San Diego State University
Department of Chemistry and Biochemistry
Diversity and Inclusion Plan
Approved by department December 1, 2021

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Assessment of Student Success

Undergraduate admissions: In Fall 2020, a single Native American student represented 0.2% of students admitted to the SDSU undergraduate chemistry & biochemistry programs, identical to Native American representation in university-wide admissions, which in itself is too low (**Fig. 1**). Further, the number of Native Americans admitted in chemistry and biochemistry has declined since 2016 by 75%, compared with a 15% decrease university-wide for that ethnic group. With fewer than 5 Native American students in the program at any given time since 2016, statistical analysis is not meaningful, but we acknowledge that the low numbers reflect genuine equity gaps. The department will address these gaps with active recruitment and targeted outreach activities. Notably, the representation of African American students admitted to the chemistry and biochemistry programs was 4.2% in Fall 2020, an increase by 63% since 2016 (which is twice the institutional rate of increase for that ethnic group), indicating that the department is successful at recruiting African American students to its undergraduate programs.
Data source: SDSU Admissions Dashboard.

SDSU undergraduate admissions into Chemistry majors (2016-2020)*

	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020	Fall 2020 (%)	SDSU-wide Fall 2020 (%)
Asian	140	141	164	157	164	26.6%	15.0%
Pacific Islander, Native Hawaiian	0	1	1	2	0	0.0%	0.2%
Filipino	47	41	49	38	37	6.0%	4.1%
Multiple Ethnicities	29	45	40	46	48	7.8%	7.1%
White	169	172	218	184	153	24.8%	35.4%
Other, Not Stated	24	18	12	12	11	1.8%	2.8%
International	23	33	47	26	22	3.6%	4.0%
Total	432	451	531	465	435	70.5%	68.6%
Native American	4	0	2	1	1	0.2%	0.2%
African American	16	22	33	38	26	4.2%	3.9%
Hispanic, Latino	165	166	198	150	155	25.1%	27.2%
Total	185	188	233	189	182	29.5%	31.4%
	617	639	764	654	617	100.0%	100.0%

*Source: SDSU Admissions Dashboard

SDSU Chemistry & Biochemistry graduate admissions by ethnicity*

		Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020	Fall 2020 (%)	SDSU-wide Fall 2020 (%)	National Chem MS degree holders (2018)
Not URM (CO)	Asian	5	6	2	3	1	3%	7%	
	Pacific Islander, Native Hawaiian	0	0	0	0	0	0%	0%	
	Filipino	2	0	1	0	0	0%	3%	
	Multiple Ethnicities	1	2	1	0	0	0%	5%	
	White	10	5	8	13	7	24%	36%	
	Other, Not Stated	2	0	4	2	1	3%	4%	
	International	11	7	7	14	9	31%	14%	
	Total	31	20	23	32	18	62%	70%	
URM (CO)	Native American	0	2	0	0	0	0%	0%	0.2%
	African American	1	0	1	1	1	3%	4%	3.4%
	Hispanic, Latino	3	4	7	11	10	34%	26%	7.50%
	Total	4	6	8	12	11	38%	30%	
Grand Total		35	26	31	44	29	100%	100%	

*source: SDSU Admissions Dashboard. Note: this data does not include direct admissions to the JDP program (a few students)

Figure 1: SDSU undergraduate and graduate admissions in chemistry majors.

Graduate admissions: Admission of URM students into the SDSU chemistry graduate programs is comparable to or better than the SDSU-wide graduate admission rates of URMs, and comparable to the national data for MS degree holders in chemistry. However, admission of Native Americans is virtually absent.
Data source: SDSU Admissions Dashboard.

Degrees: The percentage of women students who earned a Bachelor's degree in Chemistry at SDSU increased from 33% in the 2015-2016 academic year to 62% in 2019-2020, and exceeded the 2018 national average of women holders of Chemistry Bachelor's degrees of 50% (**Fig. 2**). This is consistent with and probably a reflection of the department's successful efforts in reducing the gender gap among its faculty in recent years. A similar trend is seen in the MS and MA programs where 67% of SDSU Chemistry Master's degree earners at SDSU are women. However, a gender gap is clearly present at the doctoral level, with only 19% of SDSU Chemistry PhD earners in 2015-2020 being women, almost half the national rate. Also, women representation has declined from 40% in 2015 to 17% in 2020. This may be a result of gender imbalance in Chemistry JDP admissions in 2015 (SDSU admissions data by gender is not available at this time). Nonetheless, the department should look into ways to reduce this gender gap and aim to catch up with the national rate as a first step. Factors likely to contribute to the gender gap in our JDP include our small applicant pool and PhD student stipends before the national average.
Source: SDSU Degrees Dashboard and American Physical Society
https://www.aps.org/programs/education/statistics/womenmajors.cfm.

Students earning degrees in Chemistry/Biochemistry by gender*

	Undergraduate					Master's					Doctoral					All Graduate Students				
Year	Men	Men %	Women	Women %	Total	Men	Men %	Women	Women %	Total	Men	Men %	Women	Women %	Total	Men	Men %	Women	Women %	Total
2015-2016	34	67%	17	33%	51	9	53%	8	47%	17	3	60%	2	40%	5	12	55%	10	45%	22
2016-2017	37	55%	30	45%	67	8	40%	12	60%	20	4	80%	1	20%	5	12	48%	13	52%	25
2017-2018	31	51%	30	49%	61	4	50%	4	50%	8	4	80%	1	20%	5	8	62%	5	38%	13
2018-2019	28	40%	42	60%	70	6	55%	5	45%	11	5	100%	0	0%	5	11	69%	5	31%	16
2019-2020	38	38%	63	62%	101	2	33%	4	67%	6	5	83%	1	17%	6	7	58%	5	42%	12
total 2015-2020	168	48%	182	52%	350	29	47%	33	53%	62	21	81%	5	19%	26	50	57%	38	43%	88
National data in 2018**		50%		50%			54%		46%			60%		40%						
* source: SDSU Degrees Dashboard																				
** source: American Physical Society https://www.aps.org/programs/education/statistics/womenmajors.cfm																				

Figure 2: SDSU undergradaute and graduate chemistry & biochemistry degrees earned by gender.

Graduation rates for direct-admission students: The percentage of URM direct-admission Chemistry majors who graduate in 4 years or less has been on the rise since 2012, and consistent with the rise among non-URM Chemistry majors (**Fig. 3**). In 2016, 57% of URM SDSU Chemistry majors graduated in 4 years or less, compared with only 45% among all SDSU URM students. However, the 5-years-or-less graduation rate among URM students lagged behind that among non-URM students by ~7-17% since 2013. This is an equity gap that we should address. In 2015, 70.2% of URM direct-admission Chemistry majors graduated in 5 years or less, comparable with 68% among all SDSU URM students. Nonetheless, the department should look into why URM students lag behind non-URM peers once they stay longer than 4 years in the program. Is this due to a higher rate of switching majors among URM students for example, or are they usually part-time students? The yearly academic progress data for 2016-2019 show that there is no significant gap in GPA in years 1 and 2 between URM and non-URM chemistry majors (data not shown). There is a gap specifically for the 1-4 Native American students in the major (average GPA 2.2 and 2.33 for years 1 and 2, respectively, compared with 3.21 and 3.09 for all ethnic groups in the major). Again we need to recruit more Native American students to our majors and encourage their success. We did not find academic progress data for years 3 and 4. *Source: SDSU Degrees Dashboard*.

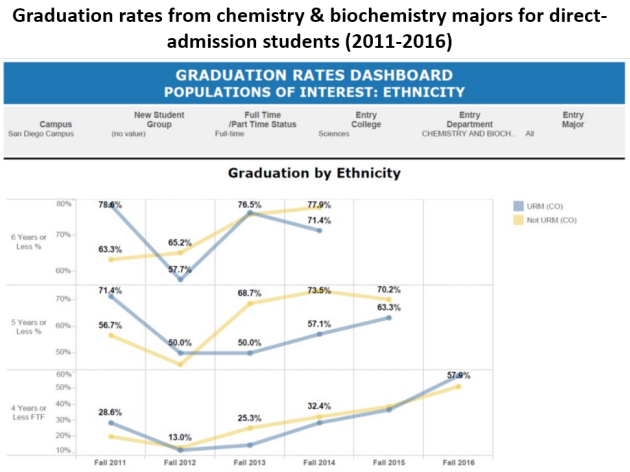

Figure 3: Graduation rates for direct-admission chemistry and biochemistry majors.

Graduation rates for transfer students: since 2015, there has been a general decline in the percentage of URM Chemistry transfer students who graduate in 2 years or less, compared with a general increase among non-URM transfer students (**Fig. 4**). This is an equity gap that the department should look into. Overall the percentage of URM transfer students graduating in 3 years or less (or 4 years or less) has been steadily rising since 2012 and this more or less mimics the trend for non-URM transfer students. So, no obvious equity gap there. *Source: SDSU Degrees Dashboard*.

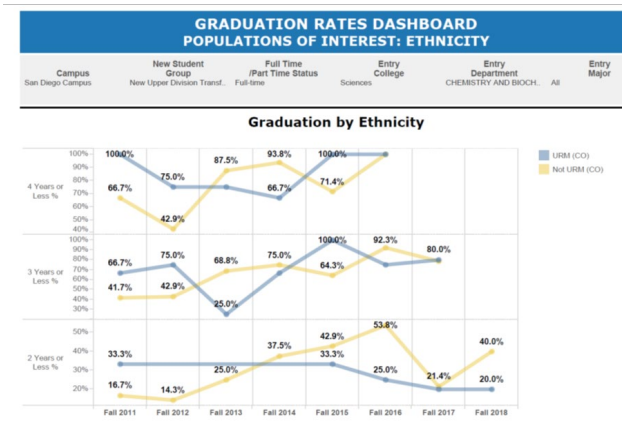

Figure 4: Graduation rates for SDSU transfer students majoring in chemistry.

DFW rates: The SDSU Analytics Studies data for 2016-2020 show that in both lower division and upper division courses, DFW rates have been consistently higher for URM students relative to non-URM students in those academic years (**Fig. 5**). This is an equity gap that the department should address. This gap is often bigger for chemistry courses than for the College of Science or university courses as a whole.

In courses where a minimum grade of C is required to advance to the next course in the major, URM students suffer a higher rate of DFW grades than non-URM students. These courses are CHEM 100, 200, 201, 232, and Math 150 and 151 (offered by the Mathematics Department). This is a gap in performance that the department should address. Three additional courses that are prerequisites to some upper division courses display a similar gap. These are CHEM 130, 410A and 520A. The grades during the Covid year are likely inflated and do not represent real performance, but it is notable that the gap in DFW rates persisted during the Covid year for most of these bottleneck courses. *Source: SDSU Course Outcomes Dashboard*.

Gap in % DFW between URM and non-URM students in lower and upper division courses in 2016-2020

Range of gap between URM and non-URM students	Chemistry majors	CoS	University
Lower division	4.2%-11.2%	3.9%-6.4%	2.3%-4.1%
Upper division	2.1%-7.1%*	2%-4%*	1.2%-3.5%*

* highest gap in URM vs. non-URM DFW rate was in Fall 2020 (Covid year)

% DFW in bottleneck chemistry courses

	2018-2019 ##		2019-2020		Fall 2020	
Course	URM	non-URM	URM	non-URM	URM	non-URM
CHEM 100 $	33.1%	21.9%	28.2%	13.8%	15.0%	9.6%
CHEM 130	30.3%	15.3%	19.4%	1.3%	N/A	N/A
CHEM 200 **$	11.7%	6.5%	7.3%	4.9%	19.0%	10.6%
CHEM 201 $	7.8%	3.0%	8.6%	3.1%	10.5%	7.5%
CHEM 232 $	27.0%	17.8%	26.7%	16.9%	18.8%	15.3%
CHEM 410A	23.5%	11.8%	17.4%	6.5%	0.0%	0.0%
CHEM 520A	50.0%	13.5%	22.2%	21.2%	0.0%	8.3%
Math 150 $	35.0%	25.5%	31.6%	26.5%	29.3%	16.1%
Math 151 $	38.5%	34.0%	38.0%	33.1%	64.1%	46.4%

** 33% of students in the course are URM students, 27% are Pell Grant recipients, 2.1% are chemistry majors. Higher W rates due to online labs.

$ C grade or better is required to advance to the next course.

2018-2019 data are most reliable (before Covid19)

Figure 5: Recent DFW rates among URM and non-URM SDSU chemistry students.

Curriculum Review

A review of the Chemistry curriculum revealed DEI practices in ~ 24% of the courses, and these courses and practices are listed below.

Course	Course description	DEI-related content/practices currently in the course
CHEM 232 Organic Chemistry	A first semester rigorous organic chemistry class.	The class is lectured live in person, but also simultaneously live streamed with the recordings posted. This accommodates students that may have a long commute, e.g. cross-border students. Key contributions from underrepresented scientists are emphasized (i.e. Francis Kelsey and thalidomide, Maude Menten and kinetics, Rosalind Franklin and DNA, Carolyn Bertozzi and Chemical Biology, Luis Miramontes and northindrone).
Chem 300 Forensic Science	A general education class that uses examples from forensics/criminalistics to interest non-majors in science.	The course includes extensive reading assignments and discussions about cases in the news to highlight racial disparities in justice for people of color, examples for each chapter topic (fingerprinting, arson, drugs, etc) that illustrate how mistakes are made by not being willing to consider errors or by rushing to judgement, and how it affects POC because of institutional racism and income differences.

CHEM 362: Confronting Cancer	A general education course on understanding the complexities of cancer from a scientific, political, community, and personal perspective.	Contributions to cancer research by scientists from historically minoritized/excluded groups are featured. Students are provided with reflections to explore their identities, to foster a sense of belonging in science, and find personal relevance to the material we cover. Students read and discuss Rebecca Skloot's "The Immortal Life of Henrietta Lacks." I include syllabus language that explicitly lays out my commitment to DEI principles in the classroom and provides some flexibility to facilitate student success in terms of retaking some material for a higher grade, some flexibility on late assignments, etc., and a welcome video that tries to foster inclusiveness and normalizes struggling in the classroom.
CHEM 365 Biochemistry, Cell and Molecular Biology I	Introduction to biochemistry, required for biology majors, describes a framework for studying and understanding biological systems at the molecular level.	The pioneering work of women scientists in the early days of the molecular biology revolution is featured, including X-ray crystallography experiments by Franklin and Hodgkin to resolve the structures of nucleic acids and proteins (and viruses!), and highly original methods by Chase to establish DNA (not protein) as the genetic material.
CHEM 560: General Biochemistry	Introduction to Biochemistry, offered twice a year to chemistry and biochemistry majors, sometimes taken by graduate students.	Examples of historical gender inequalities in the field have been incorporated in classroom discussions since 2016, e.g. award inequalities for Michaelis vs. Menten in enzyme kinetics; Crick/Watson vs. Franklin in DNA structure, among other examples. Topics and in-class discussions have been updated to relate to real life issues for students, e.g. the "antibodies/immunity" lecture includes an in-class discussion of vaccines and vaccine hesitancy, the "hemoglobin/sickle cell disease" lecture includes in-class discussion of health discrepancies faced by people of African descent. Class is taught in person, broadcast live and recorded, which accommodates cross-border and working students.
CHEM 563: Nucleic Acid Function and Protein Synthesis	A senior course taken by ~2/3 of biochem majors and some graduate students and focuses on the biochemistry of nucleic acids and protein synthesis, from structure to function to mechanisms.	Women scientists in the field are discussed in depth: Rosalind Franklin's data and important role in deciphering DNA structure are discussed in detail and emphasized, as well as her career story and highlights from her life in England's 1940's male dominated society (and discussing the BBC documentary In Search of the Double Helix about her life and science is a recommended bonus assignment). In the protein synthesis module (30% of course material), Nobel Laureate Ava Yonath's contributions to understanding the biochemistry and structure of the ribosome are emphasized, and a lecture is dedicated to discussing her work on ribosome-targetting antibiotics. Class is taught in person, broadcast live and recorded, which accommodates cross-border and working students.
CHEM 567: Biochemistry Laboratory	A lab techniques class, focusing on protocols useful to those seeking employment in biotech	During the tissue culture lectures we touch on the ethics of using genetic material without permission (Henrietta Lacks).

CHEM 596: Advanced Special Topics in Chemistry / Advanced Nucleic Acid Biochemistry	Senior undergraduate course offered once a year taken by biochem majors and graduate students and covers advanced topic in nucleic acid biochemistry and nucleic acid-based technologies related to human health and disease.	This recently developed course (since 2019) underwent several improvements in Fall 2020 and Fall 2021 to include the learning objective "To celebrate the women scientists behind the 21st century's most important discoveries in nucleic acid biochemistry." Assignments include required discussion of a documentary film on the CRISPR/Cas genetic engineering technology and the women biochemists behind it (Nobel Prize winners Doudna and Charpentier); required reading and discussion of the career story and research of US immigrant Katalin Koriko whose overlooked discoveries enabled development of the mRNA vaccines. Another assignment is a discussion of the bioethics and future implications of gene editing in humans and its possible uses in addressing healthcare discrepancies. The biochemistry of genetic vaccines includes an historical introduction to variolation practices in ancient China and West Africa, and the role of African slaves in bringing vaccine awarenesss to Bostonians during the 1700's smallpox outbreaks.
CHEM 695: Graduate Education in Chemistry	Introduction to graduate school.	One course session is focused specifically on issues related to implicit bias and microaggression that ties into broader discussions of DEI issues in chemistry including highlighting recent areas of progress in relation to issues of insensitivity/colorblindness.
CHEM 765: Molecular Mechanisms of Disease	Graduate level course looking at the chemistry, biochemistry, cell biology, business, and ethics of cancer and HIV and their treatments.	Contributions to cancer research by scientists from historically minoritized/excluded groups are featured. Students are provided with reflections to explore their identifies as scientists, to foster a sense of belonging in science, and find personal relevance to the material we cover. I have just introduced a new section where we have a dedicated lecture on the drug BiDil, a modern-day example of the racialization of medicine in which to extend patent life, a heart failure drug underwent clinical trials and marketing as a drug only for African Americans. We combat the problems of this by exploring the poor science involved and take on an anti-racist stance to explore the ethics that failed. I include syllabus language that explicitly lays out my commitment to DEI principles in the classroom and provides some flexibility to facilitate student success in terms of retaking some material for a higher grade, some flexibility on late assignments, etc., and a welcome video that tries to foster inclusiveness and normalizes struggling in the classroom.
CHEM 781: Scientific Approaches to Teaching & Learning	Graduate level course providing an introduction to the STEM education research literature with an emphasis on implications for classroom practice.	New course in which a discussion of DEI research in STEM education is incorporated.

Planned Curricular Changes

1. *New GE course for CoS majors:* Following the teach-ins inspired by the murder of George Floyd, the Department of Chemistry and Biochemistry began to develop a prospectus for a course on the intersection of racism with both the institution and the practice of science, as we were unable to find any course on this subject in SDSU's General Catalog. The goal of such a course would not only be to review the unhappy history of racism in science, but to address the role science can play in dismantling racism, as well as the roles that our students and faculty can play in dismantling the racism within the institution of science.

At the end of summer 2020 we brought this prospectus to the attention of Norah Shultz, in her capacity as Director of Inclusive Education at the Division of Student Affairs and Campus Diversity. She proposed splitting the course into one upper division and one lower division course, which would widen the opportunities for students in the College of Sciences (COS) to learn about the historical and contemporary relationships between science and racism. Prof. Schultz then arranged a meeting with faculty of the College of Arts and Letters (CAL), including Catherine Clune-Taylor, Director of the fledgling Science and Technology in Society Studies (STSS) program. Prof. Clune-Taylor identified points of overlap between the proposed upper division course and an existing STSS course (WMNST 382, which we did not find on our first look because it is offered through the department Women's Studies). The lower division course was submitted to CurricuNet as a new GE course, but was later withdrawn over concerns that the framework for a collaboration between the two Colleges should be established first, given the large number of students to be affected and the desire of both colleges to participate in the syllabus development and instruction. We are optimistic that this framework will be developed and we look forward to the offering of that course.

While this work has not been specifically related to the chemistry curriculum, we believe that it will spur the creation of a more inclusive curriculum for all science majors. Prof. Clune-Taylor was a guest at one of our department meetings, to ensure that all our faculty are more aware of the relevant expertise that already exists on campus. Her departure for a position at Princeton may set this collaboration back somewhat, but we look forward to the department's continued participation in this effort. A partnership between COS and the STSS program will be a cornerstone of inclusive education in the sciences, and our department has been instrumental in opening this dialog.

Once this course is established, the degree programs will be adapted to require the course except with permission of the undergraduate advisor. This intervention seeks to increase the sense of belonging among our students from groups underrepresented in science. The course will satisfy one of the GE requirements for students in the sciences.

2. Changes in curriculum content and assessments: Chemistry faculty will incorporate *two or more* of the curricular changes listed below. The format for introducing these topics will be the instructor's choice and may be in the form of lecture content, reading assignments, surveys, discussions, classroom group activities, etc.

i) Overview of the relevant area of chemistry in the context of equity, inclusion, diversity and disparities. Example topics: contributions from scientists who are from underrepresented groups in chemistry, such as Native American, Latinx, African American, and women; history of the HeLa cell line; chemical knowledge and concepts in indigenous cultures; the development of modern science in the medieval Islamic world; the impact of segregation in the US on the scientific community.

ii) Assignment of students to attend webinars on diversity presented by the American Chemical Society (https://www.acs.org/content/acs/en/about/diversity/acs-webinars-diversity.html). Topics include microaggressions, inclusive environments in chemical education, and graduate student mental health.

iii) Reading Assignments. Selected readings focus on inequities and solutions as manifest in industry and academia in chemistry and closely aligned fields. The ACS maintains a list of editorials and articles from their own journals and news publications at https://axial.acs.org/2020/09/17/editorials-and-issues-on-diversity-and-inclusion-from-acs-publications/. Short quizzes based on a reading assignment may be included.

iv) Writing Assignments. Short essays or reflections will be assigned, typically based on reading assignments or webinars. As an alternative, students may be asked to reflect on the impact of diversity (or lack thereof) of speakers at our weekly department seminars.

v) In-class student discussions on equity, inclusion, diversity and disparities. Students will discuss aspects of diversity in chemistry and the need to and ways to promote inclusivity and diversity. This activity can be coupled with reading assignments that precede the discussion sessions or with faculty or graduate students providing a short introduction to initiate the conversation.

vi) Mindset GPS implementation. Faculty will include the elements of GPS (Growth, Purpose, Social) into the curriculum, syllabus, and/or classroom policy. This might include exam wrappers, resubmissions for regrading, reflections that allow students to discuss their identity as scientists or how the material directly impacts their lives, discussion of the communal and prosocial values of science, language and policy that emphasizes mechanisms for growth and skill development and normalizes struggling, mistakes, and seeking help.

vii) Student-generated action items. These are discussion groups where students identify specific changes that will foster a climate of inclusivity and promote diversity in Chemistry at SDSU and in the community at large. For example, students could be asked to design specific recommendations to first-time instructors in large classes.

viii) Course Size Optimization plans. The Chemistry Department received a grant to develop and pilot test smaller sections of our key service courses: Chem 100, Chem 200/202, and Chem 232. These smaller sections are being designed specifically to improve the sense of community and mutual support among students in each of these courses. Use of free or low-cost instructional materials and increased personal attention are expected to improve participation, self-confidence, and retention of students from historically underrepresented groups.

3. ***Informing faculty and fostering a climate promoting equity and inclusivity.*** (Actively implementing this will also serve to address the new policy (SDSU) of soliciting student feedback on "whether the instructor created an inclusive learning environment where diverse students, particularly those from marginalized communities, were supported and welcomed"): All Chemistry faculty will be asked to read a current report on the current diversity of chemists in the workforce, such as the ACS report https://cen.acs.org/education/Racial-ethnic-diversity-US-chemistry/98/i43. This will be paired with selected readings on strategies to ensure a welcoming and inclusive classroom. Sources for readings include citations in Intervention 4 below and an upcoming special issue of the *Journal of Chemical Education* (https://pubs-acs-org.libproxy.sdsu.edu/doi/10.1021/acs.jchemed.0c01300). An alternative to the readings is an ACS webinar on inclusive and chemistry-specific classroom practices at https://www.acs.org/content/acs/en/acs-webinars/popular-chemistry/resilient-future.html.

4. ***Inclusion of equity/inclusion/diversity issues and contributions among the student learning outcomes in the syllabus in all Chemistry lecture courses.*** The CoS 'Diversity, Equity and Inclusion' plans require this by the beginning of the Fall 2022 semester. The curricular changes that are listed above can provide the basis for crafting the appropriate student learning outcome for each Chemistry course.

Planned Strategies and Interventions

Please see Table 1 for a summary of goals, interventions, and implementation plans. Please see Table 2 for a draft implementation timeline.

Goal area A: Establish a climate and curriculum that emphasizes the role of diversity, equity and inclusion with respect to race and gender.

Intervention 1: We will increase inclusion in student learning experiences in large freshman courses in General Chemistry. In these courses, outsourced online homework platforms are a major part of students' learning experiences. We will work with platforms from companies committed to inclusion and diversity, e.g. Cengage who updated their homework platforms to include a diverse representation of scientists and inclusion-focused assignments. Open-source textbooks. Although we now use open-source textbooks for some of our courses (Chem 200/201 and Chem 251), we additionally propose this for other courses like Chem 100 (which can also use a cheaper text from Cengage), Chem 130 and/or Chem 232. We will gather information about textbook costs for all chemistry courses, and engage the faculty in serious conversations about textbook costs for our students, especially freshmen students, and about students' financial struggles, especially URM students. The Chemistry department is also the recipient of a $160,000 Course Size Optimization grant, which we are using to develop reduced-size sections for the key service courses Chem 200, 201, 202, and 232. These optimization plans will capitalize on the disproportionately beneficial impact of smaller section sizes on URM students.

Resources needed: Time to identify open-source textbooks and to modify courses accordingly; *ongoing funds to support additional instructional staff to maintain these smaller sections*.

Responsibility: Curriculum Committee and chemistry faculty, e.g. Chem 100 instructors and coordinators.

Assessment: Syllabi of more chemistry courses showing transition to open-source textbooks.

Intervention 2: To address gaps in performance (e.g. in DFW rates) in lower division Chemistry courses between URM and non-URM students, we will collect data on freshman preparedness and learning experiences in these courses to identify obstacles to performance for URM students. We need to know our students in these large classes and identify populations facing disproportionate challenges in their education and access to learning opportunities such as TA office hours and Supplemental Instruction. This is a challenge in large classes (>100 students) and will require additional resources to gather information about students' preparedness and educational backgrounds in an efficient manner while upholding HIPPA requirements.

Resources needed: Analytics staff time and/or release time for a chemistry faculty member to lead this effort, help from science education faculty over several semesters, and training in surveys and related software.

Responsibility: Department Chair in consultation with Dean's office Resource Manager.

Assessment: Report to the department diversity liaison.

Intervention 3: Increase flexibility in course delivery modes, e.g. online versus in person, flipped classroom, hybrid mode, where it can be shown that this will not reduce efficacy of instruction. This will help decrease the time-to-graduation for URM students who work part-time or full-time jobs to support themselves and their families. This effort should also involve deep and routine discussions among the faculty and teaching staff of student learning styles and lingering concerns about cheating versus learning through alternative methods.

Resources needed: Training through the SDSU Course Design Institute and release time for some faculty to redesign courses and/or sections of large courses to alternative modalities.

Responsibility: Department Curriculum Committee will review and approve any permanent changes in course modality.

Assessment: Syllabi showing flexible course delivery modes for 2 lower division courses and 2 upper division courses published on the department website starting Spring 2023 semester.

Intervention 4: Actively introduce effective anti-racist strategies and motivational interventions in chemistry courses, including learning objectives that interrogate biases in the discipline and support an anti-racist classroom, and diversity and inclusion syllabus statements that illustrate at least one thing the instructor will do to create an anti-racist classroom. Examples: introducing historical contexts (related to course topics) that our diverse students can identify with, emphasizing diverse practitioners and scholars in chemistry, assignments asking students to write about the relevance of course concepts to their own lives, etc. We aim for 5-10 courses improved in this fashion per semester starting Fall 2023 which would get most chemistry courses updated in 3 semesters.

Resources needed: Specific training from DEI on how to effectively incorporate these strategies into our courses. References are available, but these changes can also be mishandled, and many faculty will need guidance. Time for faculty to be trained, to design, and to implement these improvements in course syllabi. References include: https://www.brown.edu/sheridan/teaching-learning-resources/inclusive-teaching/effective-teaching-anti-racist-teaching and https://www.brown.edu/sheridan/sites/sheridan/files/docs/Motivational%20Interventions%20%281%29.pdf

Responsibility: The department diversity liaison.

Assessment: Updated course syllabi to the department diversity liaison by Fall 2023, increasing in each subsequent semester.

Intervention 5: As shown in Figure 2, only 19% of students graduating from our PhD program in the last 5 years were women. This is less than half the national rate of 40%, and has been on the decline. This is largely due to a lower rate of admission and, to some extent, retention of women PhD candidates. The department will increase its efforts to recruit women applicants to our PhD program through the following general and targeted recruitment strategies: Hire more women faculty (to become one, you need to see one), develop a recruitment video featuring women faculty and PhD alumni, clearly state commitment to diversity and inclusion on the department website, participate annually in the networking events of the SDSU Women in Science Society, similar societies at other CSU campuses, the national, regional and local chapters of the American Women in Science (AWIS) organization and tap into their expertise and networks, advertise our JDP program at Gordon Research Conference Power Hours, CSUPERB annual meetings, and provide speakers from among the chemistry women faculty and graduate students to speak at these events, present their research and promote the JDP program. We will also invite more women speakers to the department seminar series and work with the chemistry graduate

student club to help promote these activities. We note that a chemistry faculty member (Erica Forsberg) was instrumental in drafting and establishing SDSU's existing policy to accommodate pregnant graduate students.

Resources needed: Release time for a faculty member to take on recruitment activities, and funds to cover travel costs to recruitment events.

Responsibility: The department Graduate Committee.

Assessment: Annual report to the department chair documenting graduate recruitment activities and results.

Intervention 6: Increase the number of Native American students in chemistry undergraduate programs through the following targeted recruitment activities: i) work with the SDSU Tribal Liaison to arrange annual trips to local Native American reservations (e.g. Viejas Indians in Temecula, San Pasqual Kumeyaay) and high schools serving their communities to build a relationship of trust, speak about careers in chemistry and encourage applications to our chemistry programs. ii) advertise our programs to indigenous students in local community colleges and high schools and host targeted information sessions on campus or on Zoom. iii) participate in the SDSU Native American Student Alliance events and the Annual Youth Empowerment Conference held at SDSU to motivate Native American youth to embrace chemistry careers, and in the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) conferences.

We will also increase efforts to recruit more African American students to our undergraduate and graduate programs by i) participating in annual career days at local high schools and community colleges, ii) working with the SDSU Black Resource Center, SASC and the EOP program to organize or participate in outreach events, iii) sending a recruitment liaison to speak and host a recruitment session/table at the Annual Biomedical Research Conference for Minority Students (ABRCMS) conference, and iv) providing scholarship opportunities (the department has already set up the Joi Weeks scholarship dedicated to African American students).

Resources needed: Release time for a faculty member to take on recruitment activities, and funds to cover travel costs to recruitment events.

Responsibility: Departmental External Affairs Committee.

Assessment: Monitor the number of Native American and African American students in chemistry majors, and annual report to the department chair and Graduate Committee detailing recruitment activities and outcomes.

Intervention 7: Improve inclusive competencies and practices of staff by encouraging and rewarding training in diversity, e.g. implicit bias and microaggressions training. These are already beginning with requirements for service on search committees.

Resources needed: Faculty incentives: supplemental pay, release time, small research grants.

Responsibility: Department chair and administrative coordinator.

Assessment: Department administrative coordinator will maintain records on trainings and workshops completed.

Goal area B: Recruiting diverse faculty and staff.

1) Use Building on Inclusive Excellence (BIE) Criteria. Beginning Fall 2021, the department of Chemistry and Biochemistry will ensure that finalists for faculty positions meet at least three of the BIE criteria.

Resources needed: Not applicable; this is part of the role of search committee members.

Responsibility: The chair of the search committee will be responsible for including the BIE criteria in the job advertisement. The search chair will also be responsible for submitting the BIE Finalist Candidate form as soon as finalists are selected.

Assessment: The BIE review committee will not approve any candidates who do not meet at least three of the BIE criteria.

2) Require Inclusion Representative on faculty and staff search committees. Beginning with searches in AY 2021-2022, all faculty search committees must have a certified Inclusion Representative (IR). If outside the subject area, the IR serves as a non-voting member.

Resources needed: Not applicable; this program is funded by the Chief Diversity Officer.

Responsibility: The search committee chair will recruit an approved Inclusion Representative.

Assessment: The department will submit a report after each search to the College Diversity Council detailing the implementation of this intervention.

3) Require implicit bias training. Beginning with searches in AY 2022-2023, the department of Chemistry and Biochemistry will only approve search committee members who have participated in one of the University's Equity-Minded Hiring seminars within the last two years.

Resources needed: This program is funded by the Chief Diversity Officer. Committee members will need to invest two-three hours to complete the basic training.

Responsibility: The search committee chair is responsible for confirming that all members have participated in the training prior to beginning review of applications.

Assessment: The department will submit an annual report to the College Diversity Council detailing implementation of this intervention.

4) Improve candidate pool proportionality. Beginning with searches in AY 2021-2022, in cases where pool proportionality is not reflective of terminal degree holders within the field, the department of Chemistry and Biochemistry will require the search committee to specify actions that have been taken to ensure a representative pool. Documentation of these actions will be provided to the College Diversity Council. Actions include advertising in venues targeting underrepresented groups, such as NOBCChE, SACNAS, and the HBCU Network. We hope that the applicant pool for each search will help refine our strategies to improve diversity in the pool for the next search.

Resources needed: Committee chairs may need training to interpret the data and understand appropriate actions to increase pool proportionality.

Responsibility: The search committee chair is responsible for submitting the pool proportionality form, and any required documentation, to the Office of Faculty and Staff Diversity. The department chair will monitor effective strategies to maintain for subsequent searches.

Assessment: The department will submit a report after each search to the College Diversity Council detailing implementation of this intervention.

Accountability

Table 1. List of goals and interventions.

academic year	***goal area***	***intervention***	***responsibility***
21-22 22-23	A. climate & curriculum	1. Inclusion in general chemistry. Open-source and other low-cost resources	Curric. Comm. & gen chem faculty
22-23 23-24 24-25		2. Analytics to determine barriers to URM; actions to address identified sources of inequity	dept chair
22-23		3. Increase flexible course offerings	Curric. Comm.
24-25		4. Begin anti-racist strategies in courses	Diversity Liaison
23-24		5. Begin recruit women grad students	Grad. Comm.
24-25		6. Begin recruit Native American undergrads	External Affairs
21-22		7. Inclusive competencies training	dept chair
21-22	B. diversify faculty & staff	1. Three BIE criteria for faculty hires	search comm. IR
21-22		2. IR in all search committees	DEI
22-23		3. Bias training for search committee members	search comm chair
21-22 22-23 23-24		4. Increase applicant pool diversity; ongoing analysis of effective recruitment strategies	search comm chair, dept chair

Table 2. Implementation timeline.

academic year	***intervention***	***responsibility***
21-22	A1. Inclusion in general chemistry. Open-source and other low-cost resources	Curric. Comm. & gen chem faculty
21-22	A7. Inclusive competencies training	dept chair
21-22	B1. Three BIE criteria for faculty hires	search comm. IR
21-22	B2. IR in all search committees	DEI
21-22	B4. Increase applicant pool diversity; ongoing analysis of effective recruitment strategies	search comm chair, dept chair
22-23	A1. Expand courses and affordable components.	Curric. Comm. & gen chem faculty
22-23	A2. Analytics to determine barriers to URM; actions to address identified sources of inequity	dept chair
22-23	A3. Increase flexible course offerings	Curric. Comm.
22-23	B3. Bias training for search committee members	search comm chair
22-23	B4. More analysis; refine strategies.	search comm chair, dept chair
23-24	A2. More analytics; propose strategies	dept chair
23-24	A5. Begin recruit women grad students	Grad. Comm.
23-24	B4. More analysis; refine strategies.	search comm chair, dept chair
24-25	A2. More analytics; implement strategies.	dept chair
24-25	A4. Begin anti-racist strategies in courses	Diversity Liaison
24-25	A6. Begin recruit Native American undergrads	External Affairs