable, and adaptable.

- Importance of having UR backgrounds of mentors to serve as role models.

- Openness about sharing career experiences with students.

- Being open-minded to student input and ideas.

Support and service that effective mentors should provide:

- Make time for teaching students.

- Provide students with opportunities to apply for conferences, scholarships, and grants.

- Teach and model being a professional in the field.

- Provide students with feedback on readiness to apply for graduate school.

- Inform and provide support to students about alternative paths to pursuing careers in the sciences.

Students from both groups spoke candidly about effective mentoring in terms of desired characteristics of mentors and specific types of support and services that effective mentors provide. Some of the characteristics discussed referred to **effective mentors needing to be culturally sensitive which can aid in them relating to the students from different backgrounds.** A Ph.D. candidate student said, *"I think mentors and role models have to be culturally sensitive and they have to be able to respect your culture and kind of what you're going through as a student. And a lot of times I think white faculty may not purposely know that they disagree with you, but they do. And I think that is really discouraging in terms of going back to them for questions or advice if you feel that they are not going to understand where you're coming from. I think it is hard to see that person as a role model after that."* (Latina female) The importance of **having faculty from underrepresented groups** was discussed as a factor that influenced the effectiveness of a mentor. Another

student added, *"Back when I was an undergrad, I could say that partially the reason that I did pretty well was because of my mentor. Because she understood me, she was resourceful, supportive, but also there was compatibility between our life experiences I feel like, you know her background was really similar to mine. She had a large family, second generation, so that kind of inspired me in a way to pursue higher education… It was really important, especially being in a predominately white institution."* (Latino male) Other characteristics reported by the students included being supportive, approachable, open (about sharing their experience as it relates to their career), and being open-minded and receptive of student input and ideas. For example, one student touched on how the lack of some of these characteristics in mentors may negatively impact students. She said, *"I think it's important for a role model to be very open and also open with their time because as a student sometimes it's intimidating to say, 'Can I please have fifteen minutes of your time?' You know someone is really busy, but especially someone out there playing that role and if they are a mentor, they should have flexible time and then be very open when it comes to their personality and just understanding things like that."* (African American female)

Students discussed at length the various types of support and resources that effective mentors should provide. Students talked about the **need for mentors to make time for them and to be engaged in the mentoring process.** As one student said, *"They also have to be engaged because, what if they have like 15 other obligations? Then you're never going to be at the top of that priority list. If you're going to have someone who is really going to mentor you and help you through these processes, then it has to be someone where you can just walk in and not have to sign-up on some list to talk to them. They have to be available."* (Latina female) Students discussed many specific areas that effective mentors should support students in. For example, the students reported that effective mentorship involves providing and supporting students with opportunities to apply for conferences, scholarships, and grants. In addition, the students expressed the need for mentors to teach and model professionalism. As one student said, *"I've had a faculty member who works with a lot of students and what she does is teaches them to also protect her time so when they meet, she sets meetings with them monthly, sets a time and expects them to be there at that time but also be prepared. So I think she's mentoring but at the same time teaching people to be professional and to be ready to meet with mentors."* (Latina female) It was noted that effective **research mentors should recognize that students have multiple demands.** For example, a student said, *"Being understanding of others obligations, because there was a student in our lab who came from a different lab and the research mentor treated them like that was their full-time job and they didn't have any other classes. If you don't have a mentor who understands that you have three midterms this week and they want you in*

the lab, it's not [good]." (African American female) Other specific areas of support included the importance of mentors providing students with feedback on readiness to apply for graduate school, being knowledgeable and supportive of alternative paths to pursuing careers in the sciences, and recognize that students have other competing obligations.

RECOMMENDATIONS FOR PROMOTING EFFECTIVE MENTORING - STUDENTS

Desired Characteristics of Effective Mentors

- Culturally sensitivite and open-minded.

- Committed to providing time to students.

- Provide soft-skills training regarding professionalism for students.

Steps to Change Institutional Climate to Promote Effective Faculty Mentors

- Provide faculty with funded time to mentor students as part of the responsibilities.

MENTORING – ACADEMIC ADVISORS

Participants highlighted their perceptions of factors that influence effective advising for URS as well as their experiences with good and bad advising. Participants also described what they enjoyed most about advising and the characteristics of bad advising and its effects on their students.

Characteristics of effective advisors:

- Advisors have to help students navigate through the system (not stagnating in program, problems with grades, and issues with faculty mentors).

- Hands-on individual monitoring of students by academic advisors is helpful to keep students on track.

- Effective advisors have some sort of counseling/eclectic background, as well as knowledge of different career options in the sciences, and gets students connected to appropriate services and resources, including those related to mental health, financial aid, and career counseling.

- Understanding the personal history of a student helps tailor academic advising for different needs.

Professional development of students:

•   Helpful to have discussions or practical training workshops for advisors that highlight what factors four-year universities evaluate to admit students into their programs.

•   Need to maneuver the unit cap system at CSULB to help students get the classes they need to be competitive for graduate programs in the sciences.

•   Importance of connecting students to faculty mentors, as well as research opportunities and applied experiences in the sciences.

•   Having examples of former students that academic advisors can use to help motivate current students who are pursuing science careers.

Academic advisors at all three levels (community college, graduate, undergraduate) shared their thoughts on important characteristics for effective advising and mentoring of URS pursuing science degrees/careers. Advisors stated that they **often have to help students with how to navigate through the academic system so that they do not stagnate in their respective programs.** One graduate advisor stated, *"My role is to make sure people are moving along. I am the gateway to make sure a certain level of quality [of student] comes out at the end and if there are issues with people then I will intervene, but we are also trying to increase the pre [majors] to core as well meeting with all of the students."* (White male) Another advisor described how much time they spend in the individual monitoring of students' progress through the masters program indicating, *"I do a lot of hands-on individual monitoring of students for helping them meet the requirements for the program, keeping track of their advancement to candidacy, and making sure that they get to that point. Lock in to their program, know what they need to do, make sure that they do it… Make sure that they don't drop below their GPAs but I am there because I am staff. I am there 40 hours plus for them so if they have any questions or any problems that they need solved, with either their classes or faculty mentors, getting through the thesis project, I am there for them to come at any time. So, we are really lucky that the department can have that. I know that most departments have to rope in a faculty member to do the job of graduate advisor."* (White female)

Another characteristic that was shared was the importance of advisors being supportive, approachable, and sensitive to students' experiences so as to connect them to the services or resources they need. For example, one undergraduate advisor discussed the need for her to provide emotional support to URS given their experiences with marginalization and **URS being given negative messages about**

the likelihood of their academic success from academic institutions, instructors, and faculty, indicating, *"I did a lot of personal counseling with these students because a lot of the times what I saw when I was in a typical advising session, I would have the majority of the students underrepresented, disadvantaged, come from a high school that did not adequately prepare them to be successful in college. So they are struggling here."* (Latina first-generation female) She added, *"So, if one person says that you are done. I'm sorry you can't make it because you failed. They [students] really internalize that and personally what I have seen is that it really affects their success."* Other advisors commented on how their experiences and background in other areas has also helped in their work with URS. For example, they stated the importance of being knowledgeable of how to connect students to mental health resources when needed indicating, *"It is important getting students through the pipeline and getting them connected to adequate resources on campus. So if someone is having a mental health issue, which I do see that sometimes, getting them connected to Counseling and Psychological Services (CAPS)…I think it is critical to have somebody that has that background, that has the counseling and psychology background that can really help that student move along."* (Latina female, undergraduate advisor) A graduate advisor added that her background in financial aid has helped her advising with URS stating, *"I find that my background in financial aid helps. I'll get students that come and they have money issues or financial aid issues. Since, I've worked there for so long I know the process the students need to do to move forward to stay eligible. Plus, I still have some contacts over there and that I take advantage of."* (White female) Other advisors highlighted the **importance of understanding students' academic and personal background history to better tailor the academic advising they provide.** *"I think that [understanding the student's] personal history information would help determine how much that student can handle for that semester and, therefore, design that [student's class schedule] for their success. Students who do not work at all can obviously take more courses as compared to a student who has to work part-time or even full time…and the question that you also have to gauge is, 'Does this student come in with a good background in all those basic core classes, like calculus?' That also plays a role. If the student has struggled throughout the process, then the question is, 'How can we design this so they can succeed later on?'"* (Latino male, undergraduate advisor)

Advisors also shared the **importance of understanding the different factors associated with successful entry into behavioral and biomedical graduate programs** when advising students. For example, advisors indicated that the most helpful trainings and conferences that they have attended included going over specific case examples of students that were denied entry to undergraduate or graduate science programs. *"I'm listening to that training because now you're tearing apart a [student] transcript and telling me this is a problem on this transcript and this is*

going to get them denied. Now you have my attention because I'm going to tell the student. For example, at USC if you [the student] got more than two W's [Withdrawals] you are not going to transfer to USC. That's very valuable information... We go to conferences and we piece together that information. They [referring to USC] almost tell us to tell the student, 'Get the F'. We'd rather see you attempt it and be in the seat for the whole semester and fail, and get a ding in your GPA, rather than showing really that you are a quitter. Because that's what that W shows." (Latino male, community college advisor) Another factor that affects URS' acceptance into graduate science programs is CSULB's unit cap (e.g., 144 units) policy for timely graduation. This policy limits students' abilities to double major or add a minor to their transcript, thereby making their graduate school application less competitive. Advisors described trying to get around this policy by requesting exceptions for students who have an excellent academic track record. *"As advisors, we were talking about how we had a student who wanted to do a music minor in addition to a biology major and we decided that basically because the student is a good student we were just going to ignore the administration and let the student declare this minor. We try to make exemptions for them, but there is no guarantee that Brotman Hall would allow us to do that."* (White male, undergraduate advisor) Another undergraduate advisor added, *"If this [double majoring] is something you are passionate about, who am I to say, 'No, you can't do it'?… For example, I had one young lady who wants to go to medical school but she wanted to get a women and gender studies minor because she wants to be an obstetrician, which that's a great idea, but then it will it go into your timely graduation pot unit limit. And if it doesn't fit, she can't do it. So how do you make a student more marketable, especially where you have to have that little edge over everybody else? But they don't have it because of that timely grad."* (Latina first-generation female)

Advisors also spoke of different methods they used to **encourage students to connect with faculty mentors and participate in different research internship opportunities on campus,** such as looking up different research faculty on the department website, having current research students share their experiences with others in the classroom environment, and using upcoming research conference to motivate students to complete research projects. *"In my bio-stats class, which is a intro level course, at the end of this semester I bring in a bunch of my lab students and I say a five or ten minute speech on different projects that they're doing in the lab and then I tell the students about MARC and RISE and LSAMP. I don't think other faculty bring their students into their classes like that, but those students are role models."* (White male, undergraduate advisor) Another advisor said, *"I'll encourage students with the American Public Health Association (APHA) as our big conference that we have in public health. I'll tell them, 'Contact your faculty and ask them, do you need help with a lit review? Do you need help with a poster presentation?'*

Whatever skills you have, offer to your faculty. That way you get to know them and you can build your resume." (Latina first-generation female, graduate advisor) Several advisors also discussed how helpful it is to **use student success stories as examples to motivate URS pursuing science careers.** As one undergraduate advisor indicated, *"I'll try to help focus them, but if they don't have that motivation I give them examples of things that they can do. For example, I've had a student who worked 20 hours a week free at the Long Beach Health Department in their Epidemiology Department and applied for grad school, got in and was hired by the state as an epidemiologist. Nobody does that without a grad degree. And so I try to use stories like that to motivate students in terms of this is what you can do or this is where you need to go. So trying to get students excited about what they want to do, I feel is helpful."* (White female)

RECOMMENDATIONS FOR PROMOTING EFFECTIVE MENTORING & ADVISING – ACADEMIC ADVISORS

Steps to Promote Characteristics of Effective Advisors

• Provide more staff support and resources to help academic advisors meet individually with students who are identified early on as struggling in their behavioral or biomedical science program.

• Host trainings for advisors that focus on addressing students' mental health issues, financial aid, and career options in different areas of science.

Steps to Promote the Professional Development of Students

• Host cross-campus orientation workshops, with use of case examples, to increase awareness of different admissions criteria for URS pursuing behavioral and biomedical science careers.

• Modify CSULB's unit cap policy for students (in good academic standing) to support students who need an extra year to strengthen their graduate school application with more science courses or prerequisites by creating a one-year science certificate program.

• Partner with different Colleges on campus to host an open house where students would be able to hear about various research opportunities for their area of interest, meet faculty mentors looking for students, get tours of research labs, and hear from current research students about their experiences with conducting research.

• Request that students provide peer to peer presentations about their contributions.

Findings from the AHORA Conference Regarding Mentoring

Conference participants expanded considerably the discussion about effective mentoring. They recognized that different levels (B.S., M.S., Ph.D.), types (Profesional, Academic, Communication) and sources (staff, faculty, peer) of mentoring are needed, and that mentoring needs change along the pipeline. They also noted that mentoring skills are rarely taught, but are vital and recommend this type of training, as well as professional recognition (e.g. mentorship awards) for this type of service. Participants recommended mentoring networks or support systems (similar to "co-parenting") as an effective way to provide students the required professional help without overtaxing the mentors. Similar to the students, conference participants stressed accessibility and quality of interaction, but emphasized quality over frequency. In additional to one-on-one and group mentoring mentioned in the data, participants indicated that other forms (e.g. Skype, phone, forums) or a mixture of forms were helpful. With regard to the types of mentorship needed, "professional" mentoring included both soft-skills like building students confidence and understanding of the biomedical and behavioral culture or unspoken rules, as well as hard skills such as where and how to apply for scholarships and the different roles, tasks, responsibilities and associated recognition within the academic environment. Discussion of "academic" mentoring focused on monitoring progress, information about career options, as well as navigating university systems. Communication mentoring included the family support systems, as well as preparedness, how to approach people, and continuity of interaction. Conference participants were vocal in that both good and bad mentors exist and described the characteristics of each, provided detailed description of each. Finally, they also described what student outcomes of mentoring should be: how to be organized, prepared, ready to meet with faculty; how to professionally ask for time; how to receive and accept critiques; readiness to enter tough environments; knowledge of expectations, and ultimately to be independent, self-reliant, enabled, and confident students.

References

1.   Crisp G, Cruz I. Mentoring college students: A critical review of the literature between 1990 and 2007. Research in Higher Education. 2009;50:525-545.

2.   Kendricks KD, Nedunuri KV, Arment AR. Minority student perceptions of the impact of mentoring to enhance academic performance in STEM disciplines. Journal of STEM Education. 2013;14 (2):38-46.

3.   Erickson LD, McDonald S, Elder GH. Informal mentors and education: Complementary or compensatory resources? Sociology of Education. 2009;82:344-367.

4.   Hu S, Ma Y. Mentoring and student persistence in college: A study of the Washington State achievers program. Innovative Higher Education. 2010;35: 329-341.

5.   Davis DJ. Mentorship and the socialization of underrepresented minorities into the professoriate: Examining varied influences. Mentoring & Tutoring: Partnership in Learning. 2008:278-293.

Belonging

According to O'Keeffe,[1] higher education institutions should be responsible for creating an environment where students feel welcomed. Creating such a college environment is particularly important for minority students. A study found that racial minorities tend to report a lower sense of belonging than their White counterparts.[2] In addition, researchers have tried to understand some of the components that can create a sense of belonging for college students. The literature shows that social support services, counseling,[3] positive student/faculty relationships, and campus diversity are positive factors that contribute to sense of belonging among college students of color.[1,2] Research shows that positive student/faculty relationships not only foster college life satisfaction but also motivate students to continue higher education.[1,3]

BELONGING – DIVERSITY LEADERS AND FACULTY

Participants underscored the need for academic environments to create the social support structures, space, and cultural relevance needed for students to perceive themselves as part of, and belonging within, the university environment.

•	Programs that attempt to avoid UR student isolation can increase students' sense of belonging.

•	Mentors that avoid referring to students as "untraditional" or out of place can increase students' sense of belonging.

•	Programs that provide culturally relevant and sufficient space for activities can increase students' sense of belonging.

•	Programs and mentors that create support systems and social support for UR students facilitate a sense of belonging.

•	Programs and mentors that avoid a Darwinistic approach and 'survival of the fittest mentality' can facilitate a sense of belonging among students.

Perspectives on Creating a Sense of Belonging

Participants emphasized the importance of creating a sense of belonging among UR students. They highlighted the differences in academic environments as being related to the existence of a long-term "good old boys" network that makes it difficult

for UR students to gain a sense of belonging or even understand how to "play the game". Participants stressed the **need for support systems that encourage resilience and self-validation.** *"There is no question that if someone feels they don't belong, they're not going to last very long in that environment. There have to be support systems that make self-validation possible, until you do belong. Part of it also comes with the person - there are resilient people that sustain and fight very difficult life circumstances or find a way to move on - but moving up takes its toll on those that are in very difficult situations where they just give up and leave because they haven't obtained the support and the validation necessary to feel that they belong. Those are real factors that we need to remedy because to the extent that we don't have diversification in many circles, it becomes a 'good-old boys' network or it becomes an environment where only the 'insiders' get to succeed and that doesn't do justice to the diverse consumers that are needing to learn from a more diverse faculty and administration."* (Latino male) Another diversity expert shared a student's reaction regarding the adverse environment he experienced in the sciences. *"The culture of science has a long way to go to be more accessible. I work a lot with first-generation students and low income students and it's almost like being behind enemy lines for them. They have to make sure that they wear their armor when they're in contact with the majority of the scientists and their peers. That's why [diversity] programs are so important because as one student shared 'Being in BSP is the one place on this campus where I can actually take off my armor.'"* (Asian American male)

Diversity experts stressed the existence of an elitist, Darwinistic attitude that validated the continuation of the status quo by underscoring an [attitude of] *"let them find out the hard way, as a way to get rid of people that can't make it because they were never told about certain things they should have known."* (Latino male) One expert expressed his frustration with the fact that **the Darwinistic environment is antithetical to student success,** often resulting in waste and inefficiencies due to the lack of quality mentorship. *"[An administrator at my institution] said 'I am trying to change the culture on campus more broadly than just increasing diversity'. It's based on this Darwinian struggle model of only the strongest will survive. And it doesn't make sense to leave students at the doctoral level to flounder on their own. Doctoral study is very expensive and is very time-consuming and so I think we have an obligation to provide good mentoring for the students. So I think in order to get the students to the doctoral level is important for them to have strong research experience as an undergraduate and strong mentoring…to further foster the success and sense of belonging of the students. And it needs to continue for the students that are in doctoral programs."* (White female)

Belonging was inextricably connected to mentorship and **mentors were seen as one of the principal conduits to creating a sense of belonging.** *"I think there's something to be said for making sure that the student is placed in an environment that is conducive to their success. And there are certain mentors who eat their young… I tell students that if the mentor won't give you their e-mail, the phone number, or some contact it's a red flag."* (Latina female) Participants discussed belonging as integral to the retention of students. *"I think it [sense of belonging] is very critical. I think that if you're questioning whether you even belong there [academia] all of us will go through a trying time no matter who you are because becoming a successful scientist is not an easy undertaking. So if you feel like you don't even belong, then when you experience those more difficult times they may impact your decision of whether or not to continue."* (White female)

The difficulty students, principally those who are UR and first generation-educated, have in creating a sense of space and belonging in an unwelcoming environment that devalues their presence is marked, particularly when professors have little human contact with their students. *"I think contact with the students is huge. I'm always in contact with my students, I see them every day. [Some] faculty mentor their students via email, telecom, and things like that…I think the one-on-one contact is important. You'd be surprised at all the things you can avert just by making sure you are around… and making sure the students feel they can always come to me for questions."* (Latino male) Another participant shared how he gained a sense of belonging in academia through attention and recognition of a great mentor. *"I know when I was in grad school, I happened to have a very good mentor, a professor who shepherded me through some of the things that I was unaware of and really took a liking to me as a person and a student. It meant a whole lot to me because I was able to fit in. I would go with him to meetings, I would go with him to his house, and be with his family, I knew his neighbors… and he just saw me as being one of his bright, shining students."* (African American male)

Participants discussed the isolating environment that often prevails within a university setting and how this contributes to a lack of belonging, especially when there is **little opportunity to interact with faculty.** *"In a university with big classes you have students going to class and through their entire educational experience without getting to know a faculty member or a TA. I think that does not lead you to feel like you belong and it doesn't create a full educational experience. It is simply coming and going for your education. It's like eating without sitting down and having a meal with people."* (White female)

Diversity programs and spaces were seen as absolutely integral to minority student success and without them experts stated that success among UR students was not sustainable. *"They give us a place where we can share our difficult and challenging life experiences with others that have gone through the same experience, which is very important to create social support and the sense that we are not alone in an otherwise difficult journey that we've had to undergo. Those programs that allow us to come together, exchange notes, provide social support, encouragement, and validation to each other - are VERY important… because otherwise, we would be left to our own devices and self-doubts about 'did I really get here the way I should?' Comparing and contrasting with others and learning from each other through a minority program is very important."* (Latino male) Another participant discussed the imperative of ensuring that her lab created a welcoming space for students who don't feel they belong in the overall university environment. *"I think I provide to my students the sense of belonging, and I'll be honest, they feel they belong to my lab but not necessarily [the university]. But they feel more connected, I suppose, to the lab environment that I provide than the actual university."* (Latino male)

Participants stressed cultural competence and how inseparable it is to creating a sense of belonging. *"I think it comes down to truly understanding the culture of the folks involved. When you truly have cultural competence, you can feel it in terms of programs that are supportive. Despite high academic standards students feel that they belong because these programs were made for them. Scholars of culture really appreciate these types of programs, versus those that are sterile and that are based on false assumptions or premises, that don't apply to UR students, but are being imposed by people who don't really know how to make those programs relevant to UR student participants. There is no substitute to knowing the culture, and making a commitment to then help those that are trying to succeed. Some are very talented, but maybe having to deal with struggles that are not faced by people in the mainstream."* (Latino male)

RECOMMENDATIONS FOR PROMOTING SENSE OF BELONGING AMONG URS – DIVERSITY LEADERS

• Prioritize diversity hiring of faculty and staff in order to create support systems that encourage resilience and self-validation among URS in the behavioral and biomedical sciences.

• Work with diversity-related student organizations to increase URS' support network in the sciences and sense of belonging within the campus environment.

- Formalize cultural competency training for administrators, faculty, and staff in the sciences that identifies factors associated with URS isolation and devaluing of their academic worth. Conversely, this training would help identify factors associated with developing student confidence and interest in the sciences.

- Host social events on campus that give URS an opportunity to interact and network with faculty in the behavioral and biomedical sciences.

- Implement diversity and science-related programs that incorporate a peer mentoring environment that facilitates exchange of information and support networks among URS.

BELONGING – STUDENTS

Participants underscored the need for academic environments to create the social support structures, space, and cultural relevance needed for students to perceive themselves as part of, and belonging within, the university environment.

- Programs that aim to create a sense of community on campus.

- Activities that involve parents.

- Offer opportunities for students to meet and hear from other URS research scientists.

- Increasing awareness of one's cultural capital.

- Student organizations hosting multicultural events and providing networking opportunities.

- Internships as an opportunity for both professional and personal development.

- Effective programs need clear communication between students, faculty, and the university.

Perspectives on Creating a Sense of Belonging

Participants emphasized the importance of creating a sense of belonging. They highlighted many ways that programs can support academic environments to create the support structures, space, and cultural relevance needed for students to perceive themselves as a part of the university. Some students believed that **programs could**

create a sense of community by engaging in activities that bring the students together. A student said, *"A big one for me [important characteristic of effective student programs] is finding a program that establishes a sense of community to help you throughout college. I think that's really important whatever ethnicity or program, like that cohort, that one solid foundation through college is beneficial to every student."* (African American first-generation female, undergraduate student) The students discussed the need for programs to have clear lines of communication between staff, students, and faculty so that they can be effective in supporting students and remedying problems that arise. For example, a student said, *"For me it would be structure, communication, and support. All the programs I've been involved in like Upward Bound, and those programs have been very effective. They communicate really well with students and within themselves and faculty. Their structure is very stable. If one thing goes wrong, they have some way to fix it. For support, they motivate and push you to go further than you think is possible."* (Latino first-generation male, undergraduate student) Programs **involving the family of the students** were also reported as another factor that can develop sense of belonging among students.

Students also reported many benefits to interacting **and hearing from other underrepresented science professionals** that student organizations or programs hosted. A student remarked, *"When I was in college, I was in the MARC program and they brought people who gave talks and who had done what I am doing right now, like first generation minorities who then got Ph.D.s and were now doing research. So they came to talk to us and so that's when I finally met people who I could relate to."* (Latina first-generation female, graduate student) Similarly, students commented on the **benefits of having student-led multicultural events** that can decrease the sense of isolation, and increase a sense of community and belonging. A student noted, *"At [a UC school] we had the Latino Graduate Association and we would meet and we would have dinners…we would have nights were we would have different cuisines because some people were from Peru and some from Colombia. And so we would go and cook together and that was a lot of fun. We would share recipes and we also had Black grads. We would meet and many of us from the Latino Graduate Student Association would go to Black grads and some Black grads would come to our Latino meetings and so that was a lot of fun."* (Latino male, doctoral student)

RECOMMENDATIONS FOR PROMOTING SENSE OF BELONGING AMONG URS – STUDENTS

• Use of diversity-related programs to create a behavioral and biomedical science community among URS and faculty.

• Host campus events that include panels of UR science professionals who can serve as role models for URS.

• Host social events on campus that meld different cultural backgrounds and give URS an opportunity to interact and network with each other and faculty in the behavioral and biomedical sciences.

BELONGING – ACADEMIC ADVISORS

Participants underscored the need for academic environments to create the social support structures, space, and cultural relevance needed for students to perceive themselves as part of, and belonging within, the university environment.

Use of campus events and resources

• Hosting culturally-tailored open houses on campus for families to support URS' efforts in the sciences.

• Hosting a career day for freshman about different career options in the sciences.

• Having a physical space for students to gather and create support systems facilitate a sense of belonging.

Developing campus networks

• Using student groups on campus to help build a sense of community among students.

• Helping to set up or introduce students to different science networks.

Implementing various mentoring approaches

• Importance of having academic advisors who are encouraging and engage URS in the sciences.

• Use of story-based or prescriptive counseling to engage and retain URS in the sciences.

• Emphasizing to URS that there are different routes to achieving different science careers so that they don't drop out of the sciences altogether.

• Some students feeling relieved and less pressure when they are told by advisors that they should explore other career options in the sciences besides becoming a doctor.

Academic advisors identified several factors that help create campus environments which promote a greater sense of belonging among URS. One potentially effective factor for producing a supportive academic environment for students is the use of campus events and resources. More specifically, advisors spoke of **hosting culturally- and linguistically-appropriate open houses for students' families** to have a better understanding of their career path in the sciences. *"I think it is really important to make it [open house] culturally relevant. We have a very diverse population here. We have Cambodians, we have Latinos, African Americans. In terms of language, my mom does not speak English and so if there were an open house that she came to on campus and she couldn't understand it, there's kind of no point. Actually, she probably would not sign up because she wouldn't be able to really learn or understand."* (Latina first-generation female, graduate advisor) Another campus event that was suggested to help engage URS earlier to different science career options was having a freshman career day. *"Maybe the university could have some kind of career day with some workshops for starting freshman talking about different occupations… Maybe you can have someone specialized from psychology, someone from natural sciences to talk about their careers. Different options and just opening doors for students."* (Asian-American first-generation female, graduate advisor) Advisors also highlighted the **importance of having dedicated spaces on campus where students can come together** to develop a science identity and close-knit community. *"The marine bio part of our department is probably the most tightly knit group with the best alumni relationships and everything. They have a nice marine lab where they bring in [student] volunteers to help clean the tanks and take care of the animals and then some of the students go work in labs…That might be partially the reason why they're the most conducive group of students within our department. If there is a way for the chemistry, geology, or math departments to have some sort of facility to help students get that sense of community."* (White male, undergraduate advisor)

Another potentially effective factor for producing a supportive academic environment is helping students develop networks on campus. In particular, advisors described the **importance of URS becoming actively involved with different student groups** to help build their sense of belonging in academia. *"For students, I think about them because it's such a big campus and they really get lost…If they [student body groups and clubs] can meet and help them regularly and really build the community for the students on campus, they feel this a part of where they belong."* (Asian-American first generation female, graduate advisor) Another graduate advisor shared, *"I see the health science students who get involved and become board [members]. They typically just do better because they feel they are a part of the whole major. They help to coordinate career fairs, they do the panels…They put on these different events and I think that helps to empower them a little and they typically do a little*

better…and then the majority of board members usually end up going on to grad school. Very few just stop at the undergrad." (Latina first-generation female) Advisors also stated the importance of helping to guide students to specific science networks of faculty and students based on their interest areas. *"I mean that's part of the job. You're setting up networks for people and it's all individualized. It's where they want to go. The industry network is different than the Ph.D. network and the health network…That's part of knowing the strengths and weaknesses of the student."* (White male, graduate advisor)

Finally, a third factor for producing a supportive environment for students is **having mentors and advisors who are encouraging and engage URS in the sciences.** *"I think that is really crucial for students because they are still pretty impressionable when they come in…So, if one person says that you are done. 'I'm sorry you can't make it because you failed'. They really really internalize that and personally, what I have seen is that it really affects their success. So, it's important having a person that really believes in them, helps them belong, and has their best interest at heart."* (Latina first-generation female, graduate advisor) In order to **help students feel more comfortable speaking with faculty and staff,** advisors described using prescriptive, or story-based, counseling where they are asking students a few extra questions about their personal background to get to know them better, develop trust, and be able to tailor their advice to the student's situation. *"I think prescriptive counseling allows for having a more holistic approach, getting to know the student, and it doesn't even take that much time. I had a student that came in twice, and both times he was sweating and shaking, and at the end of the second session, I asked him, 'Do I make you nervous? Am I intimidating?' He said, 'No, I just have a hard time with professors.' I told him, 'We are just having a conversation. I'm your advisor. I'm here to help you.' So the third time he came in he was really relaxed and I've been picking up on those cues and trying to be more receptive to that. Sometimes we have students on the [factory] floor, and we work almost like we would on that machinery—get them in, get them out. So maybe just taking that time to get to know them. Just asking, 'How are you today?' And you know, maybe one or two extra sentences of dialogue with them can make a world of difference."* (Latina first-generation female, undergraduate advisor)

Several advisors also emphasized the need to tell students that there is **more than one pathway to reaching their goal of entering science careers,** particularly if they encounter barriers such as having to switch majors. *"In the College of Liberal Arts we see a lot of students that are moving from the natural sciences because maybe they got to a point where they are not able to go any further. [It's important] to be able to show them there's other routes in the social science areas where they can still move forward with their dreams and their goals. Being able to share with*

them that you can go and do these things as another alternative, you don't have to major in Biology or Chemistry to get into med school. To be able to give them those alternatives because sometimes they just feel like, 'My dream is dead,' and I say, 'No your dream is not dead, we just have to take another route to get there'… We just need to take a different route, another pathway, so that they feel like, 'I can still do it, just maybe not this way.'" (Latina first-generation female, undergraduate advisor) For many students who are struggling, they **feel relieved and are less likely to drop out from science majors** when they are advised early on to explore additional career options in the sciences besides becoming a doctor, especially if they experience a lot of family pressure to pursue a medical career. *"The thing that helps me is getting the student early because they've been trying to do that [natural] science major and just hitting walls, hitting walls, but they could be a psychology or sociology major and be successful. So I think using SOAR, the orientation program, and letting students know early that you can do any major would be very helpful."* (White female, undergraduate advisor) *"Sometimes parents are a barrier because they say, 'You need be a doctor.' So the student is relieved because now somebody at the university has told them you cannot go this route anymore and now, 'I could tell my parents it is not my choice anymore. The university told me I can't do this anymore.' They feel relief because they know, 'I am drowning and I am stressed out. I can't do this.' But they can't tell their parents that because they are paying the bill or say, 'I am helping you, you have to help our family.' So they feel that obligation of trying to make more money to improve their family life and help and give back, but they don't have all the necessary skills."* (African-American first-generation female, undergraduate advisor)

RECOMMENDATIONS FOR PROMOTING SENSE OF BELONGING AMONG URS – ACADEMIC ADVISORS

Steps to Promote Campus Events and Resources at CSULB

•   Host culturally- and linguistically-tailored open houses on campus for URS' families so that they have an opportunity to understand the student's academic workload, as well as the requirements and career options available in the behavioral and biomedical sciences.

•   Host a career day for freshman that provides an overview for different career options in the sciences. This event could include alumni or other professionals that share information and their experiences about their science professions.

•   Develop dedicated campus space for URS science majors that provide an area for students to study, socialize and network with others, and receive up-to-date information on research, scholarship, and other career opportunities.

Steps to Develop Campus Networks

• Develop formal partnerships between existing student groups on campus (e.g., science-specific, diversity-related) and faculty and staff through campus events or forums that enables URS to become more aware and actively involved in student campus networks.

Steps to Promote Supportive Approaches to Mentoring/Advising

• Implement cultural competency training for faculty and academic advisors so that there is an increased understanding of the unique factors that URS face in the behavioral and biomedical science majors, as well as to promote supportive communication with URS.

• Integrate the use of story-based or prescriptive counseling in academic advisor trainings in order to engage and retain URS in the behavioral and biomedical sciences.

• Host culturally - and linguistically-tailored campus events for URS and their families to discuss different career options in the behavioral and biomedical sciences that highlight course requirements, potential income earnings, internship opportunities, and campus tours of research labs and classrooms.

Findings from the AHORA Conference Regarding Belonging

Although conference attendees indicated that there can be unwelcoming faculty, mentors, and students in academia, thereby creating an isolating environment, there are also many trusting relationships that URS create with academic advisors. In addition, URS receive a lot of informal mentoring from non-faculty before they get connected to a research lab. These mentoring relationships continue long-term throughout URS' academic development, often with mentors who come from similar backgrounds as that of the students. Typically, these mentors are sought out because they have had similar experiences while navigating through the science pathway, and can empathize with the struggles that URS will face. Although UR faculty engage in many of these formal and informal mentoring relationships, there becomes an increasing need for universities to recognize the time and effort involved in mentorship as part of the evaluation criteria for faculty. Many faculty create research lab environments that help create a supportive environment and a sense of community on campus. In addition to these lab environments, conference attendees also identified using existing student organizations (e.g., National Health Science Network), diversity-related research programs (e.g., MARC), and increasing diverse faculty hires to increase student sense of belonging in academic settings.

References

1.   O'Keeffe P. A sense of belonging: Improving student retention. College Student Journal. 2013;47(4):605-613.

2.   Johnson DR, Soldner M, Leonard JB, Alvarez P, Inkelas KK, Rowan-Kenyon HT, Longerbeam SD. Examining sense of belonging among first-year undergraduates from different racial/ethnic groups. Journal of College Student Development. 2007;48(5):525-542.

3.   Grant-Vallone E, Reid K, Umaly C, Pohlert E. An analysis of the effects of self esteem, social support, and participation in student support services on students' adjustment and commitment to college. Journal of College Student Retention. 2004;5(3):255-274.

AHORA SWOT Analysis

The primary focus of the Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis is to elucidate what is needed to optimally support the success of students most underrepresented in biomedical, behavioral, clinical, and social sciences research (hereafter, collectively termed "biomedical" research).

Strengths

•   California State University Long Beach (CSULB) is located in one of the most diverse regions of the country and while only being able to admit 10% of the ~80,000 applicants annually has a student body that largely reflects the region it serves. We have been both a Hispanic Serving Institution (HSI) since 2005 and an Asian American and Native American Pacific Islander-Serving Institution (AANAPISI) since 2011.

•   Offers one of the most cost-effective, quality higher education degrees in the nation.

•   Improvements that have positively impacted both time to graduation and graduation rates have been made and CSULB continues to benefit from these adjustments.

•   Through its Long Beach Promise partnership with the local K-12 district and community college, and continuing externally funded programs with regional community colleges, CSULB has multiple ongoing strong and well-articulated partnerships with local community colleges.

•   There are a number of innovative and effective initiatives and programs housed in individual departments and colleges that could be scaled up and institutionalized to advance the entire university community.

•   With a Latino student population increasing at approximately 1% per year CSULB has developed multiple campus and community focused programs including the NCLR CSULB Center for Latino Community Health, Evaluation, and Leadership Training, and CSULB *Centro Salud es Cultura*.

•   The school has effective student support services.

Weaknesses

- Several biomedical and behavioral-related departments and degrees are impacted resulting in an inability to serve all those who are eligible.

- Academic achievement, such as GPA, is often used as principal or sole selection criteria, resulting in lower number of underrepresented students (URS) in the admission pool who may have grit, resilience, and determination.

- While there are a number of collaborative interactions with Research I universities, formal or large-scale interactions are lacking.

- There is a need to increase the number of faculty from underrepresented (UR) populations to facilitate academic role models with an innate understanding of the contextual and cultural factors to promote academic success in the CSU system.

- The standard approach to promoting graduate education has been a "program-specific" model, wherein on-campus student research and mentorship programs work separately and develop programmatic curriculum and resources, often through grant mechanisms, to support their small cohort of students moving towards doctorate programs. This approach constrains programmatic ability for resource sharing, building a strong and visible campus presence for URS, and creating support networks. Additionally, this patchwork approach does not provide alternate pathways for students interested in changing majors within the biomedical fields or facilitate programmatic collaboration and sharing of best practices. Consequently, students often lack awareness of available mentorship and resources to engage in biomedical research.

- Operating student research and mentorship programs in isolation does not take advantage of the diverse on- and off-campus resources, student peer interaction, and common initiatives for promoting graduate education that a unifying institutional infrastructure would provide.

- For students changing majors or late entrants to the research career pathway, there are limited support options making it difficult for them to develop the portfolio of experience necessary to matriculate to graduate study and research careers.

- The current emphasis on addressing timely graduation through a cap on units hinders the ability of students to train across disciplines, to change the focus of their studies or career plans, and penalizes community college transfer students by counting courses that cannot be counted toward their degree in their total units.

- While writing and communication course are required for degrees, the skills specific to research professionals are not available within the curriculum.

- The university lacks consistently applied policies with regard to faculty workload applied to mentoring student researchers and to resources needed to support this work. While the university expects faculty to be engaged in scholarly activity, many faculty must find their own resources to support these duties.

- Tracking of graduates and alumni, while expected by funding agencies, is extremely difficult and time consuming.

- The relationship between staff and faculty is not always collaborative.

Opportunities

- CSULB is located within one of our nation's most diverse cities.

- With the region's demographics any forward movement on immigration reform or the "Dream Act" will provide an additional pool of diversity to the CSULB campus.

- The CSU system consists of 23 campuses, with shared challenges and opportunities all of whom who have pursued their own strategies to address diversity. This presents ample opportunities to identify best practices and mine data from the largest university system in the nation.

- With its long tradition of commitment to its diverse student population and its ongoing successful programs, CSULB has a compelling story to present.

- Given the regional and university demographics and CSULB's ongoing activity and commitment to diversity oriented programs, we can be held as a Model Institution.

- CSULB provides an ideal environment for, and historic commitment to, the development of first generation-educated UR research scientists. Although we have a strong historic track record of serving UR students through diversity training grants, we have not yet fully integrated the breadth of programs developed to promote educational excellence among diverse, underrepresented populations.

- We have developed several collaborative relationships demonstrating the strong commitment of a national network of experienced NIH-funded mentors, near and far, so support graduate, and in particular, Ph.D. level education for CSULB alumni.

- CSULB's central location, historical commitment to diversity, and emerging status in research make it a central partner, working with the regions many nationally known Ph.D. granting institutions.

- Within CSULB, four colleges train students who will pursue biomedical or behavioral careers, providing opportunities for interdisciplinary interactions and shared resources.

- With major world-class convention facilities in Long Beach, Los Angeles, and Anaheim, CSULB has the opportunity to extend its leadership role by bringing national conferences to the region.

Threats

- While individualized mentored research experiences are key to the development of future biomedical and behavioral research scientists, politicians and legislative leaders prioritize an economics-of-scale in educational experiences. It is critical to educate political leaders about the importance of individualized mentored research experiences in achieving the public benefit of a high tech economy.

- The CSU system was structured as a teaching rather than research focused enterprise, resulting in limited research infrastructure and faculty time allotment for research. For example, full-time research scientists to oversee community-based or laboratory teams are not part of the system and must be grant-funded, leading to a loss of institutional memory as grant projects end. Moreover, the needed equipment and laboratory facilities to enable research are not always in place or maintained by state funding.

- The space allocation formula of the CSU system does not facilitate development of research space for both faculty and undergraduate researchers resulting in infrastructure limitations that inhibit the ability to enable students to engage in directed and independent research experiences and mentorship.

- First generation-educated Latino, African American, and Native American students have been, and continue to be, gravely underrepresented in the biomedical and behavioral disciplines, in the CSU system and across the nation.

- The higher education political and funding structure results in students being viewed as customers purchasing degrees rather than as individuals vested in the enrichment of a particular field of study, as well as the university as a whole.

"I think from an institutional level, if there were more of a mindset that we're making an investment in these students. Not just [viewing] students as paying tuition into the system, but more like the school is helping us because we are going to make this school look good when we go out into the world." (first generation educated student)

- Socio-cultural barriers relevant to URS persistence include a lack of family support for chosen scientific career paths. Financially disadvantaged students often struggle to help support their families, and in so doing, often jeopardize their academic success. Family commitments, such as providing child care to siblings and fulfilling other responsibilities, often act as barriers that inhibit students' full engagement in behavioral and biomedical research careers.

- URS experience unsupportive and discriminatory campus climates that provoke a lack of congruence between their cultural identities and campus science learning environments. Micro-aggression, defined as an automatic or unconscious verbal or nonverbal subtle insults directed at people of color, has been found to have a negative impact on campus racial/ethnic climate and the career paths of URS.

- In a climate where faculty members' time must be "billed" in a cost-benefit accounting system, there is little room for "inefficient" activities, such as individualized mentoring of first generation students who feel isolated and lack confidence in knowing how to successfully navigate academic and scientific research environments. From the faculty perspective, such mentoring is also not generally recognized as being of value when promotion and tenure decisions are made, when grant applications are reviewed, or when institutional resources are allocated.

- Self-segregation by ethnicity or politics has been increasingly noted in the U.S. It will be important as programs develop to emphasize commonality of interests and goals over forcing integration to diversify.

AHORA
Alliance for Health Opportunities Research Advancement

N C L R ▲ C S U L B
CENTER FOR LATINO
COMMUNITY HEALTH,
Evaluation & Leadership Training