Comprehensive Program Review
Department of Chemistry
Georgia State University
May 2021

The following programs are critical to the institutional mission and thus MEET the institution's criteria for retention.

The Department of Chemistry offers a B.S. in Chemistry. In addition to the traditional chemistry major, the Department also offers an ACS certified degree as well as premedical and biochemistry concentrations. All our degree programs follow standards set by the ACS. The number of declared majors in Chemistry was 587 in fall 2016, 528 in 2017, and 507 in 2018. Over the same three-year period, 71 B.S. degrees were conferred in 2016, 84 in 2017, and 90 in 2018. Also, the undergraduate program has seen a dramatic increase in the number of credit hours taught over the last three years. As detailed in action steps 2a, 2b, and 2c above, the Department plans to continue excellence in undergraduate teaching and research and improve graduation and retention rates of Chemistry majors by developing major-specific cohorts in introductory Chemistry courses, developing clear curricular paths for students who wish to obtain ACS certification, and continuing to develop research opportunities for undergraduate students.

The Department of Chemistry offers an M.S. in chemistry with possible specialization in analytical chemistry, biochemistry, physical chemistry, organic/medicinal chemistry, or computational chemistry. The program awards thesis and non-thesis M.S. in Chemistry. The Department also offers a 4 +1 Program (Dual Degree Program) that provides Chemistry students with the unique opportunity to enroll in graduate level courses while they are undergraduates. The number of M.S. students in Chemistry was 70 in fall 2016, 62 in 2017, and 61 in 2018. Over the same three-year period, 29 M.S. degrees were conferred in 2016, 39 in 2017, and 39 in 2018. As detailed in action steps la, 1e, and 1h, the department will seek to be more selective in M.S. admissions and reduce reliance on master's students for teaching, enabling them to progress efficiently through their programs. The department will ensure the continuous improvement of the master's program by re-examining curriculum, learning outcomes, and research training programs.

The Department of Chemistry offers a Ph.D. in chemistry with concentration in the following core disciplines: analytical chemistry, biochemistry, biophysical chemistry, chemical education, organic/medicinal chemistry, geochemistry, and nutritional sciences. A bioinformatics option is available in each of the core disciplines. The Department of Chemistry collaborates with the Department of Geology and the Department of Nutrition in the Byrdine F. Lewis College of Nursing and Health Professions to offer Ph.D. degrees in chemistry with concentrations in geochemistry and nutrition, respectively. The Ph.D. program is designed to provide its graduates with the ability to approach fundamental scientific questions from both biological and chemical perspective. The number of Ph.D. students in Chemistry was 97 in fall 2016, 104 in 2017, and 101 in 2018. Over the same three-year period, 12 Ph.D. degrees were conferred in 2016, 13 in 2017, and 18 in 2018. As detailed in action steps la-i, the Department seeks to provide doctoral students with additional teaching opportunities to enhance their career preparation and increase their stipends. The department will ensure the continuous improvement of the doctoral program by re-examining curriculum, learning outcomes, and research training programs.

Provost/VPAA Signature and Date _____

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Provost/VPAA's Designee Signature and Date  5/13/21

Appendix
2020 Action Plan
Department of Chemistry
Georgia State University

Status of Action Items from Prior Review

The Department has been accredited by the American Chemical Society (ACS) since 1971 and continues to offer programs that follow standards set by the ACS. The Department has made significant progress since the last documented academic program review, which occurred during the 2005-2006 cycle. Since then:

- External funding was approximately $8.2 million in FY 2020, compared to approximately $4.4 million in FY 2005.
- The total number of full-time faculty in fall 2019 was 46 (24 tenure-track and 22 non tenure-track), compared to 24 (18 tenure-track and 6 non tenure-track) in 2005.
- The total number of chemistry undergraduate majors, masters, and doctoral students in fall 2019 was 477, 67, and 80, respectively, compared to 266, 26, and 56 in fall2005.
- Finally, the total number of credit hours generated in AY 2019-2020 was approximately 37,769, compared to 21,449 in AY 2005-2006.

As a result, The Department has emerged as one of theleading departments in teaching and research at Georgia State.

Major Findings in Current Review

The major findings in will allow the department to assume an even more prominent role in suppo1t of the strategic plans of the College and University. The most significant and actionable findings are enumerated below.

1. Graduate Programs: The external reviewers and the self-study conclude that the department needs a strong Ph.D. program to stay competitive and thrive as a department within a research-intensive university. The heavy reliance on M.S. students as teaching assistants impeded growth of the PhD program. Consequently, Ph.D. students gain limited teaching experience during their program or they extend their time to degree to gain additional experience. The Ph.D. base stipend of$23K/year is one of the lowest in the Southeastern United States with some students receiving more than others due to supplements from other sources by the advisors. The external reviewers also commented that while targeted admissions of Ph.D. students into specific research groups are efficient in populating research labs, they risk leaving students unhappy, since some students may not know exactly what area of research to pursue before entering graduate school and may need some time to decide. The reviewers recommended a comprehensive review of the graduate admissions process and graduate program requirements to improve morale and determine how best to balance the number of M.S. and Ph.D. students. Although not explicitly noted by reviewers, re-examining learning outcomes and training opportunities are another method of enhancing graduate programs.
2. Undergraduate Program: The external reviewers conclude that the undergraduate students are generally satisfied with the education they are receiving. The Department serves an exceptionally high number of students from underrepresented groups (about 70%). Students feel that the Department is good about encouraging them to pursue research. However, the six-year graduation rate for incoming freshman is between 45% and 60%, which concerned the external reviewers. A reason cited for this rate was that some students enroll with the intent of transferring to comparable programs at other universities after two years. The external reviewers

recommended making the undergraduate experience more cohesive in the early years to improve retention/graduation rates and continue providing substantive research experiences to as many undergraduate students to improve student learning.

3. Research and Visibility: The external reviewers conclude that the Department is reasonably well funded by external grants. The strong focus on research at the interface of chemistry and biology has allowed the Department to be competitive for biomedical grants. However, the external reviewers felt that the number of tenure-track faculty was relatively low compared to many higher ranked public RI institutions. More tenure track faculty would give the Department greater flexibility in responding to research opportunities. The external reviewers recommended identifying new areas for faculty hiring that can open doors to collaborations with other units at Georgia State and other institutions in the Atlanta area. The external reviewers indicated that the Department should develop promotional materials to highlight its interdisciplinary research at the interface between chemistry and biology, describing the Department's unique qualities, successes, and needs that can be used in recruiting and fund-raising.

Action Steps for the Coming Cycle

The Department of Chemistry educates a diverse group of students on how to solve challenging problems through effective teaching of the fundamental chemical principles and cutting-edge research by excellent, productive faculty; prepares students for national and global leadership roles in industry, academia, and government; aims to be a model for undergraduate and graduate education in the chemical sciences by embracing Georgia State's goal in becoming a leading public research university; and continues to improve the quality of teaching ru1d increase research productivity in the chemical and life sciences to ensure all of our students succeed. To continue this mission, the Department will undertake the following action steps to address the major findings of the academic program review.

1. Strengthen the graduate programs of the department and improve student morale:
   a. The Director and Associate Director of Graduate Studies will review the goals and curriculum of the M.S. and Ph.D. programs, including re-examining learning outcomes and assessment processes, to ensure the continuous improvement of our graduate programs. The Associate Director will also work with the Office of Institutional Effectiveness to make sure the assessment of SLOs is properly done and reported to guide future curricular and pedagogical changes. (Year I and ongoing)
   b. The Associate Director of Graduate Studies will lead the review of all aspect of the Ph.D. qualifying examination, including the use of the ACS standardized examinations, dissertation proposal length, and the format of the oral examination (Year I and Year· 2)
   c. The Associate Director of Graduate Studies will develop a standard grading rubric and evaluation form for the Ph.D. oral examination, annual committee meetings, and dissertation defense. (Year 1 and Year 2)
   d. The Associate Director of Graduate Studies will work with the head of each division (Organic, Biochemistry, etc) to evaluate course requirements for the doctoral program and to streamline core course requirements. (Year 1)
   e. The Director and Associate Director of Graduate Studies will review the need for the GRE in admitting students to the M.S. and Ph.D. degree programs and submit any resulting proposal(s) to the College for review. (Year 1 and Year 2)
   f. The Associate Director of Graduate Studies will develop a required Ph.D. course, in collaboration with other faculty, ensuring that all Ph.D. students give a public presentation to the Department prior to their final Ph.D. defense. This type of literature seminar is a mainstay of traditional chemistry Ph.D. programs. (Year 2 and Year 3)

g. The Chair will work with the graduate director and faculty to increase the base stipend of Ph.D. students annually from of$23K, which is the lowest in the Southeast, by funding fewer M.S. students (most likely non-thesis students) and increasing the teaching workload, which is also the lowest in the Southeast, of the Ph.D. students. This measure will be budget neutral. and will not only increase the quality of incoming Ph.D. students but will have positive downstream effects, such as attracting more domestic applicants, reducing the time to degree. improving graduation and retention rates, and enhancing the research enterprise and grant funding of the Deprulment and College. (Year 2 and ongoing)

h. In connection with the previous action step, the department will better enable master's students to progress efficiently through their programs by being more selective in M.S. admissions and reducing reliance on master's students for teaching. (Year 2 and ongoing)

ı. The Director of Graduate Studies will pilot a program to admit some Ph.D. students who ru·e not targeted for any particular research groups, and the students will be given two semesters to find research groups. The progress of these students will be monitored by the Director of Graduate Studies to assess the pros and cons of the current targeted admission system discussed above. (Year 2 and ongoing)

2. Continue excellence in undergraduate teaching and research and improve graduation and retention rates:
   a. The Associate Chair will work with the Undergraduate Director and College to explore establishing chemistry major only sections of lower division courses, specifically general (CHEM 1211/1212) and organic chemistry (CHEM 2100/2400/2410/3110), to make the undergraduate experience more cohesive in the early years and to improve retention and graduation rates. This move will be facilitated by moving some sections for non-majors to high quality fully online versions to accommodate enrollment demand, lessen the burden on instructional laboratory space, and meet ACS standards for majors. (Year 1 and ongoing)
   b. The Associate Chair will work with the curriculum committee to remove the senior research requirement for general chemistry majors. All students will have research oppo11unities and exposure in major coursework, but directed research will be required only for ACS certified majors and an elective for others, The Associate Chair will work concurrently with the curriculum committee to develop an alternate program path for all general chemistry majors. (Year 2 and ongoing)
   c. The Chair will identify departmental laboratory space in the Natural Science Center and the Petit Science Center to be shared by non-tenure track faculty to mentor undergraduate students in research, providing substantive research experiences to as many undergraduate students as possible. Flexible use of existing laboratory space will be made by optimizing use of facilities, such as instructional laboratory space when not in use for instruction. (Year I and Year 2)
3. Continue to build on depm1ment strengths through strategic faculty hiring:
   a. As tenure-track hiring opportunities emerge, the Chair will work with the College and search committee to recruit junior faculty with research interests at the interface of chemistry and biology, with application in biomedicine. (Year 1 and ongoing)
   b. The department will also focus on faculty diversity as part of recruitment eff011s in keeping with college strategic goals. (Year 1 and ongoing)

4. Use promotional efforts to enhance recruitment, fundraising, and general department reputation:
   a. The Chair, Director and Associate Director of Graduate Studies will work with the college PR office on creating promotional materials to showcase the Department's unique qualities, successes, and needs for the purposes of student and faculty recruitment, fundraising, and general promotion of the college and university. (Year 1 and ongoing)
   b. In support of promotional goals and to enhance the general functioning of the department, the department will work with the college PR office to revamp and upgrade the website to showcase and make the Depru1rnent more visible. (Year 1)