Department of Chemistry

Sam Houston State University

MS Chemistry
Graduate Program Review
Self-Study Report

Fall 2017

Contents

I. Program Profile

A. Mission of Program

1. Unit's Mission, Vision, Goals, and Objectives.

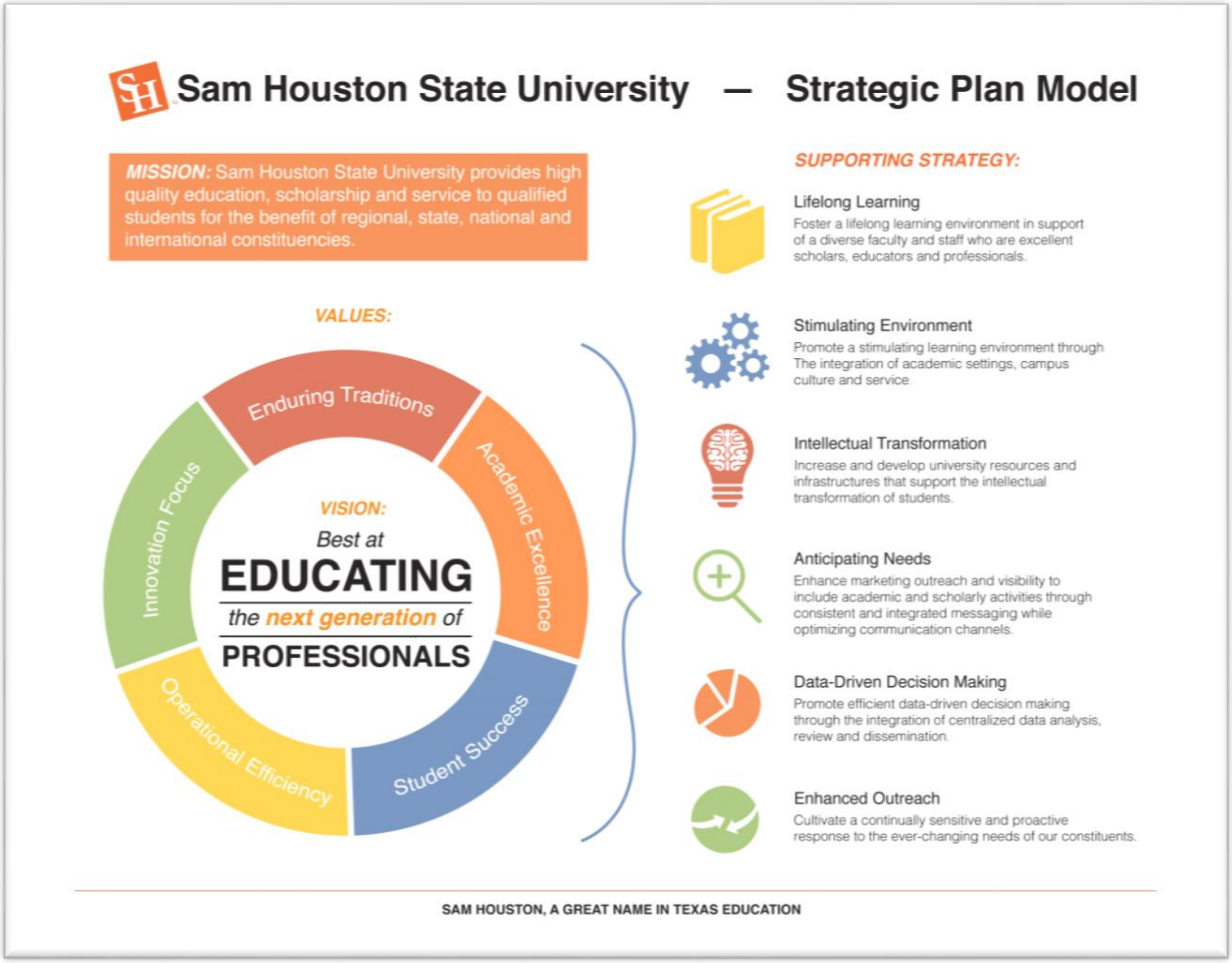
The Department of Chemistry at Sam Houston State University currently has three primary programs: the BS in Chemistry, the BS in Forensic Chemistry, and the MS in Chemistry. In addition to the MS program that is the subject of this report, the department serves over 400 Chemistry and Forensic Chemistry undergraduate majors.

A few years ago, the department established a mission statement to guide department activities. It is also listed in the Graduate Catalog as the mission for the MS program.

> *The Department of Chemistry is committed to providing an educational environment conducive to scholarship, intellectual development, and the acquisition of a foundation of knowledge and techniques required of professional chemists. This goal requires the effective representation of the fundamental areas of chemistry, a dedicated and creative faculty, and support for the many functions of the department.*

2. Alignment with the University's Strategic Plan.

Sam Houston State University's Strategic Plan, obtained from the Office of the President's website (http://www.shsu.edu/dotAsset/53bef4a9-b816-4a56-afe2-86c9f6e3863c.pdf at http://www.shsu.edu/dept/office-of-the-president/ on 10/22/17) can be seen on the next page.



The mission of the university is supported by our graduate program through our commitment to provide "high quality education, scholarship, and service to qualified students". The mission to provide high quality education is supported specifically by the broad coverage of the department's graduate curriculum and is supported by the high rating our graduates give to the value of their education in this program (for details see alumni survey results in section VIII. Assessment Efforts B. Alumni Surveys on page 150). The high-quality scholarship mission is evident in the funding and publication history of the department's research advisors and in the departmental expectation that students would be included in the authorship of articles and presentations.

The university's supporting strategies of "lifelong learning, stimulating environment, and intellectual transformation" are perhaps most visible in the chemistry department where graduate and undergraduate students are in the lab every day collecting data, analyzing results, preparing presentations, grading lab reports, and writing articles.

The service component to "regional, state, national, and international constituencies" is supported in qualitative ways through the international diversity of the department's graduate student population. Many excellent interactions occur between the primarily Southeast Texas undergraduate population and the internationally diverse graduate population through the laboratory teaching assistant duties, the required tutoring hours for our TAs, and through graduate-undergraduate research teams that develop in the faculty research groups. This mixing of national and international viewpoints in the practice of chemistry has a salutary effect on all parties from regional to international. Research in the department supports a number of constituent interests including industrial cleaning, forensics, material and polymer science, developing defenses against potential terrorist chemical weapons attacks, drug and hormone metabolism, and enhancing education. The students working in these areas enter the workforce primarily in Texas and other parts of the nation, providing a much needed a much needed well-trained technical workforce.

3. Unique Roles the Unit Plays or Special Contributions it Makes to the University, State, and/or Region.

The Department of Chemistry, and more specifically the MS in Chemistry program, plays many special or unique roles. We are one of the most research-active departments on campus, continuously creating new knowledge in a fundamental area of science. We attract students from around the world, increasing the cultural diversity of our campus, our community, and our state. The faculty and students in the department have been quite successful in attracting external funding, bringing much-needed funds for reagents and equipment that are necessary not only to carry out research but also to train the scientists of tomorrow. Research in the department develops cyanide poisoning antidotes and prophylactics, new materials for cutting edge electronics and sensing, new models of time-of-death in forensics, development of solvent blends that are much safer to use and more efficient at cleaning parts in industry, compounds that can be used to study lipid hormone metabolism in the body, new methods for teaching the difficult subject of chemistry to students, and more. The faculty and graduate assistants play a major role in the teaching of chemistry to non-science majors, providing expertise and translating that to an audience of non-experts. The students we train go on to positions in the energy industry, in companies that serve the U.S. military as contractors, in quality control labs, doing research in a wide-range of topics including MRI contrast agent development and nanobiotechnology, entering medical research careers, teaching at the high school level, and more. Our students go on to populate many PhD programs in Texas and beyond, providing those programs with students that both the programs and the students indicate are stronger than the typical PhD student (for details see alumni survey results in section VIII. Assessment Efforts B. Alumni Surveys on page 150).

B. History of Program

A graduate degree in chemistry at what was to become Sam Houston State University was first mentioned in the 1940-1941 Catalog (the degree was the Master of Arts with a major in chemistry). The Master of Science degree was first mentioned in the 1962-1963 Catalog.

The history of the university itself is described in the graduate catalog (http://catalog.shsu.edu/graduate/mission/):

> Sam Houston State University, located in Huntsville, Texas, is a member of The Texas State University System. The school was created by the Texas Legislature in 1879 as Sam Houston Normal Institute to educate teachers for the public schools of Texas. The baccalaureate degree was first awarded in 1919.
>
> In 1923, the institution's name was changed to Sam Houston State Teachers College. Two years later, the college was admitted to membership in the Southern Association of Colleges and Schools (SACS) as an accredited institution of higher learning. A graduate degree was authorized in 1936, and the curriculum was expanded to emphasize preparation in a variety of fields.

Following World War II, an increase in students and faculty as well as a wide range of faculty-research activities provided impetus for the continued emergence of a multi-purpose institution. In recognition of these developments, the institution's name was changed by the Texas Legislature to Sam Houston State College in 1965. The number of graduate degrees conferred increased significantly in the late 1960s; and the Texas Legislature, recognizing the changes that had taken place, changed the name of the institution to Sam Houston State University in 1969.

In the 1970s, the University was granted permission to offer its first doctorate, a PhD in criminal justice. This program grew to be one of the largest and most recognized doctoral programs in the country. In the 1980s and 1990s, the University completed a number of academic, athletic, and support facilities. With the improvement of faculty and facilities, the University set a vision to become one of the best regional universities in the country.

During the last five years of the twentieth century, the University expanded its reach by offering programs online, at The Woodlands in a multi-institutional teaching center, and various other off-campus sites. Beginning in 2000, the University expanded its building program and committed resources to develop and maintain nationally-recognized academic support programs. Sam Houston State University increased the number of doctoral programs, including programs in education and psychology, and experienced a tremendous surge in enrollment and name recognition.

Currently Sam Houston State University is organized academically into seven colleges: Business Administration, Criminal Justice, Education, Fine Arts and Mass Communication, Health Sciences, Humanities and Social Sciences, and Sciences. Students are offered an extensive range of bachelor's and master's degrees, as well as doctorates in selected areas. The faculty and the University are recognized regionally, nationally, and internationally.

C. Program Demographics

The number of students per class:

Academic Year	Fall Courses	Enrollment	Spring Courses	Enrollment
2011-2012	5361	11	5372	8
	5374	10	5385	10
2012-2013	5385	9	5362	9
	5385	11	5368	13
2013-2014	5374	15	5361	14
	5385	15	5385	18
2014-2015	5372	24	5362	14
	5385	23	5368	19
2015-2016	5374	16	5373	25
	5381	19	5385	8
2016-2017	5375	10	5372	13
	5385	7	5374	6
2017-2018	5382	7		
	5385	5		

Note: Students in other programs (like Forensic Science) enroll in our courses occasionally.

The number of students per cohort (from the data provided by SHSU Institutional Effectiveness):

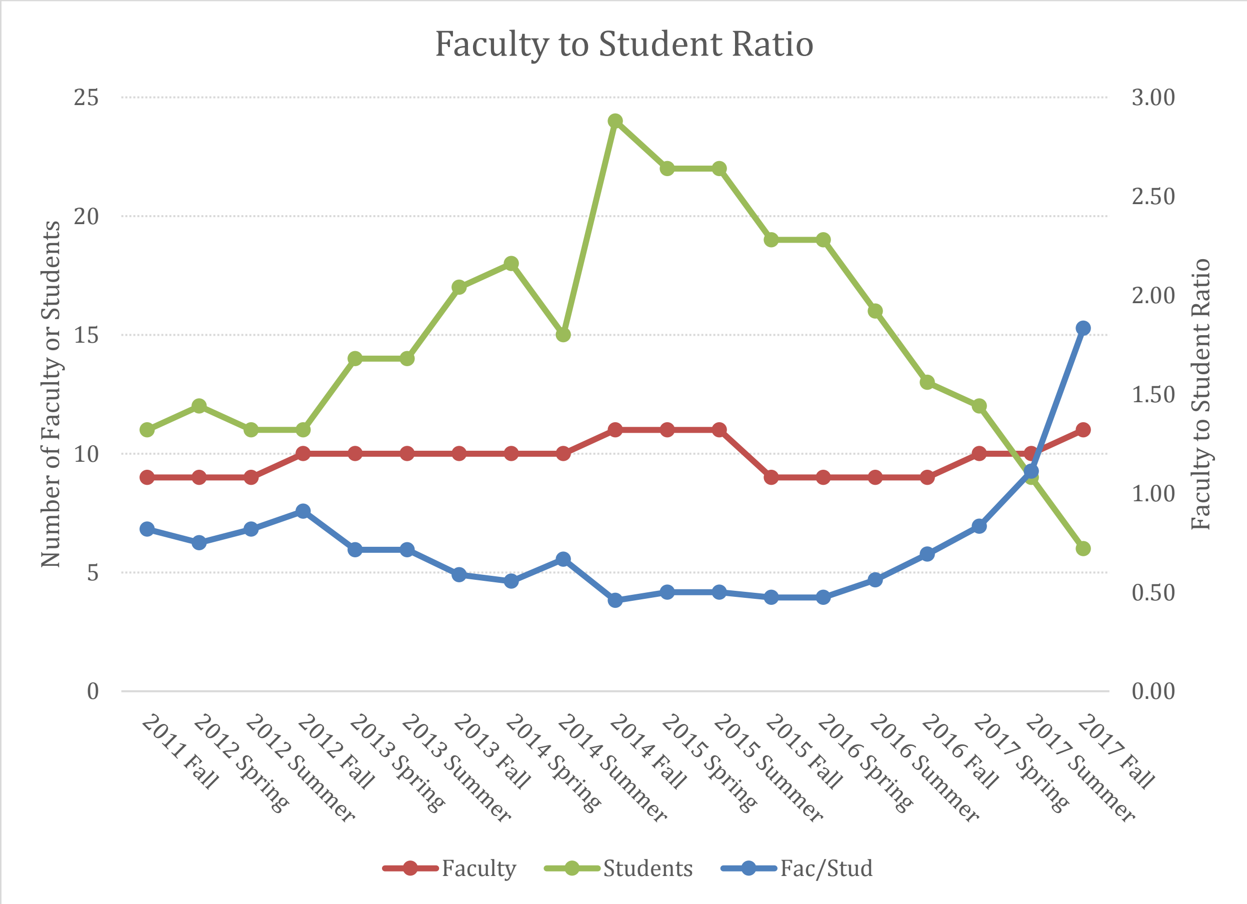
	FALL	SPRING	SUMMER	TOTAL
2011-12	6	0	2	**8**
2012-13	4	2	0	**6**
2013-14	8	4	0	**12**
2014-15	12	0	0	**12**
2015-16	5	1	0	**6**
2016-17	4	1	0	**5**
TOTAL	**39**	**8**	**2**	**49**
AVERAGE	**6.5**	**1.3**	**0.3**	**8.2**

The number of degrees conferred per year (from the data provided by SHSU Institutional Effectiveness):

	FALL	SPRING	SUMMER	TOTAL
2011-12	0	2	3	**5**
2012-13	1	0	4	**5**
2013-14	0	3	3	**6**
2014-15	2	0	8	**10**
2015-16	1	3	7	**11**
2016-17	1	3	3	**7**
AVERAGE	**0.8**	**1.8**	**4.7**	**7.3**

The number of core faculty has fluctuated between 9 and 11, and currently stands at 11.

D. Faculty/Student Ratio



Academic Year	Fall	Spring	Summer
2011-2012	9/11	9/12	9/11
2012-2013	10/11	10/14	10/14
2013-2014	10/17	10/18	10/15
2014-2015	11/24	11/22	11/22
2015-2016	9/19	9/19	9/16
2016-2017	9/13	10/12	10/9
2017-2018	11/6		

(Faculty over students enrolled in the program)

Note: All graduate faculty also have a significant portion of their workload assigned to undergraduate degree programs.

E. Alignment of Program with the Stated Program and Institutional Goals and Purposes

1. How does the program align with the program goals and the university goals?

The 2017-2018 SHSU Graduate Catalog (http://catalog.shsu.edu/graduate/mission/) lists the following as the university's mission and goals:

University Mission

Sam Houston State University provides high quality education, scholarship and service to qualified students for the benefit of regional, state, national, and international constituencies.

University Vision

Best at Educating the Texas Workforce:

- Excellence in academics
- Effective in student success
- Efficient in operations
- Loyal to traditions
- Dedicated to innovation

University Goals

- Foster a lifelong learning environment in support of a diverse faculty and staff who are excellent scholars, educators, and professionals.
- Promote a stimulating learning environment through the integration of academic settings, campus culture, and service.
- Increase and develop university resources and infrastructures that support the intellectual transformation of students.
- Enhance marketing outreach and visibility to include academic and scholarly activities through consistent and integrated messaging while optimizing communication channels.
- Promote efficient data driven decision making through the integration of centralized data analysis, review, and dissemination.

- Cultivate a continually sensitive and proactive response to the ever-changing needs of our constituents.

Alignment with the University strategic plan and overarching goals was already discussed in Section I.A.2. on page 7, and much of that discussion also applies here. The department works very hard to achieve Excellence in academics, and our surveys of current students and alumni suggest that they agree that we are doing a good job educating them, which leads to student success. The department is efficient in operations, with relatively low staffing and working hard to keep costs down. We are loyal to traditions, and try to pass on a respect for those that came before to our students. We are dedicated to innovation, teaching cutting edge techniques and continuously improving our teaching.

2. In the next several years, what factors will affect the demand for what you do?
This year there is a great deal of upheaval in the STEM graduate applicant pool, as many schools have reported a decrease in applicants from overseas and these applicants make up a major portion of the pool in U.S. STEM programs. As a result, PhD programs have gotten more aggressive with their financial offers and their recruiting activities (for example, a number of schools that do not normally recruit in the Southwest region had recruiters at the recent American Chemical Society Southwest Regional Meeting). This will make our department's recruiting activities and financial packages much more important.

The demand for MS Chemistry students is still strong. For example, in the survey of department alumni only one student reported being unable to find a job using their degree out of about 50 responses (plus one had just started their job search). MS Chemistry graduates that have been educated well will continue to be in demand.

3. How can you position the unit to respond to changes in demand?
As will be discussed in other sections of this report, the department is pursuing new recruiting activities to attract more applicants as the demand for graduate students rapidly changes. The department is also evaluating the alumni survey comments that contained suggestions for better preparing students for industrial careers and for entrepreneurial endeavors.

II. Program Administration

A. Administrative Processes

The Office of Admissions—Graduate Programs responds to general questions about SHSU and collects application information. They (the Office) forwards specific questions about the Chemistry Program to the Graduate Program Coordinator (GPC, currently Donovan Haines, previously Tom Chasteen) and notifies the GPC once an application is complete. The GPC responds to student inquiries, evaluates individual applications, and in consultation with the Chair of the Department (Richard Norman) decides which students should be admitted and which students should be rejected. The GPC and Chair communicate these recommendations to the Dean of the College of Science and Engineering Technology (CoSET) (John Pascarella) who makes the official admission decision and the Dean's office informs the Office of the decision and the Office notifies the student of the decision.

For the Department of Chemistry, all decisions to admit include the offer of a graduate assistantship. That assistantship is actually offered by the Dean of CoSET and is communicated directly to the student by the Dean's office.

Decisions about course rotations and course offerings are made by the Chair, sometimes in consultation with the faculty, after consideration of the needs of the students and the availability of the faculty.

B. Administrative Policies

There are a number of University policies that directly impact our M.S. program in Chemistry. These include Academic Policy Statement (APS) 790601 "Faculty Instructional Workload" (revised June 2, 2010), APS 890303 "Employment of Graduate Assistants" (revised March 19, 2012), APS 801014 "Graduate Faculty Status" (revised June 2, 2010), and various parts of the Graduate Catalog (including but not limited to Admission Standards, Admissions Types, and Course Load for Graduate Assistants). Additionally, the Commission on Colleges, Southern Association of Colleges and Schools Faculty Credentials has a significant impact on what we are allowed to do.

The text of these various policies follows and some aspects are discussed below. Discussion of the impact of these policies on our program and related issues will be discussed after (on page 45).

1. **Faculty Instructional Workload Policy (APS 790601)**

Text of APS 790601

PREAMBLE: IMPLEMENTATION PROVISIONS

- Effective with the fall 2004 semester, the University entered a transition period relating to an instructional workload conversion designed to provide additional resources to enhance faculty research, scholarship, and teaching.

- Each year, under budgetary constraints, the University allows the academic deans to reduce the normative teaching load from twelve credit hours per semester to nine credit hours per semester for selected faculty members who desire to place a greater emphasis on research productivity.

- Faculty members currently on a normative instructional load of twelve credit hours per semester who desire to place a greater emphasis on teaching, while cognizant of research responsibilities, will be allowed to remain on such a load.

- To ease reporting requirements as established by the Texas Higher Education Coordinating Board, this policy will be written from the perspective of the normative teaching load of twelve credit hours being equivalent to 1.0 FTE. Faculty on the normative nine-hour teaching load in essence are a .75 FTE for teaching and a .25 FTE for research.

    - Undergraduate and master's-level three-hour courses equate to .25 FTE teaching load.

    - For any tenured/tenure-track faculty member on a normative nine-hour teaching load and teaching a doctoral class, 1.0 FTE is defined to be six hours of classroom instruction, regardless of any other provisions of this policy.

    - Any faculty member teaching two doctoral classes in one semester will have the option of being evaluated on either the nine-hour or twelve-hour normative teaching load.

1. AUTHORITY

The faculty workload policy for Sam Houston State University is designed to comply with V.T.C.A., Education Code §51.402, and will be reported to the Texas Higher Education Coordinating Board and included in the operating budget for the University. These guidelines reflect the essential nature of the University as a teaching institution but provide flexibility to permit accommodation of related activities essential to the effective operation of a multipurpose regional university.

2. DEFINITIONS

2.1 Normative instructional load of twelve credit hours per semester (prior to any course load reductions): The expected teaching load for a faculty member with an FES 3 weight of 0.25 (See Attachment 1).

2.2 Normative instructional load of nine credit hours per semester (prior to any course load reductions): The expected teaching load for a faculty member with an FES 3 weight of 0.40 (See Attachment 1).

2.3 The workload for department/school chairs is not covered by this workload policy. The workload for a department/school chair is directly related to the number of faculty FTEs in the department/school. The specific instructional workload for chairs is detailed in Attachment 2.

2.4 Teaching assistants are graduate students who are pursuing degrees and are assigned part-time instructional duties commensurate with their academic preparation and experience. Such duties for which prorated salaries are paid include responsibility for organized classes; regularly scheduled discussion, quiz, or laboratory sections; or other duties directly involved in instructional activities. Teaching assistants are not covered by this workload policy.

3. WORKLOAD POLICY

The workload policy recognizes that faculty members' interests, strengths, and skills evolve throughout their careers. The University is best served by a policy that has enough flexibility to allow the academic deans, with permission of the Provost, to assign workloads that meet the University's changing needs and interest and skill sets of the faculty. The respective colleges are responsible for documenting rationale for modifications from the normative workloads.

3.1 The normal teaching loads for faculty members paid from appropriated funds defined as Faculty Salaries within the Elements of Institutional Costs shall be either an instructional load of twelve credit hours per semester or nine credit hours per semester. Final allocation of faculty to a specified instructional load rests with the appropriate academic dean with the Provost's approval. Departments/schools and colleges may propose deviations to the provisions of this academic policy to their academic dean.

To be eligible for this instructional load, a faculty member must be tenured or in a tenure-track position. All newly hired tenure-track faculty will be assigned to the normative instructional load of nine credit hours per semester.

a. Moving from one workload to another.

(1) Tenured/tenure-track faculty may request to change their teaching load from a twelve- to a nine-hour teaching load or vice versa. Faculty must file a written request with the department/school chair to move from one teaching load to another by April 15 for change effective in the subsequent spring semester. Approval is dependent upon availability of funding, departmental needs, and of the faculty member's ability to successfully produce the research as evidenced by a review of supporting materials such as vitae and professional portfolio. The academic dean, with the approval of the Provost, may grant such requests.

(2) Each year, as part of the Faculty Evaluation System (Academic Policy Statement 820317), the research and scholarly productivity of the faculty on the nine-hour teaching load will be reviewed by the academic dean in consultation with the department chair. If a faculty member has not produced sustained and demonstrable research, creative, or scholarly achievement by meeting established college standards, the faculty member may be moved to the twelve-hour teaching load by the dean in consultation with the department chair and the DPTAC.

b. Normally, the equivalent FTE workload is determined by multiplying the total number of hours taught by one-twelfth (.0833). Following are exceptions to this norm:

(1) Two clock hours of scheduled class time per week in a long semester (or its equivalent in a summer term) will equate to 1/8 (.125) FTE for one-credit hour kinesiology and dance courses.

(2) Supervision of one student teacher will equate to 1/24 (.04) FTE with a maximum credit of 1/4 (.25) FTE per section.

(3) Six contact hours per week in a Studio Art course during a long semester (or

its equivalent during any summer term) is equivalent to 1/3 (.33) FTE per semester.

(4) A faculty member teaching a net twelve contact hours in two studio art courses and three contact hours in lecture course in the Workshop in Studio Art and History (WASH) program will receive 1.0 FTE credit for coordination of the WASH curriculum, preparation of studio activities, and supervising studio activities outside of scheduled meeting times.

(5) A three-semester-hour course that receives field-based funding will equate to 1/3 (.33) FTE per semester.

(6) Two clock hours of scheduled laboratory time per week in a long semester (or its equivalent in a summer term) equates to 1/12 (.08) FTE semester hour of workload credit for a faculty member who teaches a formally scheduled laboratory.

(7) A faculty member may receive credit for supervising a formally- scheduled laboratory course when the faculty member directly supervises graduate or undergraduate students who serve as the instructors for the laboratory sections. Two clock hours of scheduled laboratory time per week during a long semester (or its equivalent in a summer term) will equate to 1/24 (.04) FTE per semester for a faculty member who supervises laboratory courses up to the following limit: A faculty member may receive a maximum of 1/4 (.25) FTE during any single semester or any summer term for such supervision regardless of the number of sections of a single course (or the number of student instructors) that are supervised. A faculty member may receive separate credit for each course number using this formula if laboratory sections representing different courses are supervised.

(8) Appropriate workload credit for teaching or supervising laboratory- type sessions in courses other than the sciences may be assigned by the academic dean with the approval of the Provost and Vice President for Academic Affairs.

c. Music courses other than the usual three-semester-hour courses will be equated as follows in computing normal load:

(1) Lecture class of two semester hours with three hours contact will equate to .25 FTE.

(2) Instrumental Techniques of one semester hour with three hours contact will

equate to .25 FTE.

(3) Singers Diction of one semester hour with two hours contact will equate to .20 FTE.

(4) Private Applied Music:

(a) One-semester-credit-hour courses, as indicated by last number of section number, with one-half hour contact per week will equate to .0275 FTE times the number of students.

(b) Two-, three-, or four-semester-credit-hour courses, as indicated by last number of section number, with one hour of student contact per week will equate to .055 FTE times the number of students.

(c) Two-semester-credit-hour courses with one hour contact will equate to .055 FTE times the number of students.

(5) Music Composition: one-semester-hour contact will equate to .055 FTE times the number of students.

(6) Major ensemble of one semester hour with six hours of student contact will equate to .50 FTE.

(7) Minor ensemble of one semester hour with three hours of student contact will equate to .25 FTE.

(8) Chamber Music and Practicum in Music Therapy of one semester hour with one hour of student contact will equate to .20 FTE.

(9) Advanced Conducting of three semester hours with six hours of student contact will equate to .25 FTE.

(10) Class Piano of one semester hour with two hours of student contact will equate to .125 FTE.

(11) Recital of one semester hour with one-half hour of student contact will not receive load credit (equates to thesis-type courses).

d. Instructors in the above music activities may deviate from a total of 1.0 FTE for any particular semester, but it is expected that the two semesters combined will total at least 2.0 FTEs.

3.2 Accrual of credit for assignments beyond full-time load: Credit hours not compensated with overload payment and earned under these criteria may be accrued for application to a faculty member's future workload. Once a faculty member accumulates overload hours equivalent to a one-course reduction, the released time must be taken within a three-year period, or it will be deleted.

Credit for such courses may be accrued for a maximum of three years after which time credit older than three years will be deleted. To assure that adequate faculty resources are available for the standard teaching functions of the department/school, the department/school chair will decide when the course load reduction will be granted. Such teaching load compensations can only be granted in long semesters. No more than a total of three semester hours of instructional load accrual credit may be awarded to any faculty member during a long semester.

3.3 Instructors of organized classes that are team taught will proportionally share the workload credits allowed for those classes in accordance with their distribution of responsibilities.

3.4 As the need dictates, faculty members may be requested on occasion to exceed normal teaching loads. Nothing in this workload policy should be construed to prohibit the President of the University or the Provost and Vice President for Academic Affairs from making this determination. A faculty member may be given an assignment that exceeds the normal load as defined in paragraph 2.01 either by assignment of an extra class or by assignment of a combination of courses from different levels. In such instances, compensation for such overload will be granted in accordance with established University policy or, subject to the policies and at the convenience of the affected college, equivalent released time. A faculty member may not be paid for an overload during the semester he/she is granted released or reassigned time.

3.5 Released time accrues at the forbearance of the University and is not reimbursable by the University should an instructor terminate or have his/her employment with the University terminated prior to the utilization of said released time.

4. ADJUSTMENTS TO THE NORMAL LOAD

4.1 During the academic year, the dean of a college may grant teaching load reductions for the following reasons:

a. Full-time tenured or tenure-track faculty member for whom a scheduled class does not materialize and for whom an appropriate alternate assignment is not available. This exception is not permissible for any individual beyond two consecutive semesters without a prorated reduction of salary.

b. Full-time tenured or tenure-track faculty member for whom enrollment in a scheduled class reduces to zero after the twelfth class day. In this event, the dean of the college may assign alternative responsibilities related to the programs and purposes of the college.

c. Faculty members who are given an administrative, supervisory, or coordinator assignment directly related to the instructional programs and purposes of the University and whose assignment is subordinate to that of department/school chair. The following examples are illustrative but not intended to constitute a complete list of possibilities.

   (1) Coordinator of a program, multiple-section course, or other similar responsibilities.

   (2) Developer of a significant new academic program.

   (3) Supervisor of radio and television programming, news gathering and transmission, and other program production in the Department of Mass Communication.

   (4) Director of a major musical, dramatic, or dance stage production or the designer/director for lighting, scenes, costumes, and properties for such major productions.

   (5) Faculty in Music whose professional assignments include participation in the SHSU Faculty Brass Quintet, SHSU Faculty Woodwind Quintet, and/or the SHSU Trio.

d. Instructor of one or more large classes (typically 100 students). The reduction is subject to the approval of the dean in consultation with the chair. A written justification prepared by the chair must accompany the request and should address enrollment numbers in the course(s), complexity of delivery of course material, and availability of resources that may assist in the delivery of material, e.g., teaching assistants. (Effective fall 2010.)

e. Faculty members with miscellaneous assignments such as:

(1) Chair of a major accreditation evaluation committee.

(2) Holder of a major office in a national professional organization.

f. Three-credit-hour-load (.25 FTE) reduction for direction to completion of five master's theses or three doctoral dissertations.

g. Released time accrued in accordance with Section 3.02 should apply during the semester immediately following the completion of the qualifying thesis or dissertation, or during the earliest possible long semester thereafter. The released time must be taken within a three-year period or the credit will be deleted.

h. Faculty members may receive instructional load credit for supervising approved internship courses. Each student who completes an approved internship course will equate to 1/60 (.001667) FTE (i.e., 15 students equate to a .25 FTE). No more than 1/4 (.25) FTE, a total of three semester hours of instructional load credit for internship completion, may be awarded to any faculty member for any given section.

5. MONITORING FACULTY WORKLOAD POLICY

5.1 It is the responsibility of each department/school chair at the beginning of each instructional period to report to the appropriate dean the workload assignment of each faculty member within his/her academic unit.

5.2 It is the responsibility of each dean to review and to transmit to the Provost and Vice President for Academic Affairs a report of workload assignments of all faculty members within his/her academic unit, to specifically note each instance in which a faculty member's assignment deviates from the general workload policy, to explain the basis for such deviation, and to recommend approval or disapproval of the deviation.

5.3 The Provost and Vice President for Academic Affairs will have final responsibility for the approval of faculty workloads in conformity with adopted University policy subject only to review by the President and final action by the Board of Regents, The Texas State University System.

6. EFFECTIVE DATE

This revised policy becomes effective fall 2010.

APPROVED: /signed/
James F. Gaertner, President

DATE: 07/06/10

Here is a section of the 2003 version (i.e. Revised June 18, 2003) of APS 790601:

2. WORKLOAD POLICY

2.1 The normal teaching loads for faculty members paid from appropriated funds defined as Faculty Salaries within the Elements of Institutional Costs shall be:

a. Twelve semester hours (usually four courses) of undergraduate instruction or combination of undergraduate and master's level graduate instruction.

b. Nine semester hours (usually three courses) of master's level graduate instruction.

c. Six semester hours (usually two courses) of doctoral-level courses or other graduate courses that enroll a majority of doctoral students.

d. Instructional assignments that do not conform to the usual concept of lecture-discussion courses will be expected to meet the following minimum criteria:

(1) Two clock hours will equate to one semester hour equivalent in activity physical education and one-hour dance courses.

(2) Supervision of one student teacher will equate to one-half semester hour.

(3) Eighteen contact hours yielding nine semester credit hours of Studio Art.

(4) Nine semester credit hours of courses that receive field-based funding.

(5) Two clock hours will equate to one semester hour equivalent for a faculty member who **teaches** a science laboratory (a science laboratory is defined as a lab in biology, chemistry, environmental science, geology, geography, or physics).

(6) A faculty member may receive credit for **supervising** science laboratory courses when the courses are instructed by graduate or undergraduate students but the faculty member oversees the student teachers. Two clock hours will equate to one-half semester hour equivalent for a faculty member who supervises laboratory courses up to the following limits: 12-31 clock hours will equate to three semester hours, 32-51 clock hours will equate to four and one-half semester hours, 52 or more clock hours will equate to six semester hours.

(7) Appropriate workload credit for teaching or supervising laboratory type sessions in courses other than the sciences may be assigned by the academic dean with the approval of the Provost and Vice President for Academic Affairs.

2. Employment of Graduate Assistants (APS 890303)

Text of APS 890303

1. GENERAL

1.1 The term "Graduate Assistant" as used at Sam Houston State University indicates a graduate student who is employed by the University on a part-time basis as either a teaching or a research assistant. A teaching assistant is usually employed one-quarter or one-half time to teach lower division courses and/or laboratories under the supervision of a full-time faculty member. A graduate assistant working as a research assistant is employed to perform specific research duties or to assist in office functions in a position related to his/her degree program.

1.2 Graduate Assistantships are made available to a limited number of graduate students each year. The purposes of the Graduate Assistantship program are to aid in financing the graduate studies of outstanding students and to provide experiences in the instructional and research programs through the assignment of duties designed to support and improve the total instructional program of the University.

1.3 There are six types of graduate assistantships at Sam Houston State University. A graduate student seeking a master's degree may be employed as a Graduate Teaching Assistant, a Graduate Research Assistant, or a Graduate Assistant. A graduate student seeking a doctoral degree may be employed as a Doctoral Teaching Assistant, a Doctoral Research Assistant, or a Doctoral Fellow.

2. RESPONSIBILITIES AND DEFINITIONS

2.1 A half-time Graduate Teaching Assistant or a Doctoral Teaching Assistant normally is responsible for two courses, or four laboratories, or twenty clock hours of duty each week and is expected to be enrolled in six to nine semester hours of course work each semester, or students who have only the thesis or dissertation to complete may, with permission from the Dean of Graduate Studies, enroll in only 3 semester hours each semester. These assistants are employed by an academic department, usually paid from faculty salaries, and are responsible for, or in charge of, a class or class section, or a quiz, drill, or laboratory section. According to the Southern Association of Colleges and Schools regulations, they must have earned eighteen (18) graduate semester hours in their teaching discipline, report directly to a faculty member, and be evaluated regularly, if they are the instructor of record.

2.2 A half-time Graduate Research Assistant, Graduate Assistant, Doctoral Research Assistant, or Doctoral Fellow may be assigned duties associated with research of a technical or professional level, faculty support, or other duties as permitted by the funding source, with twenty clock hours of duty each week and is expected to be enrolled in six to nine semester hours of course work each semester, or students who have only the thesis or dissertation to complete may, with permission from the Dean of Graduate Studies, enroll in only 3 semester hours each semester. Funding for these positions is usually derived from departmental operating expense or external sources such as grants, contracts, fellowships, or endowments.

2.3 Graduate students on an assistantship may not normally hold other salaried positions from the University. An exception to this rule may be made with the written approval of the appropriate academic dean. A graduate student on an assistantship may not be employed more than 80 percent from all sources of funding.

3. REMUNERATION

A stipend is paid in accordance with University faculty/staff payment schedule. Nonresidents (including citizens and permanent residents of the U.S. and all foreign students) employed as graduate, research, or teaching assistants on at least a half-time basis in a position related to their degree programs are entitled to pay the resident tuition rate.

4. HIRING

4.1 The hire of Graduate Assistants will be in consonance with Academic Policy Statement 800114, Academic Instructional Staffing. To be eligible for appointment to a Graduate Assistantship, the applicant must have met all requirements for regular admission to graduate studies. The maximum course enrollment load for Graduate Assistants on one-half time employment is nine (9) hours per semester or three (3) hours per summer session. Graduate Assistants on less than a half-time assistantship may have their maximum course load authorization increased proportionately by the appropriate department/school chair. Determination of maximum load for summer school is dependent upon the recommendation by dean.

4.2 Graduate Assistants usually are appointed for one academic year, i.e., two semesters, and may have the position renewed. In some circumstances Graduate Assistants may be limited to a single semester. Retention of the position, Graduate Assistant, is at all times conditional upon the continued good standing of the student in graduate studies (not less than a 3.0 minimum overall grade point average) and upon satisfactory performance of work assignments for which the stipend is provided.

4.3 Applications for positions of Graduate Teaching Assistant and Doctoral Teaching Assistant may be obtained from the office of the academic dean or department/school as appropriate.

5. QUALIFICATIONS

5.1 Graduate Teaching Assistants and Doctoral Teaching Assistants who have primary responsibility for teaching a course or laboratory for credit and/or for assigning final grades for such course or laboratory must be under the direct supervision of a faculty member experienced in the teaching field, receive regular in-service training, and be regularly evaluated.

5.2 Criteria for selection of Graduate Teaching Assistants and Doctoral Teaching Assistants include but are not limited to: undergraduate/graduate grade point average, experience, performance on the GRE or GMAT, and letters of recommendation.

5.3 Prior to teaching a lecture section of a course, a Graduate Teaching Assistant and Doctoral Teaching Assistant must have earned at least eighteen (18) graduate semester hours in the teaching field.

5.4 The requirements of paragraph 5.03 do not apply to graduate students on assistantships who are engaged in assignments such as providing laboratory assistance, attending or helping to prepare lectures, grading papers, keeping class records, conducting discussion groups, or engaging in research projects.

6. ORIENTATION/TRAINING, SUPERVISION, AND EVALUATION

6.1 All Graduate Assistants will periodically receive orientation/training, supervision, and evaluation necessary to ensure their effective performance as classroom/laboratory teachers, researchers, or office workers.

6.2 Department/School chairs are responsible for ensuring that the orientation/training, supervision, and evaluation of Graduate Assistants are accomplished.

7. ENGLISH LANGUAGE PROFICIENCY

In accordance with the provisions of Academic Policy Statement 871214, English

Language Proficiency for Instructional Personnel, each written recommendation for the employment of a Graduate Teaching Assistant or Doctoral Teaching Assistant will bear the following endorsement from the appropriate academic chair/dean:

“I certify that /insert name/ has been carefully evaluated as to his/her English language proficiency and is qualified to fill this position vacancy.”

3. Graduate Faculty Status (APS 801014)

Text of APS 801014

1. GRADUATE FACULTY

The academic integrity of graduate programs rests primarily with the Graduate Faculty. The main responsibilities of the members of the Graduate Faculty are to (1) teach graduate students effectively, (2) foster independent learning, (3) enable students to contribute to a profession or field of study, (4) conduct scholarly research and creative work of high quality, (5) maintain proficiency in their discipline, (6) ensure graduate programs in their discipline are relevant and of high quality, and (7) cultivate the research and scholarly endeavors of graduate students. The University recognizes that each member of the Graduate Faculty contributes to the success of its graduate programs. Whether through classroom instruction, guiding academic research, professional supervision, or mentoring, the University seeks to find avenues to allow each Graduate Faculty member to best use his/her particular strengths. Toward that end, the University incorporates three categories of graduate faculty membership.

1.1 The Graduate Faculty at Sam Houston State University will have three categories of membership: (1) Full Membership – Doctoral, (2) Full Membership – Master's, and (3) Associate Membership. Membership in these categories is based on academic qualifications and productivity in teaching and research/creative accomplishments. Membership is in no way limited by the graduate programs offered in each department/school/college.

1.2 Faculty members awarded Full Membership – Doctoral status may teach graduate classes, serve on thesis and/or dissertation committees, serve on the Graduate Council, and chair theses and dissertations.

1.3 Faculty members awarded Full Membership – Master's status may teach graduate classes, serve on thesis and/or dissertation committees, serve on the Graduate Council, and chair theses.

1.4 Faculty members awarded Associate Membership status may teach graduate classes, serve on thesis and/or dissertation committees, and serve on the Graduate Council.

2. CRITERIA FOR MEMBERSHIP ON THE GRADUATE FACULTY

Members of the graduate faculty must (a) possess a terminal degree in the teaching discipline or a related discipline from an institution accredited by a recognized accrediting agency, (b) demonstrate evidence of currency in the literature of the discipline, (c) be effective educators at the graduate level, and (d) be consistently active in scholarly and/or artistic endeavors. On rare occasions, a faculty member with a long standing record of exemplary scholarly and/or artistic accomplishments with a subsequent lapse may be granted graduate faculty status at the appropriate level. The distinction between the three categories of graduate faculty membership rests primarily in the minimum scholarly or artistic expectations as broadly described below. The colleges and/or departments/schools are expected to provide more specific guidelines based upon the norms and expectations of their particular discipline and provide a copy of these guidelines to the Office of Graduate Studies.

2.1 Criteria for Full Membership - Doctoral status requires substantial, documented evidence of excellence in scholarly and creative activities on a current and sustained basis. These scholarly and creative efforts must be peer- reviewed publications, performances, or competitive externally-funded contracts or grants in the disciplinary or related area of assigned graduate responsibility. In addition, for Full Membership-Doctoral status, a graduate faculty member must be tenured/tenure-track or clinical faculty.

2.2 Criteria for Full Membership – Master’s status requires documented evidence of scholarly and creative activities on a current and sustained basis. These scholarly and creative efforts must be peer-reviewed publications, performances, or competitive externally-funded contracts or grants in the disciplinary or related area of assigned graduate responsibility. In addition, for Full Membership-Master’s status, a graduate faculty member must be tenured/tenure-track or clinical faculty.

2.3 Criteria for Associate Membership status requires documented evidence of scholarly and creative activities on a current and sustained basis. These scholarly and creative efforts must be peer-reviewed in the disciplinary or related area of assigned graduate responsibility. Scholarly and creative efforts include but are not limited to publications, performances, competitive externally funded contracts or grants, and presentations at scholarly conferences. For clinical faculty and non-tenured/tenure-track faculty or staff, appropriate professional experience may be used in conjunction with or in lieu of scholarly and creative activities.

2.4 Notwithstanding satisfaction of the above requirements, conferral or retraction of graduate faculty status is within the sole discretion of the University; no member of the faculty is hereby conveyed a property right or entitlement to such status; nor does retraction of such status impact a liberty interest in one’s name or reputation.

3. APPOINTMENT/REAPPOINTMENT PROCESS

3.1 Nominations for appointment may be submitted at any time in a faculty member's career and are not connected to the reappointment timelines. Nominations may be initiated by the individual faculty member, the appropriate departmental/school chair, and/or the appropriate academic dean, using Form 1. Form 1 and a current curriculum vita will be routed through the departmental/school chair, academic dean, Graduate Council, and the Dean of Graduate Studies. The Dean of Graduate Studies makes the final appointment with an informational letter sent to the Provost and Vice President for Academic Affairs with a copy sent to the academic dean and departmental/school chair.

3.2 a. On an annual basis, an academic dean may recommend a change in Graduate Faculty Status for any faculty member in his/her college using Form 2. The form is to be submitted to the Dean of Graduate Studies for review by the Graduate Council and Dean of Graduate Studies. The final decision is made by the Dean of Graduate Studies.

b. Reappointment to graduate faculty status will be reviewed when a recommendation is submitted for tenure, promotion, and post-tenure review. The process will be initiated with a memo from the Office of Graduate Studies. Form 2 and a curriculum vita must be routed through the departmental/school chair, academic dean, Graduate Council, and the Dean of Graduate Studies. The Dean of Graduate Studies makes the final appointment with an informational letter sent to the Provost and Vice President for Academic Affairs with a copy sent to the academic dean and departmental/school chair. Faculty not subject to post-tenure review will be reviewed for reappointment to graduate faculty status every five (5) years.

3.3 The Graduate Council must have a quorum present to act upon a recommendation for appointment or reappointment to graduate faculty. A simple majority of those Council members present is required for a recommendation for appointment or reappointment. The Dean of Graduate Studies will chair the Graduate Council meetings but will not have a vote in the Council's recommendation process for appointments/reappointments to graduate faculty status.

4. TEMPORARY APPOINTMENT TO THE GRADUATE FACULTY

The University recognizes that tenure-track faculty who recently completed the requisite terminal degree or have recently entered academe but have not had time to create evidence of sustained scholarly productivity may be valuable contributors to SHSU's graduate programs. Based upon the individual's academic and professional expertise and qualifications, renewable one-year temporary appointments may be requested for each of the three graduate status categories. A faculty member may serve no more than three years on the Graduate Faculty with temporary membership.

Nominations for temporary appointment are made by submitting Form 1 and a current curriculum vita through the department chair and academic dean to the Graduate Council, and then to the Dean of Graduate Studies. The Dean of Graduate Studies makes the final appointment with an informational letter sent to the Provost and Vice President for Academic Affairs with a copy sent to the academic dean and departmental/school chair.

5. EXCEPTIONS

On rare occasions, exceptions to this policy may be granted by the Dean of Graduate Studies.

6. REVIEW PROCESS

Individuals who are denied appointment to graduate faculty status may appeal to the Dean of Graduate Studies, whose decision is final. An appropriate administrator may submit an appeal on behalf of a faculty member.

FORMS

This revised policy becomes effective September 1, 2010.

APPROVED: /signed/
James F. Gaertner, President

DATED: 07/16/10

4. Policies Appearing in the Graduate Catalog

From the 2017-2018 Graduate Catalog (http://catalog.shsu.edu/graduate/academic-policies-procedures/):

Admission Standards

For Graduate Admission, SHSU requires an undergraduate GPA from the baccalaureate-granting institution of 2.5 (on a 4.0 point scale) or a GPA of at least 2.8 from the last 60 hours of courses taken at the baccalaureate degree-granting institution. The minimum GPA may be waived for programs in certain circumstances, please contact the program department for additional information.

Admission to graduate studies at Sam Houston State University and any of its sponsored programs is open to qualified individuals without regard to race, color, national origin, religion, gender, disability, or age.

Admission Types

A student applying for admission to graduate studies at SHSU may be considered for six types of admission. Details of the possible admission types follow. **The final admission decision rests with the respective academic dean.**

Regular Admission

Regular admission may be granted to a degree-seeking student who meets all of the University and program-specific admission requirements. Meeting stated minimum admission requirements does not constitute automatic admission to a graduate program at Sam Houston State University. Any inquiries regarding program-specific admission requirements should be directed to the graduate adviser (access advisers at http://www.shsu.edu/academics/degrees.html) or the dean of the appropriate college in which the program is housed.

Conditional Admission

Conditional admission may be granted, at the discretion of the appropriate academic dean, to a degree-seeking student who has not yet submitted ALL of the required admission materials to allow an admission decision to be made but is being allowed to enroll in classes pending receipt of the missing material(s). Conditional admission is valid for **ONE SEMESTER ONLY**. A subsequent admission decision will be made upon receipt of the missing admission material. **Conditional admission does NOT guarantee regular admission upon receipt of the missing material**, regardless of the student's performance in classes taken during the one semester of conditional admission. Some programs do not grant conditional admission. At the discretion of the appropriate academic dean, a conditionally admitted student may be limited to fewer than the normal maximum semester load of 12 graduate credit hours. International students do not qualify for conditional admission, with the exception of international students transferring directly from U.S. institutions.

Probationary Admission

Probationary admission may be granted, at the discretion of the appropriate academic dean, to a degree-seeking student who has submitted all of the required admission materials BUT does not qualify for regular admission. Probationary admission allows a student to enroll in courses to demonstrate ability to succeed at the graduate level. A student may complete a maximum of 12 graduate semester credit hours with probationary admission. A student with probationary status may be limited to fewer than 12 graduate credit hours by the appropriate academic dean. To petition for regular admission, a student must earn a grade of "B" or better in each course completed under probationary admission. A program may set a higher standard. The final decision rests with the appropriate academic dean. A maximum of 12 credit hours completed in probationary status may be applied to a graduate program, but the department concerned may choose not to accept some credit hours taken prior to regular admission. **Probationary admission does NOT guarantee regular admission upon completion of the requisite coursework.** International students are not eligible for probationary admission.

Preparatory Admission

Preparatory admission may be granted, at the discretion of the appropriate academic dean, to a degree-seeking student who has NOT qualified for regular admission AND needs to complete one or more prerequisite (stem) courses. A student granted preparatory admission may be limited to a specified number of credit hours and be subject to a stringent GPA requirement in the prerequisite (stem) courses. **Preparatory admission does NOT guarantee regular admission upon completion of the stem courses**, regardless of the student's performance in the preparatory (stem) courses taken. International students are not eligible for preparatory admission.

Non-Degree Admission

Non-degree admission may be granted to a student who holds a baccalaureate degree or higher from a regionally accredited institution and others recognized by THECB and does not intend to pursue a graduate degree at SHSU, but instead wishes to take courses for professional advancement, licensure, certification, or self-edification purposes. An applicant for non-degree admission must submit the following documents to the Office of Admissions: the graduate application for admission, a non-refundable application fee, and an official copy of the transcript from the school which awarded the baccalaureate degree. A non-degree student who later applies for regular admission to seek a graduate degree may apply a maximum of 12 credit hours of coursework taken in non-degree status toward a graduate program at the discretion of the appropriate academic dean. International students are not eligible for non-degree admission.

Admission Classifications

A student admitted into a graduate or post-baccalaureate program at SHSU may be considered for three distinct classifications. Details of the possible classifications follow.

Post-Baccalaureate

Post-baccalaureate classification is assigned to a student possessing a baccalaureate degree who has not been regularly or conditionally admitted to a graduate program (master's or doctoral) at SHSU. A student who is classified as a post-baccalaureate is typically:

- taking undergraduate classes to raise an undergraduate GPA,
- seeking certification or a certificate credential but not seeking a degree,
- taking prerequisite courses for a degree program and does not yet meet the admission requirements for the degree program, or
- taking courses for self-edification.

Master's

Master's classification is assigned to a degree-seeking student possessing a baccalaureate degree or the equivalent and who has been regularly or conditionally admitted to an approved master's degree program at SHSU. Master's classification is also granted to a degree-seeking student admitted to a doctoral program who has not yet earned the required master's degree or 30 hours toward the doctorate degree.

Doctoral

Doctoral classification is assigned to a degree-seeking student who has been regularly or conditionally admitted to an approved doctoral degree program at SHSU, and has completed a master's degree (recognized as the equivalent of one year's full-time work) toward the doctoral degree the student is seeking, or at least 30 graduate hours of work toward the proposed doctorate degree.

Subsequent Application

A new application for admission must be submitted if the student fails to attend for one calendar year or seeks admission into a different degree program.

For more information, please call the Office of Admissions at (936) 294-1971 or visit www.shsu.edu/graduate.

Graduate Courses

A graduate course is an advanced course requiring critical analysis and study. Typically, courses with numbers of 5000- or 6000-level are master's-level courses and 7000-level or higher are doctoral-level courses. To provide a greater range of academic course offerings, some graduate programs allow students to take a limited number of approved 4000-level courses for graduate credit. To receive graduate credit for a 4000-level course, the student must receive prior approval from the department chair and the academic dean and complete additional requirements as outlined by the professor. Please see the specific degree programs within this catalog for more details on taking 4000-level courses for graduate credit.

Course Load

Normal Load

The load for a full-time graduate student is nine to twelve credit hours per fall or spring semester and six credit hours in the summer. Students enrolled in master's and doctoral degree programs should enroll in a minimum of nine graduate credit hours in both the fall and spring semesters and six credit hours in the summer to be considered full-time graduate students.

Master's students desiring to enroll in more than twelve graduate credit hours and doctoral students desiring to enroll in more than nine graduate credit hours in any one semester must obtain approval from the dean of the college in which they are enrolled.

It is important to note that the University requirements for full-time status and requirements of various financial aid programs may differ. It is recommended that students consult with the University's Financial Aid Office to determine how assistantships and fellowships may impact financial aid.

Course Load for Graduate Assistants

Graduate students employed by the University at least half-time as graduate assistants, research assistants, or teaching assistants should enroll in a minimum of six graduate credit hours per semester to be considered full-time graduate students. The maximum course load for graduate assistants on half-time employment is nine credit hours per fall or spring semester or six credit hours during the summer. Graduate assistants on less than a half-time assistantship may have the maximum course load authorization increased proportionately by the appropriate department/school chair. For more information on the employment of graduate assistants refer to Academic Policy Statement 890303 at http://www.shsu.edu/dept/academic-affairs/documents/aps/faculty/890303_000.pdf.

Degree Plan

A degree plan details the curriculum for the specific academic program and is developed for each graduate student. All courses on the approved degree plan must be completed with a satisfactory grade to meet the requirements for the degree. Changes in an approved degree plan may be made by petition to the graduate advisor and approved by the appropriate academic dean.

A student is required to complete master's level graduate work within a six-year period, measured from the date of initial enrollment for graduate credit in a particular degree program and within an eight-year period for doctoral level graduate work. The period of time a student is on an approved leave of absence will be counted as time accumulated toward that six-year or eight-year deadline for completion of the degree. Any extension of the six-year or eight-year deadline must be approved in writing by the appropriate academic dean and the Dean of Graduate Studies.

Comprehensive Examinations

All candidates for a graduate degree must pass integrative comprehensive examinations. The major department will establish whether the comprehensive examinations are written, oral, or a combination of the two. In lieu of comprehensive exams, some programs have been granted permission to use a comprehensive capstone course or portfolio submission.

The major department will organize a committee for the administration of the examinations. A grade of "high pass," "pass," or "fail" for each exam must be filed in the office of the appropriate academic dean. Should a student fail one or more examinations, a re-examination shall be permitted per departmental or college guidelines, as appropriate. A third examination may be permitted only with the approval of the appropriate academic dean and the department. Students should consult the major department for specific guidelines regarding comprehensive examinations. Students must be enrolled in the University the semester in which the comprehensive exams are administered.

Enrollment in Thesis or Dissertation Courses

(Refer to Academic Policy Statement 930129)

A graduate student at Sam Houston State University writing a thesis or dissertation must enroll in the appropriate thesis or dissertation courses. Typically, a master's student is required to take at least six hours of thesis courses. Depending on the specific program, a doctoral student is required to take a minimum of either nine or twelve hours of dissertation courses. Once a student enrolls in a thesis or dissertation course, the student must continuously enroll in such a course every fall and spring semester until the signed thesis/dissertation route sheet is received by the Registrar's Office. Students must be enrolled in at least one course (one credit hour or more) in the semester of graduation.

A student who is unable to work on the thesis or dissertation for a period of time may present to the appropriate academic dean a written request for a leave of absence of up to one year. The dean's approval of such a request must be in writing. A student granted a leave of absence may not be enrolled in any coursework during this period. A student on a leave of absence will lose access to University services. Students returning from leave of absence should contact program advisors immediately to seek guidance for enrollment procedures.

Master's Thesis/Doctoral Dissertation

Thesis/Dissertation Committee

A thesis or dissertation committee will be formed prior to enrollment in the first thesis/dissertation course. The committee must be composed of a chair and at least two additional members, all of whom have appropriate graduate faculty status. With the approval of the department chair, academic dean, and Dean of Graduate Studies the committee may include one member who is not employed by SHSU as per Academic Policy Statement 950601. Selection of the chair depends on student preference, faculty availability, and expertise. After a faculty member agrees to serve as chair, the student will select the other committee members with guidance from the chair. The committee must then be approved by the chair of the major department and the appropriate academic dean. Any change in the composition of the thesis or dissertation committee will be approved in the same manner.

Prospectus

In consultation with the thesis or dissertation chair, the student will select a subject of investigation and determine the availability of the required sources, facilities, materials, and equipment for the research and the writing of the thesis or dissertation. The student will prepare a prospectus which will specify the topic, detail the purpose of the proposed investigation, describe the proposed method(s) of investigation, indicate the relationship of study to relevant research and findings of scholars in the student's area of concentration, and provide a commentary on source materials and/or facilities available for the successful completion of the research.

The prospectus shall be submitted to the thesis or dissertation committee following the timelines outlined by the departmental or college policies. Upon committee approval, the signed prospectus is submitted to the appropriate academic dean for final approval. Any subsequent changes in topic or the proposed method of investigation must be approved in writing by the committee and submitted for approval to the appropriate academic dean.

Preparation

To facilitate the preparation of the thesis or dissertation, the student should refer to the *Directions on Form, Preparation, and Submission of the The Final Copies of Master's Theses and Doctoral Dissertations* at http://library.shsu.edu/research/guides/thesis , as well as other important information on the Graduate Studies website.

Procedure

Candidates should be in regular contact with committee members throughout the thesis/dissertation process. Candidates should allow committee members ample time to review draft versions of the thesis/dissertation. The candidate should submit the completed thesis or dissertation to the thesis or dissertation committee at least two weeks prior to the scheduled defense. The following steps must be completed, most in the graduating semester.

1. The candidate shall submit a draft of the thesis/dissertation to the Library for format and style review. The last day to submit the draft can be found in the Academic Calendar.
2. The chair of the committee or the graduate advisor establishes a time and location for administering a verbal defense of the thesis or dissertation. The defense must be held at least six weeks prior to graduation. Attendance at the defense is open to the entire university community.
3. The thesis/dissertation chair will submit a signed *Report of the Outcome of the Thesis/Dissertation Defense* to the appropriate academic dean.
4. Upon successful completion of the defense, the candidate should begin the routing of the Electronic Route Sheet. This form will be automatically routed to the thesis/dissertation committee chair and the appropriate academic dean; the director of the library; the Office of Graduate Studies; and the Office of the Registrar.
5. Upon approval by the committee, the final (approved) version of the thesis or dissertation should be submitted to the Newton Gresham Library by the candidate for final review prior to publication. The last date for submission can be found in the Academic Calendar. Printing and binding costs for physical reproductions of the thesis or dissertation and binding costs are the responsibility of the candidate. The original copy will remain in the library collection.

5. CoC SACS Faculty Credentials Policy

FACULTY CREDENTIALS

- Guidelines -

Comprehensive Standard 3.7.1 of the *Principles of Accreditation* reads as follows:

> The institution employs competent faculty members qualified to accomplish the mission and goals of the institution. When determining acceptable qualifications of its faculty, an institution gives primary consideration to the highest earned degree in the discipline. The institution also considers competence, effectiveness, and capacity, including, as appropriate, undergraduate and graduate degrees, related work experiences in the field, professional licensure and certifications, honors and awards, continuous documented excellence in teaching, or other demonstrated competencies and achievements that contribute to effective teaching and student learning outcomes. For all cases, the institution is responsible for justifying and documenting the qualifications of its faculty.

When an institution defines faculty qualifications using faculty credentials, institutions should use the following as credential guidelines:

a. Faculty teaching general education courses at the undergraduate level: doctorate or master's degree in the teaching discipline or master's degree with a concentration in the teaching discipline (a minimum of 18 graduate semester hours in the teaching discipline).

b. Faculty teaching associate degree courses designed for transfer to a baccalaureate degree: doctorate or master's degree in the teaching discipline or master's degree with a concentration in the teaching discipline (a minimum of 18 graduate semester hours in the teaching discipline).

c. Faculty teaching associate degree courses not designed for transfer to the baccalaureate degree: bachelor's degree in the teaching discipline, or associate's degree and demonstrated competencies in the teaching discipline.

d. Faculty teaching baccalaureate courses: doctorate or master's degree in the teaching discipline or master's degree with a concentration in the teaching discipline (minimum of 18 graduate semester hours in the teaching discipline).

e. Faculty teaching graduate and post-baccalaureate course work: earned doctorate/terminal degree in the teaching discipline or a related discipline.

f. Graduate teaching assistants: master's in the teaching discipline or 18 graduate semester hours in the teaching discipline, direct supervision by a faculty member experienced in the teaching discipline, regular in-service training, and planned and periodic evaluations.

Approved: College Delegate Assembly, December 2006

6. Analysis of the Impacts of the Various Policies

As mentioned above, these various policies impact our program. While this review is about our graduate program, that program is not isolated from our undergraduate program and the two interact. One direct interaction is the possibility that graduate students might be able to serve as instructors of record for certain undergraduate courses. The SACS requirements for faculty specify that faculty teaching general education courses must have a minimum of 18 graduate semester hours in the discipline (item a. directly above). As described and discussed below, a typical student enters in the fall term and takes 10 hours. They only earn 7 hours (having received an IP in research). In the following spring term, they again take 10 hours and earn 7 hours. Over the summer they take 3 hours (in research) and earn 0 hours. In the fall term of the second year, they once again take 10 hours and earn 7 hours. At this point (after they have completed three long semesters) they have completed 18 graduate hours in chemistry. In this next spring semester (or in both the spring and summer semester), they finish their research, write-up and defend their master's thesis. Asking them to, at the same time, create a course and teach it for the first time is an unreasonable burden to place upon them. Consequently, our graduate students never serve as instructors of record for courses. Instead, all of our graduate students that receive a graduate stipend (and that is virtually all of our students) serve as graduate assistants in our undergraduate teaching laboratories or an equivalent duty (discussed in section V.D.3 on page 116). The fact that we do not use graduate students as instructors of record then impacts the workload of the faculty.

APS 790601 is the Faculty Instructional Workload policy and it specifies various details about the Workload (faculty workload is provided in detail in IVB below). Two issues of particular import to mention here is the faculty load for (1) teaching graduate courses and (2) for supervising laboratory assistants.

The load associated for teaching "undergraduate and master's-level three-hour courses equate to .25 FTE teaching load" while "any tenured/tenure-track faculty member on a normative nine-hour teaching load and teaching a doctoral class, 1.0 FTE is defined to be six hours of classroom instruction, regardless of any other provisions of this policy". Since .25 of the 1.0 FTE load is assigned to research, teaching one doctoral three-hour class and one undergraduate three-hour class is de facto .75 of a load, so the doctoral class is a .50 FTE, and a doctoral class is considered to be DOUBLE the load of a master's course. The version of the policy cited is "revised June 2, 2010". In the older version of the same policy ("revised June 18, 2003") (prior to including research as an official .25 FTE), twelve semester hours of undergraduate instruction, or nine semester hours of master's level graduate instruction or six semester hours of doctoral-level instruction are considered to be normal teaching loads—thus a distinction was made between undergraduate and master's level teaching, a distinction that disappeared from the most recent version of the policy. Having taught doctoral students and master's students in graduate chemistry courses, there is no distinction in the amount of work that goes into these courses and typically master's students and doctoral students take the exact same courses in chemistry graduate programs. Effectively, faculty teaching in master's programs at SHSU are punished as compared to faculty teaching in a doctoral program. Since the political environment in Texas has determined that SHSU will likely never have a Ph.D. program in chemistry, we are effectively being punished for something that we cannot control. This is unfair and unethical—it is discrimination. This workload issue then affects the number of positions that the Department is allocated, which, in turn, affects the student to faculty ratio and the number of graduate courses that we can reasonably offer.

The load for supervising laboratory assistants is 1/24 FTE for two clock hours of scheduled laboratory time up to a maximum of .25 FTE for a given course number. Sadly, this means that for one individual, supervising 4 sections of general chemistry labs is .25 FTE as is supervising 20 sections of general chemistry labs. However, we could assign 5 different faculty to each supervise 4 sections of general chemistry lab and each would receive .25 FTE. Thus a 1.25 load can be assigned to a single individual. This is unfair to that individual. Assigning that load to different faculty will lead to different laboratory experiences for the students in those labs—the curriculum is better served by having one individual supervising all of those laboratory sections. The older version of the workload policy has a different cap (two clock hours of lab equate to one-half a semester hour with 12-31 clock hours equating to three semester hours, 32-51 clock hours to four and one-half semester hours, and 52 or more clock hours to six semester hours). This again impacts the faculty workload which in turn impacts the number of positions that the Department is allocated, which, in turn, affects the student to faculty ratio and the number of graduate courses that we can reasonably offer.

As mentioned just above (in the discussion of credit hours earned), the typical chemistry graduate student enrolls in 10 credit hours in each of the first three long semesters. APS 890303 (in section 4.1) states that the maximum course enrollment load for Graduate Assistants is nine hours per semester or three hours per summer session. The Graduate Catalog also states that the maximum course load for graduate assistants is nine credit hours per fall or spring semester. The Department of Chemistry offers two graduate lecture courses, seminar, graduate research and thesis each fall and spring semester. In the first three semesters, the typical chemistry graduate student enrolls in both of the lecture courses, the seminar and graduate research. Technically this is 10 hours, however this is two lecture courses and a one-credit seminar of coursework. Technically our graduate students are in violation of the letter of the policy, but not the spirit of the policy. The policy as described in older catalogs states that the students are expected to be enrolled in six to nine semester hours of *course work* each semester (italics added for emphasis), not credit hours. Also, as stated above, virtually all of our graduate students receive graduate assistantships, and that entitles them to pay the resident tuition rate.

APS 801014 is currently in flux. While we have provided the current official text of the policy (the revised June 2, 2010 version), the categories of graduate faculty membership, the criteria for membership, and the appointment/reappointment process are all changing and this policy isn't currently being followed. For example, while two of our faculty were nominated for appointment to the graduate faculty prior to the fall semester last year (2016), nothing was done about their appointment until this year, and one of them taught a graduate course in the fall semester of 2016. All of our tenure-track faculty are hired with the expectation that they participate in the graduate program.

The Graduate catalog describes various aspects of how the graduate program is supposed to work at the University level, but not all of the provisions are necessarily followed. For example, there was a prospective student who had completed a B.S. degree in biology but the student needed to complete some additional undergraduate course work to be admissible to our program. This is described as "Preparatory Admission" in the catalog, yet this student was admitted and classified as a regular admitted graduate student. This may be an inconsistency that the categories described in the catalog do not coincide with the categories that exist within the University database program; the software may not be able to accommodate the actual policy. A "Subsequent Application" is described as being required (as a new application) if a student fails to attend for one calendar year or if the student seeks admission into a different program, yet we have had students that were required to submit a new application after delaying admission from the spring to the fall semester and who were initially accepted conditionally and subsequently accepted as a regular student, yet in both cases, it was the same degree program.

3. Policy Changes

We would like to see two changes made to APS 790601 “Faculty Instructional Workload”. In section 3.1.b (7) we would like this section to be truncated so that it reads “A faculty member may receive credit for supervising a formally-scheduled laboratory course when the faculty member directly supervises graduate or undergraduate students who serve as the instructors for the laboratory sections. Two clock hours of scheduled laboratory time per week will equate to 1/24 (.042) FTE per semester for a faculty member who supervised laboratory courses.” This change removes the cap of .25 FTE load per course number.

The second change is more difficult to accomplish. We would like to see the load associated with teaching doctoral and master’s-level courses become equivalent. Of course, one way to do this would be to make teaching doctoral courses equivalent to load for teaching both undergraduate and master’s-level courses, but this is inappropriate. So, instead, let’s increase the load associated with master’s-level courses. This starts with the first sub-point to the fourth bullet point of the Preamble with the removal of “and master’s-level”. This sub-point would then read “Undergraduate three-hour courses equate to .25 FTE teaching load.” Change the next two sub-points by including “of master’s-level”. Thus, the second sub-point becomes “For any tenured/tenure-track faculty member on a normative nine-hour teaching load and teaching a doctoral or master’s-level class, 1.0 FTE is defined to be six hours of classroom instruction, regardless of any other provisions of this policy.” And the third sub-point becomes “Any faculty member teaching two doctoral or master’s-level classes in one semester will have the option of being evaluated on either the nine-hour or twelve-hour normative teaching load.”

With regard to the course load for graduate students, we would like to see APS 890303 “Employment of Graduate Assistants” be changed in both sections 2.1 and 2.2 by changing the phrase “six to nine semester hours” to “six to ten semester hours”. Further in section 4.1, we would like to have “nine” changed to “ten”.

With regard to other discrepancies between policy and practice, the problems are primarily either that policies are not followed or that policies are being revised, but the revisions are not complete. We don’t necessarily have a strong opinion one way or the other, for example, if a student has to pay to reapply for admission if they delay their admission for one semester (of course, it would be better for the applicant if that wasn't the case)—but that is what is being required and it is contrary to policy. If that is, de facto policy, then the policies should be re-written to reflect actual practice.

C. Mentoring and Academic Advising

MS Chemistry students have several different advisors and mentors, each with a distinct role. These include their Research Advisor, who in science is usually the most direct and important source of mentoring and advice, the Graduate Coordinator, the Department Chair, and other faculty (especially their committee members).

Graduate Coordinator. A student's first point of contact within the department is usually the Graduate Coordinator. During the period of this self-study, that was Dr. Chasteen (now retired) until 2015, and since that time it has been Dr. Haines. The Graduate Coordinator communicates with potential applicants, helps answer questions and get requirements filled during the application process, and is one of the main evaluators of the applications themselves prior to the student's arrival in the program. After their arrival, the Graduate Coordinator communicates the requirements of the program, including choosing a research advisor in their first few weeks. After that point, the Coordinator works with the College of Sciences and Engineering Technology and the Office of Graduate Studies to monitor student progress academically (probation due to grades, etc.) and to ensure major requirements are met and documented (selecting a thesis committee, completing thesis prospectus, etc.). The Graduate Coordinator also answers any questions the student may have, or refers the student to their Research Advisor if it is a question the Research Advisor should answer.

Research Advisor. In Chemistry, as in many fields of science, a graduate student's Research Advisor plays a major role in their development and serves as their primary source of information and mentoring. All students must meet with all research-active core program faculty in the first four weeks of their first semester to discuss that faculty member's research and capacity to accept new graduate students, then selects a faculty member as Research Advisor. From that point on, the Research Advisor has the role of the student's primary advisor and mentor, guiding them not only through their MS research but also giving a lot of career/field insight and helping them navigate the degree requirements. The research advisor will normally advise the student on appropriate thesis committee composition, progress toward completion of research before writing of the thesis, and generation of both the thesis prospectus and the thesis itself.

Department Chair. The Chair of the Department of Chemistry, for the period of the self-study and currently Dr. Richard Norman, helps MS Chemistry students with administrative advice as needed. He also handles the teaching assignments and overall supervision of all department undergraduate teaching assistants and graduate assistants. The Chair provides additional advice similar to that given by the Graduate Coordinator on course options (the chair determines which graduate course the department offers on a rotating basis). The Chair, in addition to the Graduate Coordinator, evaluates applications to the program to ensure quality students that have the appropriate background to be good fits to the program are admitted.

Other Faculty. Due to the relatively small size of our program, students have access to basically all core faculty one-on-one or in groups. Several recent alumni have indicated that this close interaction with both their Research Advisor and the other faculty is one of the things they liked about the program that was lacking in their PhD programs (see VIII. Assessment Efforts B. Alumni Surveys on page 150). After their first year, students have selected two thesis committee members in addition to their research advisor and they get feedback on their thesis prospectus before approval. The department has a wonderful culture of all members working hard and providing important feedback to the student, while being careful not to interfere with the important Research Advisor-student relationship.

III. Curriculum

A. Description of Curriculum

Students may begin the program in either the fall or spring semesters. Students completing their undergraduate degree in Chemistry at SHSU can begin the program in the summer (as long as they intend to continue with the same research advisor that they had as an undergraduate). In their first semester, students enroll in CHEM 6398 “Graduate Research in Chemistry” and they continue to enroll in CHEM 6398 every semester (earning a grade of IP (In Progress) until they complete their research at which point a grade is assigned). Students select a research advisor early in their first semester. Two graduate lecture courses are offered every fall and spring semester, as is the graduate seminar. Students are required to take the seminar once (for 1 credit) and may repeat it twice earning up to 3 credits for the seminar. They earn 3 credits for CHEM 6398, and 3 credits for Thesis. They take a minimum of 7 lecture courses with at least one course in four of the five areas of chemistry (analytical, biochemistry, inorganic, organic and physical). The choice of lecture courses offered each semester is based upon the needs of the students in the program, the availability of the faculty and the frequency of the offerings. Students typically take 2 lecture courses for 3 “long” semesters (fall and spring are considered to be long semesters), and 1 lecture course in the fourth semester. Students usually complete the program in 6 semesters. The typical pattern is for a student to begin the program in the fall:

Y1 Fall	Y1 Spring	Y1 Summer	Y2 Fall	Y2 Spring	Y2 Summer
Lecture 1	Lecture 3	Research	Lecture 5	Lecture 7	Research
Lecture 2	Lecture 4		Lecture 6	Research	Complete
Seminar	Seminar		Seminar	Begin Thesis	Thesis
Research	Research		Research		

In some cases, the research may take more time and the degree takes longer to complete. In those instances, the student enrolls in both thesis and research—in order to receive a graduate assistantship, the student must be enrolled in 6 hours. In some cases, students are able to defend their thesis in the spring of the second year, reducing their time-to-completion one semester.

1. Curriculum Changes in Recent Years

All tenured and tenure-track faculty are members of the graduate faculty. All graduate faculty teach graduate courses and direct the research of graduate students. When a new faculty member is hired, they teach a graduate course related to their area of research. If the course is already in the curriculum, and isn't "owned" by another faculty member, the new faculty member can teach that course. For example, Christopher Zall was hired after Paul Loeffler retired, and Dr. Zall took over teaching CHEM 5375 "Organometallic Chemistry". If an appropriate course does not exist in the curriculum, the new faculty member develops a course as CHEM 5385 "Selected Topics in Adv Chem." These CHEM 5385 offerings are refined through a couple of offerings and are then added to the course inventory after the faculty member has earned tenure. Upon the retirement of a graduate faculty member, if no one is interested in teaching a particular course, that course might be removed from the curriculum. During the time period of this review, no courses have been removed from the curriculum and three courses have been added (CHEM 5373, CHEM 5375 and CHEM 5382).

2. Proposed Changes to the Curriculum.

We are in the process of adding a new course in "Nanoscience and Nanosensing", and will likely add a course in "Polymer Chemistry" next year or the year thereafter. The former course has been offered as a special topics course by David Thompson on three separate occasions (in Sp12, F14, and F16). A special topics course may only be offered three times before it must be given its own course number. The latter course has been offered as a special topics course by Dustin Gross twice thus far (F13 and Sp16) and is currently being offered by Christopher Hobbs.

B. Appropriateness of Curriculum

1. Degree Plan

While there are technically 4 plans, in the period covered every student followed Thesis Plan 2. This plan requires students to take one 3-credit course in four of five areas of chemistry (analytical, biochemistry, inorganic, organic, and physical) for a total of 12 hours, at least one credit of seminar (which may be repeated for up to 3 credits), 11 additional hours of coursework in chemistry, 3 credits of graduate research and 3 credits of thesis for a total of 30 graduate credit hours.

Thesis Plan 1 includes a minor in a field that logically supports chemistry (such as biology or mathematics). The 11 additional hours of coursework in chemistry of Plan 2 is replaced by 12 credit hours in the minor field for a total of 31 graduate credit hours.

Non-Thesis Plan 1 also includes a minor. This plan requires students to take one 3-credit course in four of five areas of chemistry (analytical, biochemistry, inorganic, organic, and physical) for a total of 12 hours, 3 credits of graduate research, 3 credits of seminar, 6 credits of graduate chemistry electives and 12 credits in an appropriate minor for a total of 36 credit hours.

Non-Thesis Plan 2 requires students to take one 3-credit course in four of five areas of chemistry (analytical, biochemistry, inorganic, organic, and physical) for a total of 12 hours, 3 credits of graduate research, 3 credits of seminar and 18 graduate chemistry electives for a total of 36 credit hours.

We cannot provide a semester by semester listing of courses because there is no set pattern to the offering of courses and students may begin the program in the fall, spring or summer semesters. This latter start is only for students who did their undergraduate work at SHSU and have already joined a research group.

2. Content by Course Description:

SHSU Chemistry course description (copied from the current SHSU Graduate Catalog).

CHEM 5001. Independent Study In Chemistry. 1-3 Hours.
This course is intended to provide an avenue for selected graduate students to engage in

independent studies. Registration is on an individual basis and is restricted to students in residence. Variable Credit (1-3).
Prerequisite: Approval of department chair.

CHEM 5100. Chemical Literature & Seminar. 1 Hour.
Students will participate in the departmental seminar program. This participation will require the preparation and presentation of current research material in a format acceptable to the American Chemical Society.

CHEM 5361. Physical Organic Chemistry. 3 Hours.
This course consists of a study of the effect of structure upon reactivity of organic compounds. The qualitative and quantitative relationship of structure to acidity and basicity in organic chemistry is developed. In addition, reactive intermediates (carbocations, carbanions and free radicals) are studied.
Prerequisite: CHEM 2325, CHEM 2125.

CHEM 5362. Organic Reaction Mechanisms. 3 Hours.
Current models for mechanisms of organic reactions are discussed and applied. The mechanisms and applications of synthetically important reactions are also surveyed. Literature searching for less often utilized but historically important transformations are integral to the course. The methods of determining reaction mechanisms are surveyed along with applications to individual reactions.
Prerequisite: CHEM 2325, CHEM 2125.

CHEM 5368. Analytical Spectroscopy. 3 Hours.
Theory and application of selected areas of spectroscopy commonly used in qualitative and quantitative analysis are covered. Topics include atomic and molecular spectroscopy, mass spectrometry, laser analytical methods, fluorescence, phosphorescence, and chemiluminescence and their application to environmental, atmospheric, and bioanalytical problems.
Prerequisite: CHEM 4440.

CHEM 5372. Advanced Biochemistry I. 3 Hours.
The chemical structure and the biological functions and controls of proteins are reviewed. Proteins to be considered include enzymes, transport proteins and structural proteins. Protein biosynthesis and recombinant DNA technology are also discussed.

CHEM 5373. Drug and Toxin Biochemistry. 3 Hours.
This course examines biotransformations of drugs/toxins, mechanisms of drug interactions with biological systems, and selective toxicity. Students will gain insight into the design of therapeutic agents and the destruction of harmful toxins/bacterial invaders in living systems. Attention will also be given to how molecular structure is related to solubility and permeability and how to design systems for drug delivery within the human body.

CHEM 5374. Chem Of Coordination Compounds. 3 Hours.
The chemistry of compounds containing metal ions is discussed. Emphasis in placed on the complexes of transition metals. The electronic configurations of these ions in various bonding environments are considered in interpreting their chemical and physical properties.
Prerequisite: CHEM 4367 and CHEM 4448.

CHEM 5375. Organometallic Chemistry. 3 Hours.
The course examines organometallic chemistry through a detailed presentation of structure and bonding. In addition, this course focuses on these principles with in-depth discussions of organometallic reaction mechanisms, advances in catalysis, carbene complexes. metathesis reactions, application to organic synthesis, and cluster compounds.
Prerequisite: CHEM 4367.

CHEM 5381. Adv Physl Chem Thermodynamics. 3 Hours.
Principles are stressed including the three laws of thermodynamics, thermochemistry and statistical thermodynamics. Applications of the principles to gases, solution, mixtures, solids and interfaces are given.
Prerequisite: CHEM 4448.

CHEM 5382. Symmetry and Spectroscopy. 3 Hours.
Quantum theory and symmetry are studied in detail and applied to the interpretation and prediction of spectroscopic data. Infrared, Raman, and electronic spectroscopic methods are examined in depth.
Prerequisite: CHEM 4448 or departmental approval.

CHEM 5385. Selected Topics In Adv Chem. 3 Hours.
This course is adaptable to the needs and interests of the individual graduate student majoring in Chemistry. Modern developments in specific subdivisions of the field of chemistry are considered. It may be repeated for credit, provided the repetition is not in the same subdivisional field. The subdivisional fields offered are: analytical, biochemistry, environmental, inorganic, organic, and physical chemistry.
Prerequisite: Graduate standing in Chemistry.

CHEM 6099. Thesis. 1-3 Hours.

CHEM 6398. Graduate Research In Chemistry. 3 Hours.

The one analytical course is CHEM 5368.
Biochemistry courses include CHEM 5372 and CHEM 5373.
Inorganic courses include CHEM 5374 and CHEM 5375.
Organic courses include CHEM 5361 and CHEM 5362.
Physical courses include CHEM 5381 and CHEM 5382.

(Note: CHEM 5001 has never been offered.)

3. Similar Program Comparisons

	SHSU	BSU[1]	CSU, Fresno[2]	MSU[3]	WSU[4]
Total Credits	30	30	30	32	30
Course Credits	24	17	22	20	18

# of courses	7 or 8	5	7 or 8	7 – 9	7
Distribution	Y (4 of 5)	Y (5)	Y (4 of 5)	Y (3 of 7)	Y (4)
Analytical	√	√	√	√	√
Biochemistry	√	√	√	√	
Inorganic	√	√	√	√	√
Organic	√	√	√	√	√
Physical	√	√	√	√	√
Chemical Education				√	
Environmental				√	
Seminar required	Y	Y	Y	Y	Y
Thesis required	Y	Y	Y	Y	Y

[1]: Ball State University

[2]: California State University, Fresno

[3]: Missouri State University

[4]: Wright State University

All 5 programs require: the writing and defense of a Master's thesis; a graduate seminar; specified core areas (with some variation of what constitutes a core area) with a minimum of three areas covered; the total number of lecture courses required ranges from 5 to 9 with 7 courses being the norm; and all programs require a minimum of 30 credit hours of graduate credit.

The following course descriptions are copied from the various graduate catalogs indicated and were accessed during the month of October, 2017.

Course Descriptions, **Ball State University**

500 Chemical Communications (1) Use of scientific literature, sources, and classification systems, and current and retrospective searches in the specialized branches of chemistry.
Prerequisite: 20 credits of chemistry or permission of the department chairperson.
Not open to students who have credit in CHEM 400.

510 Review of Chemistry Fundamentals (1) Introductory graduate course which reviews fundamental chemistry concepts in the areas of physical, organic, inorganic, analytical, and biochemistry, and develops critical thinking skills.
Open only to chemistry graduate students.

520 Chemical Instrumentation 1 (3) Theoretical principles and applications of selected optical spectroscopic, mass spectroscopic, electrochemical, thermal, and chromatographic methods of chemical analysis with illustrative experiments.
Two hours of lecture and one three-hour laboratory period weekly.
Prerequisite: CHEM 225 and CHEM 232 or 235 or permission of the department chairperson.
Not open to students who have credit in CHEM 420.

521 Chemical Instrumentation 2 (3) Advanced treatment of selected topics in spectroscopy, electrochemistry, and chromatography. Introduction to mass spectroscopy, nuclear methods, and thermal and surface analysis. Three hours of lecture weekly.
Prerequisite: CHEM 520 or permission of the department chairperson.

525 Instrumental Methods of Analysis (3) Practical applications of modern chemical instrumentation: electrometric, chromatographic, and spectroscopic methods.
For chemical/medical technologists or departmental minors.
Two hours of lecture and one three-hour laboratory weekly.
Prerequisite: CHEM 225.
Not applicable to MS or MA degree programs in chemistry.
Not open to students who have credit in CHEM 325.

530 Organic Laboratory Techniques (2) Laboratory course that includes multi-step syntheses of organic compounds, their isolation, purification, and characterization using modern spectroscopic and chromatographic techniques. Six hours of laboratory weekly.
Prerequisite: CHEM 232 or equivalent.
Not open to students who have credit in CHEM 430.

540 Selected Principles of Physical Chemistry (3) Introduction to the properties of solids, liquids, gases, and solutions and to the basic concepts of thermodynamics and kinetics. Especially for premedical, biology, and general science majors, chemistry teaching majors, and chemistry minors. Two hours of lecture and one three-hour recitation/laboratory period weekly.
Prerequisite: CHEM 225; MATH 161.
Not open to students who have credit in CHEM 340, 344, or 544.

544 Physical Chemistry 1 (4) Thermodynamic and structural description of chemical processes and properties of solids, liquids, gases, and solutions. Three hours of lecture and one three-hour laboratory period weekly.
Prerequisite: CHEM 232 or 235; MATH 166; one year of college physics.
Not open to students who have credit in CHEM 344.
Cannot be used for credit by a candidate for the master of science degree with chemistry as a major.

545 Physical Chemistry 2 (4) Continuation and extension of CHEM 544. Topics include reaction kinetics, theoretical facets of quantum mechanics, and spectroscopy. Three hours of lecture and one three-hour laboratory period weekly.
Prerequisite: CHEM 344 or 544.
Not open to students who have credit in CHEM 345.
Cannot be used for credit by a candidate for the master of science degree with chemistry as a major.

550 Inorganic Chemistry (4) Chemistry of the elements, including the relationships of chemical properties and atomic and molecular structure, chemical bonding, acid-base theories, chemical periodicity, and modern theories of coordination compounds. Four hours of lecture weekly.
Prerequisite: CHEM 232 or 235 or 360; MATH 161 or 165.
Not open to students who have credit in CHEM 450.

560 Essentials of Biochemistry (4) Organic chemistry of carboxylic acids, amines, and their derivatives; biochemistry of proteins, carbohydrates, lipids, and nucleic acids; metabolism and the regulation of metabolic processes. For students in life sciences, dietetics, and medical technology.
Three hours of lecture and one three-hour laboratory session weekly.
Prerequisite: CHEM 231 or equivalent.
Not applicable to MS or MA degree programs in chemistry.
Not open to students who have credit in CHEM 360 or 463 or 563.

563 Principles of Biochemistry 1 (3) Chemistry of proteins, enzymes, nucleic acids, carbohydrates, and lipids. For chemistry, life sciences, and premedicine majors. Three hours of lecture weekly.
Prerequisite: CHEM 232 or 235.
Not open to students who have credit in CHEM 463.

564 Principles of Biochemistry 2 (3) Continuation and extension of CHEM 563 including biological oxidations and energy transfers; metabolism of carbohydrates, lipids, proteins, and nucleic acids; and regulation of metabolic processes. Three hours of lecture weekly.
Prerequisite: CHEM 463 or 563.
Not open to students who have credit in CHEM 464.

575 Exploration of Selected Topics in Chemistry (1-3) Discussion or written reports or both in advanced special topics in or related to chemistry. Examples are topics in neurochemistry, physical organic, chemical synthesis, kinetics, spectroscopy, etc.
Prerequisite: permission of the department chairperson.
A total of 6 credits may be earned, but no more than 3 in any one semester or term.

626 Advanced Analytical Chemistry (3) Survey of modern analytical chemistry. Topics include sampling, wet chemical techniques, nonaqueous systems, and contemporary research and applications in chromatography, spectroscopy, and electrochemistry. Three hours of lecture weekly.

Prerequisite: CHEM 225 or equivalent.

627 Analytical Chemistry in the Environmental Sciences (3) Survey of the development and implementation of modern analytical methods, particularly as they apply to the study of environmentally relevant systems. Techniques include gas and liquid chromatography, mass spectrometry, UV-visible absorption and fluorescence spectroscopy, electrochemistry and elemental analysis techniques such as AAS and ICP.
Prerequisite: permission of the department chairperson.

636 Advanced Organic Chemistry (3) Topics include nomenclature, bonding, acids and bases, stereochemistry, structure-reactivity relationships, and mechanisms of important reactions. Introduction to synthesis, the disconnect approach, synthons, protecting groups, and functional group interconversions.
Prerequisite: CHEM 232 or 235 or equivalent.

646 Advanced Physical Chemistry (3) Survey of physical chemical principles with emphasis on practical applications. Topics include thermodynamics, reaction kinetics, and selected quantum chemical applications.
Prerequisite: CHEM 345 or equivalent.

651 Advanced Inorganic Chemistry (3) Continuation of CHEM 550. Current theories of bonding in coordination chemistry. Descriptive and theoretical treatments of the chemistry and structure of transition metal complexes, organometallic compounds, fluxional molecules, and metal clusters; the importance of metals in biological systems. Three hours of lecture weekly.
Prerequisite: CHEM 450, 340 or 344.

667 Medical Biochemistry (6) Chemistry of major cellular constituents; enzymes as the catalysts of intracellular chemical reactions with emphasis on underlying principles of physical and organic chemistry. Intermediary metabolism of carbohydrates, lipids, amino acids, and nucleotides; modern techniques employed in the study of metabolic processes; biosynthesis and degradation of intracellular components; hormonal regulation of metabolism.

Prerequisite: admission to the medical education program.

670 Research in Chemistry (1-9) Original work at the molecular level on projects based in the current scientific literature. The projects will be directed by graduate faculty and will typically involve aspects of ongoing research.
Prerequisite: permission of the department chairperson.
A total of 9 credits may be earned.

671 Research in Chemical Education (1-9) Original work based on the current science education literature. Projects will be directed by graduate faculty and may involve conducting surveys, developing new instructional materials or methods, or evaluating the effectiveness of technology-based teaching.
Prerequisite: permission of the department chairperson.
A total of 9 credits may be earned.

673 Seminar in Chemistry (1) Critical examination and discussion of recent experimental and theoretical developments in chemistry.
Prerequisite: CHEM 400 or 500; permission of the department chairperson.
A total of 4 credits may be earned, but no more than 1 in any one semester or term.

675 Advanced Topics in Chemistry (1-9) Discussion, experimentation, or both in specialized topics for the qualified advanced student. Information concerning specific topics offered during a given semester may be obtained from the departmental office. Lecture and laboratory schedules appropriate to the topics offered.
Prerequisite: permission of the department chairperson.
A total of 9 credits may be earned.

690 Contemporary Instruction and Curricula in Chemistry (3) Designed to make the inservice chemistry teacher familiar with management of large-group instruction, development and implementation of multimedia materials in instructional schemes, use of videotape in the

laboratory, and facility design for modular and other systems. Field trips to nearby schools to study facility design may be included. Two hours of lecture weekly.
Prerequisite: permission of the department chairperson.
A total of 6 credits may be earned, but no more than 3 in any one semester or term.

696 Chemistry Research Methods (2) Introduction to use of scientific literature, design of research experiments, specialized techniques, and writing skills endemic to the specialized fields of chemistry. Class and laboratory experience appropriate to students' specializations.
Prerequisite: CHEM 400 or 500; permission of the department chairperson.

770 Research in Chemistry (1-12) In-depth original work at the molecular level on projects based in the current scientific literature. The projects will be directed by graduate faculty and will typically involve aspects of ongoing research.
Prerequisite: permission of the department chairperson.
A total of 12 credits may be earned.

771 Research in Chemical Education (1-12) In-depth original work based on the current science education literature. Projects will be directed by graduate faculty and may involve conducting surveys, developing new instructional materials or methods, or evaluating the effectiveness of technology-based teaching.
Prerequisite: permission of the department chairperson.
A total of 12 credits may be earned.

773 Chemistry and Chemical Education Seminar (1) In-depth analyses of recent trends and developments in chemistry or chemical education. Seminar participants report on assigned topics to departmental groups.
Prerequisite: permission of the department chairperson.
A total of 6 credits may be earned, but no more than 1 in any one semester or term.

Course Descriptions, **California State University, Fresno**
CHEM 201. Chemistry Laboratory Teaching Techniques

Prerequisites: concurrent appointment as a teaching associate in the department of Chemistry or permission of instructor. Discussion and practice of effective laboratory teaching techniques, laboratory safety, common equipment setups, and grading. (2 activity hours)
Units: 1

CHEM 211. Chemical Thermodynamics
Prerequisites: CHEM 110A, CHEM 110B, CHEM 111. Principles of thermodynamics; application to chemical problems; introduction to statistical methods, calculation of thermody namic functions from spectroscopic data.
Units: 3

CHEM 212. Chemical Applications of Group Theory
Prerequisites: CHEM 110A, CHEM 110B, CHEM 111. Introduction to symmetry operations, point groups and their properties. Application of group theory to chemical problems such as; selection rules for electronic, IR, Raman and microwave activity, molecular orbital theory, transition metal complexes, hybridization, and other chemical topics.
Units: 1-2

CHEM 215. Quantum Chemistry
Prerequisite: graduate standing. Seminar on recent advances in quantum mechanics; chemical bonding, and atomic and molecular spectroscopy.
Units: 3

CHEM 220. Theoretical Inorganic Chemistry
Prerequisites: CHEM 110A, CHEM 110B, CHEM 123. Seminar on theoretical inorganic chemistry emphasizing structure and bonding of inorganic and coordination compounds, valence bond, molecular orbital and ligand field theories; correlation of structure and reactivity.
Units: 3

CHEM 222. Advances in Inorganic Chemistry

Prerequisites: CHEM 110A, CHEM 110B, CHEM 123, CHEM 128B. Seminar on recent advances in inorganic chemistry. Topics may include, but are not limited to, organometallic chemistry, solid-state chemistry, nonmetallic complexes, and the chemistry of rare-earth compounds.
Units: 3

CHEM 225. Separation Methods in Chemistry
Prerequisites: CHEM 106 and CHEM 129B. Seminar on the theory, application, and literature of various separation methods for organic and inorganic analysis. May include laboratory.
Units: 1-3

CHEM 226. Electrochemistry
Prerequisite: CHEM 106. Seminar on the theory, application, recent developments, and literature of electrochemistry and electrochemical methods of organic and inorganic analysis. May include laboratory.
Units: 1-3

CHEM 227. Analytical Spectroscopy
Prerequisites: CHEM 106, CHEM 110A, CHEM 110B, or permission of instructor. Theory, instrumentation, and application. Recent developments and literature of spectroscopic techniques. May include laboratory.
Units: 1-3

CHEM 228. Mass Spectrometry
Prerequisites: CHEM 106 or CHEM 125, CHEM 128B, CHEM 108 or CHEM 110A, and CHEM 110B; or permission of instructor. Seminar on the theory and application of mass spectrometry techniques to chemical analysis and identification. May include laboratory.
Units: 1-3

CHEM 230. Advanced Organic Chemistry

Prerequisites: CHEM 128B, CHEM 129B. Seminar on recent advances in organic chemistry including reaction mechanisms and synthetic applications with references to current literature.
Units: 3

CHEM 235. Physical Organic Chemistry
Prerequisites: CHEM 110A, CHEM 110B, CHEM 128B. Seminar in application of modern theoretical concepts to the chemical and physical properties of organic compounds.
Units: 3

CHEM 240T. Topics in Advanced Chemistry
Seminar covering special topics in one of the areas of chemistry: analytical, biochemistry, inorganic, organic, physical. Some topics may have a laboratory.
Units: 1-3

CHEM 240T. Computational Chem
This computational chemistry course provides a basis for understanding and using a variety of computer based modeling techniques commonly found in modern research. Molecular mechanics, semi-empirical and quantum methods will be discussed, with particular emphasis on ab initio approaches. The underlying theory and algorithms, as well as practical application will be covered. Opportunities will be provided for students to apply concepts to their own research or topics of interest.
Units: 3

CHEM 240T. Physical Chemistry of Surfaces
The course will examine chemical phenomena dominated by interfacial energy and structure. Beginning with bulk manifestations (capillarity, adhesion) described by thermodynamics (adsorption, self-assembly, pattern formation). Emphasis on model experimental systems and their theoretical descriptions, with case studies for a coherent view of molecular reality. Primary literature on contemporary topics of interest will be covered.
Units: 3

CHEM 240T. Application of Learning Theories to Chemistry Instruction
This course will apply learning theories such as behaviorism, cognitivism, and constructivism to Chemistry concepts and classroom practices. Students will examine educational literature focused on the epistemology, ontology, and axiology of such learning theories and how they inform cognitive, social, and emotional perspectives. Overall, students will engage with important guiding principles for the development of effective instruction and powerful learning experiences.
Units: 3

CHEM 240T. Structure/Function Relationships in Mitochondrial Proteins
Mitochondria are cell organelles which have been shown to be implicated in the development of diseases such as cancer and tissue degeneration. This course will describe how structure definition and modification influence the function of mitochondrial proteins in processes such as cell signaling and cell metabolism. A strong emphasis will also be made on the description of the common techniques allowing the assessment of mitochondrial proteins structure and function.
Units: 3, Repeatable up to 9 units

CHEM 240T. Introduction to Medicinal Chemistry
Prerequisites: CHEM 128B, CHEM 129B. Introduction to medicinal chemistry and drug discovery, therapeutic areas and drug targets, drug design, development and metabolism, lead modification, structure-activity relationship (SAR), pro-drugs, mechanisms of drug action and case studies.
Units: 3

CHEM 241A. Molecular Biology I-II
(BIOL 241A same as CHEM 241A and FBS 241A.) Prerequisites: BIOL 102, BIOL 103, CHEM 150 or CHEM 155A or permission of instructor. Current topics in molecular biology are addressed, including protein and nucleic acid structure, DNA replication, transcription, translation, prokaryotic and eukaryotic regulation, mechanisms of exchange of generic material, and recombinant DNA technology.
Units: 3

CHEM 241B. Molecular Biology I-II
(Same as BIOL 241A and BIOL 241B.) Prerequisites: BIOL 140A, BIOL 140B, CHEM 150 or CHEM 155A, or permission of instructor. BIOL 241A/CHEM 241A is prerequisite for BIOL 241B or CHEM 241B. Current topics in molecular biology are addressed, including protein and nucleic acid structure, DNA replication, transcription, translation, prokaryotic and eukaryotic regulation, mechanisms of exchange of generic material, and recombinant DNA technology.
Units: 3

CHEM 242. Techniques in Protein Purification and Analysis
(Same as BIOL 242.) Prerequisite: CHEM 151 or CHEM 156 or permission of instructor. Corequisite: BIOL 241A or CHEM 241A. Deals with the technologies relevant to protein isolation, purification, analysis, immobilization, and modification in micro and macro quantities. (1 lecture, 6 lab hours) (Class fee, $40)
Units: 3

CHEM 242. Forensic DNA Analysis
Prerequisites: BIOL 102, CHEM 150 or CHEM 155, or permission of instructor. FBS 241A recommended but not required. Provides an understanding of forensic DNA analysis, from extraction of DNA from biological tissues commonly encountered in forensic practice through typing and interpretation of profiles obtained to the presentation of these types of data in courts of law. (Formerly FBS 252)
Units: 3

CHEM 243. Nucleic Acid Technology Lab
(Same as BIOL 243.) Prerequisites: BIOL 241A or CHEM 241A and BIOL 242 or CHEM 242. Corequisite: BIOL 241B or CHEM 241B. A lecture/laboratory course focusing on the technologies used in nucleic acid chemistry; specifically, synthesis, translation, mutagenesis, and genetic engineering. (1 lecture, 6 lab hours) (Course fee, $40)
Units: 3

CHEM 244. Cell Culture Techniques
(Same as BIOL 244.) Prerequisites: BIOL 103 and BIOL 104. The theory and practice of in vitro propagation of eukaryotic cells, including growth characteristics, metabolic requirements, genetic analysis, and screening assays. Special focus is on cancer cell lines with the potential for stem cell manipulation relative to cell biology culture and application to biotechnology. (1 lecture, 6 lab hours)
Units: 3

CHEM 245. Industrial Biotechnology
(Same as BIOL 245) Prerequisites: BIOL 120 and CHEM 150 or CHEM 155, or permission of instructor. The study of bioprocessing, both theory and current practices, including hands-on experience with standard techniques and formulation of a strategic plan for a new technology or product. (2 lecture, 3 lab hours).
Units: 3

CHEM 248. Seminar in Molecular Biology and Biotechnology
(CHEM 248 same as BIOL 248.) Prerequisite: admission to the biology or chemistry graduate program. Preference will be given to students enrolled in the Master of Biotechnology Program. Reviews and reports on current literature in various aspects of biotechnology and molecular biology.
Units: 1-2, Repeatable up to 4 units

CHEM 250. Forensic Micropscopy & Materials Analysis
Forensic science methods for analysis of inorganix evidentiary materials, including composition and comparison of trace and impression eveidence and their interpretation and significance. This course will cover topics in microscopy (confocal, polarized, brightfield, phase contrast, dissecting, compound, comparison, electron), impression evidence (fingerprints, firearms/toolmarks), trace evidence (hair, fibers, and biological), arson, ink comparisons, evidentiary statistics, and quality assurance/quality control (QA/QC). (2 hours lecture, 2 hours lab)
Units: 3

CHEM 251. Forensic Drug Chemistry and Toxicology
(FBS 251 same as CHEM 251) Prerequisites: CHEM 128B, CHEM 129A, and CHEM 102 or CHEM 105, or persmission of instructor. CHEM 106 or CHEM 125 strongly recommended. Forensic science methods for analysis of controlled substances (in vivo or ex vivo) and their interpretation and significance May include laboratory.
Units: 3

CHEM 260. Advanced Research Techniques
Prerequisites: classified standing or permission of the instructor. Advanced concepts in experimental design. Development of practical research expertise and communication skills through the planning, completion, and presentation (both written and oral) of a short laboratory project. (1 lecture, 6 lab hours)
Units: 3

CHEM 280. Seminar in Chemistry
Approved for RP grading.
Units: 1, Repeatable up to 3 units

CHEM 290. Independent Study
See Academic Placement -- [-LINK-]. Approved for RP grading.
Units: 1-3, Repeatable up to 6 units

CHEM 291. Intership in Science Laboratory
(Same as CHEM 291) Prerequisites: classified standing in the MSFS program with successful completion of the Graduate Writing Requirement and beginning work with the student's research mentor on approved project/thesis research. Minimum of 150 hours research internship. May be completed at any public crime laboratory or facility approved by program coordinator. (Current employees of public crime laboratories may take FBS 290 instead of FBS 291 - must pass required agency background investigation.) S
Units: 3

CHEM 295. Research
Prerequisite: permission of instructor. Independent investigations of an advanced character for the graduate student with adequate preparation. Approved for SP grading. (May include conferences, laboratory, library.)
Units: 2

CHEM 298. Project
Prerequisite: Preparation, completion, and submission of an acceptable thesis for the master's degree. Approved for RP grading.
Units: 4

CHEM 298C. Project Continuation
Pre-requisite: Project CHEM 298. For continuous enrollment while completing the project. May enroll twice with department approval. Additional enrollments must be approved by the Dean of Graduate Studies.
Units: 0

CHEM 299. Thesis
Prerequisite: See [-LINK-]. Preparation, completion, and submission of an acceptable thesis for the master's degree. Approved for RP grading.
Units: 4

CHEM 299C. Thesis Continuation
Pre-requisite: Thesis BIOL 299. For continuous enrollment while completing the thesis. May enroll twice with department approval. Additional enrollments must be approved by the Dean of Graduate Studies.
Units: 0

CHEM 340T. Topics in Chemistry

A professional development seminar covering speical topics in one of the areas chemistry: analytical, biochemistry, forensic, inorganic, organic, physical. Some topics may have a laboratory or activity component.
Units: 1-3

Course Descriptions, **Missouri State University**

CHM 602 Techniques of Instrumental Analysis

Prerequisite: "C-" or better in either [CHM 201 and 202] or CHM 342; and "C-" or better in CHM 302.

Recommended Prerequisite: PHY 124 or PHY 204. Applications of instrumental methods for the separation and analysis of materials; included are potentiometry, photometry and chromatography. Does not apply to a Chemistry major if the student passes CHM 702. May be taught concurrently with CHM 502. Cannot receive credit for both CHM 502 and CHM 602.

Credit hours: 4
Lecture contact hours: 3
Lab contact hours: 3
Typically offered: Fall

CHM 605 Fundamentals of Physical Chemistry

Prerequisite: permission.

A one semester introduction to physical chemistry including the following topics: thermodynamics, chemical equilibrium, chemical kinetics, atomic and molecular structure, and spectroscopy. Laboratory experiments will illustrate principles of physical chemistry and techniques of analysis. Credit does not apply to BS or MS degrees in Chemistry. May be taught concurrently with CHM 505. Cannot receive credit for both CHM 505 and CHM 605.

Credit hours: 4
Lecture contact hours: 3
Lab contact hours: 3
Typically offered: Spring

CHM 606 Physical Chemistry I

Prerequisite: "C-" or better in CHM 170; and MTH 280 or MTH 288 or concurrent enrollment in MTH 280 or MTH 288.

Recommended Prerequisite: MTH 302; and PHY 124 or PHY 204. First semester of a two-semester series covering aspects of quantum mechanics, classical and statistical thermodynamics, spectroscopy, kinetic theory of gases, and chemical kinetics. A grade of "C-" or better is required in this course in order to take CHM 607. May be taught concurrently with CHM 506. Cannot receive credit for both CHM 606 and CHM 506.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Fall

CHM 607 Physical Chemistry II

Prerequisite: "C-" grade or better in CHM 506 or 606.

Recommended Prerequisite: CHM 375. Second semester of a two-semester series that builds upon and completes the topics introduced in CHM 606. May be taught concurrently with CHM 507. Cannot receive credit for both CHM 607 and CHM 507.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Spring

CHM 608 Physical Chemistry Laboratory I

Prerequisite: "C-" or better in CHM 302; and "C-" or better in CHM 506 or CHM 606 or concurrent enrollment in CHM 506 or CHM 606.

Experiments in physical chemistry employing principles and techniques reflecting material presented in CHM 506 or 606. May be taught concurrently with CHM 508. Cannot receive credit for both CHM 608 and CHM 508.

Credit hours: 2

Lecture contact hours: 0

Lab contact hours: 4

Typically offered: Fall

CHM 609 Physical Chemistry Laboratory II

Prerequisite: CHM 507 or CHM 607 or concurrent enrollment; and CHM 508 or CHM 608.

Experiments in physical chemistry employing principles and techniques reflecting material presented in CHM 507 or 607. May be taught concurrently with CHM 509. Cannot receive credit for both CHM 609 and CHM 509.

Credit hours: 2

Lecture contact hours: 0

Lab contact hours: 4

Typically offered: Spring

CHM 614 Polymer Chemistry

Prerequisite: "C-" or better in CHM 343 or CHM 344; and CHM 505 or CHM 605 or CHM 506 or CHM 606.

Morphology and chemical structure, polymer characterization, chemical structure and polymer properties, vinyl and non-vinyl polymers and mechanism of formation. Inorganic and partially inorganic polymers. May be taught concurrently with CHM 514. Cannot receive credit for both CHM 514 and CHM 614.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Spring (even-numbered years)

CHM 635 Investigations in Chemistry for Teachers

Prerequisite: coursework sufficient to meet Missouri certification standards for secondary/middle school science teaching.

Techniques in performing science investigation with application to secondary and middle school science. May be taught concurrently with CHM 435. Cannot receive credit for both CHM 435 and CHM 635.

Credit hours: 1

Lecture contact hours: 0

Lab contact hours: 2

Typically offered: Spring (odd-numbered years)

CHM 642 Advanced Organic Chemistry

Prerequisite: "C-" grade or better in CHM 343 or CHM 344.

Structure, reaction mechanisms, stereochemistry and other topics of theoretical nature in organic and polymer chemistry. May be taught concurrently with CHM 542. Cannot receive credit for both CHM 542 and CHM 642.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Fall

CHM 652 Biochemistry II

Prerequisite: "C-" or better in CHM 452.

Bioenergetics--Metabolism of biomolecules including carbohydrates, lipids, amino acids and nucleotides. Photosynthesis. Nitrogen metabolism. Mechanisms of hormone action. May be taught concurrently with CHM 552. Cannot receive credit for both CHM 552 and CHM 652.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Spring

CHM 653 Advanced Biochemistry Laboratory

Prerequisite: CHM 453; and CHM 552 or CHM 652 or concurrent enrollment in CHM 552 or CHM 652.

Emphasis on modern techniques in the biochemistry laboratory; enzymology, protein purification and analysis; protein structure determination; isoelectric focusing; HPLC; trace techniques. Supplemental course fee. May be taught concurrently with CHM 553. Cannot receive credit for both CHM 553 and CHM 653.

Credit hours: 2
Lecture contact hours: 0
Lab contact hours: 4
Typically offered: Upon demand

CHM 660 Chemistry of Environmental Systems: Water and Land
Recommended Prerequisite: some advanced coursework in chemistry, geosciences, biology, or related fields. Chemistry of water and soil, water treatment, agricultural chemistry, and related topics. May be taught concurrently with CHM 460. Cannot receive credit for both CHM 460 and CHM 660.
Credit hours: 3
Lecture contact hours: 3
Lab contact hours: 0
Typically offered: Fall

CHM 661 Chemistry of Environmental Systems: Air and Energy
Recommended Prerequisite: some advanced coursework in chemistry, geosciences, biology, or related fields. Atmospheric chemistry; pollution issues related to power production and transportation; energy sources and fuels. May be taught concurrently with CHM 461. Cannot receive credit for both CHM 661 and CHM 461.
Credit hours: 3
Lecture contact hours: 3
Lab contact hours: 0
Typically offered: Spring

CHM 662 Chemistry of Environmental Systems Laboratory
Prerequisite: CHM 660 or concurrent enrollment.
Techniques and procedures for environmental monitoring to test natural samples. Applications and limitations of wet chemical and instrumental methods such as atomic absorption, gas chromatography, and absorption spectrophotometry. May be taught concurrently with CHM 462. Cannot receive credit for both CHM 462 and CHM 662.

Credit hours: 2

Lecture contact hours: 0

Lab contact hours: 4

Typically offered: Spring

CHM 675 Advanced Inorganic Chemistry

Prerequisite: "C-" or better in CHM 375.

Theories and techniques of modern inorganic chemistry; correlation of theories with inorganic compounds. May be taught concurrently with CHM 575. Cannot receive credit for both CHM 575 and CHM 675.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Spring

CHM 697 Special Topics in Chemistry

Prerequisite: 18 hours of chemistry.

Selected topics of a theoretical or applied nature. May be repeated up to a total of 6 hours with differing topics. May be taught concurrently with CHM 597. Cannot receive credit for both CHM 597 and CHM 697.

Credit hours: 1-3

Lecture contact hours:

Lab contact hours:

Typically offered: Upon demand

CHM 700 Chemistry Colloquium

A series of oral presentations on new developments in chemistry. Presentations to be made by faculty members, students, and guest speakers from industry and academe. One of the requirements of this course is an oral presentation. May be repeated, but not more than 2 hours may be counted toward the 32-hour requirement for the MS in Chemistry degree.

Credit hours: 1

Lecture contact hours: 1

Lab contact hours: 0

Typically offered: Fall, Spring

CHM 701 Chemistry Seminar

Attendance at oral presentations on new developments in chemistry. Presentations may include those made by departmental faculty members, departmental graduate students, guest speakers from industry and academe and ACS tour speakers. All graduate students not enrolled in CHM 700 must be enrolled in CHM 701. Hours earned will not count toward the 32-hour requirement for the MS in Chemistry degree. Graded Pass/Not Pass only.

Credit hours: 1

Lecture contact hours: 1

Lab contact hours: 0

Typically offered: Fall, Spring

CHM 702 Advanced Topics in Analytical Chemistry

Prerequisite: CHM 602.

An advanced topic in analytical chemistry will be addressed via faculty lectures and student projects. Examples of proposed topics include: electroanalytical methods, nanotechnology, forensic chemistry and data acquisition methods. Variable content course. May be repeated to a total of 6 hours with differing topics.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Upon demand

CHM 710 Special Topics in Chemical Education

Prerequisite: coursework sufficient to meet Missouri certification standards in chemistry for secondary teaching or permission.

A single topic of current interest in the teaching of chemistry will be considered. May be repeated to a total of 9 hours provided the topics are different.

Credit hours: 1-3

Lecture contact hours:

Lab contact hours:

Typically offered: Upon demand

CHM 720 Topics in Theoretical Chemistry

Prerequisite: coursework sufficient to meet Missouri certification standards in chemistry for secondary teaching or permission.

Nature of matter including atomic structure, chemical bonding and spectroscopy.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Upon demand

CHM 735 Investigation in Chemistry for Teachers

Prerequisite: CHM 635 or concurrent enrollment; coursework sufficient to meet Missouri certification standards for secondary/middle school science teaching.

Techniques in performing science investigation with application to secondary and middle school science.

Credit hours: 3

Lecture contact hours: 1

Lab contact hours: 4

Typically offered: Spring (odd-numbered years)

CHM 742 Physical Organic Chemistry

Prerequisite: CHM 642.

An in-depth study of the experimental techniques and physical principles used for the determination of organic reaction mechanisms.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Upon demand

CHM 752 Advanced Topics in Biochemistry

Prerequisite: CHM 652.

An advanced topic in biochemistry will be addressed via faculty lectures and student projects. Examples of proposed topics include: carbohydrates, the cell surface, and physical biochemistry. Variable content course. May be repeated to a total of 6 hours with differing topics.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Spring (odd-numbered years)

CHM 770 Chemical Kinetics

Prerequisite: CHM 606.

Fundamental concepts of chemical kinetics and dynamics, from both macroscopic and molecular level perspectives. An emphasis will be placed on the interpretation of gas, liquid, surface and catalyst reaction kinetics and mechanisms.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Fall (odd-numbered years)

CHM 771 Chemical Bonding

Prerequisite: CHM 607.

Quantum mechanics; atomic and molecular structure; computational procedures. Independent study project required.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Fall (even-numbered years)

CHM 775 Organometallic Chemistry

Prerequisite: CHM 675.

An in-depth examination of the structure, properties, and reactions of molecules containing one or more metal atoms bonded to organic fragments.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Fall (even-numbered years)

CHM 790 Advanced Topics in Chemistry

Detailed treatment of various advanced topics in chemistry. Variable content course. May be repeated with differing topics.

Credit hours: 1-3

Lecture contact hours:

Lab contact hours:

Typically offered: Upon demand

CHM 791 Preparation for Graduate Study in Chemistry

Prerequisite: admission to graduate program in Chemistry.

Orientation to graduate study in chemistry, including laboratory safety, scientific dissemination, and design of a research project.

Credit hours: 2

Lecture contact hours: 2

Lab contact hours: 0

Typically offered: Fall, Spring

CHM 792 Degree Paper in Chemistry

Prerequisite: 4 or more hours of CHM 798 and departmental permission.

Written research paper on a selected topic to be read and evaluated by an advisory committee and presented orally before a public audience. Exclusively satisfies requirements for non-thesis option.

Credit hours: 3

Lecture contact hours: 3

Lab contact hours: 0

Typically offered: Upon demand

CHM 793 Research Paper in Chemistry

Prerequisite: departmental permission.

Extensive paper on a selected topic to be read and evaluated by a faculty committee. Exclusively used to satisfy requirements for non-thesis option. Graded Pass/Not Pass only.

Credit hours: 1

Lecture contact hours: 1

Lab contact hours: 0

Typically offered: Upon demand

CHM 796 Science Internship

Completion of an internship project (80 hours/credit hour) at a discipline-related business, nonprofit organization, or government agency, approved and supervised by both the departmental and internship advisors. Includes a formal report in the appropriate professional format, and an oral presentation at an approved venue. Graded Pass/Not Pass only. No more than 6 hours may count toward a masters degree.

Credit hours: 1-6

Lecture contact hours:

Lab contact hours:

Typically offered: Fall, Spring, Summer

CHM 798 Research

Supervised research in special chemistry areas. May be repeated, but not more than 6 hours of CHM 798 may be counted toward the 32-hour requirement for the MS degree.

Credit hours: 1-4

Lecture contact hours:

Lab contact hours:

Typically offered: Fall, Spring

CHM 799 Thesis

Independent research and study connected with preparation of thesis. Not more than 6 hours of CHM 799 may be counted toward the 32-hour requirement for the MS degree.

Credit hours: 1-6

Lecture contact hours:

Lab contact hours:

Typically offered: Upon demand

Course Descriptions, **Wright State University**

CHM 6020 - Advanced Environmental Chemistry and Analysis

Credit Hour(s): 3

Environmental sampling and analysis using instrumental techniques. Chemical fate prediction by measurement and examination of physical and chemical properties.

Prerequisite(s): (Undergraduate level CHM 3120 Minimum Grade of D or Graduate level CHM 5120 Minimum Grade of D) and (Undergraduate level CHM 3120L Minimum Grade of D or Graduate level CHM 5120L Minimum Grade of D) and Undergraduate level CHM 2120 Minimum Grade of D

Corequisite(s): CHM6020L

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 6020L - Advanced Environmental Chemistry and Analysis Laboratory

Credit Hour(s): 0

Required laboratory for CHM 6020.

Corequisite(s): CHM6020

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lab

CHM 6170 - Applied Chemical Spectroscopy

Credit Hour(s): 2

Practical applications of various spectrophotometral techniques (mass spectroscopy, infrared spectroscopy, ultraviolet spectroscopy, and nuclear magnetic resonance) are integrated for the explanation of the structure of organic molecules. A problem-solving approach is used.

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 6350 - Instrumental Analysis

Credit Hour(s): 3

Introduction to the theory and practice of modern chemical instrumentation. Topics include elementary electronics, spectrophotometry, atomic absorption, electrochemical techniques, chromatography, and other instrumental techniques.

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 6370 - Electroanalytical Chemistry

Credit Hour(s): 2

Fundamental principles of electrochemistry and the application of electrochemical methods to chemistry and chemical analysis.

Prerequisite(s): (Undergraduate level CHM 3120 Minimum Grade of D and Undergraduate level CHM 3120L Minimum Grade of D) or (Graduate level CHM 5120 Minimum Grade of D and Graduate level CHM 5120L Minimum Grade of D)

Corequisite(s): CHM6370L

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 6370L - Electroanalytical Chemistry Laboratory

Credit Hour(s): 0

Required laboratory for CHM 6370.

Corequisite(s): CHM6370

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lab

CHM 6450 - Concepts in Chemistry I for Early and Middle Childhood Education

Credit Hour(s): 3.5

Basic fundamental concerns of chemistry for early childhood education majors. Those concrete observable topics most appropriate for early childhood education minors will be emphasized. Course includes an in-depth study of heat and temperature.

Prerequisite(s): Undergraduate level MTH 1430 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Majors: Education Leadership. Must be enrolled in one of the following Levels: Graduate, Medical, Professional. Must be enrolled in one of the following Degrees: Master of Sci in Teaching.

Level: Graduate

Schedule Type(s): Lecture/Lab Combination

CHM 6500 - Concepts in Chemistry II for Middle Childhood Education

Credit Hour(s): 4

Concepts in chemistry II is for graduate students in middle childhood science education (MST Program). Course includes detailed study of chemical reactions, kinetics, environmental issues, acids/bases, and nuclear chemistry. Portfolio development will be utilized for students to learn the development of inquiry activities for the classroom.

Prerequisite(s): Undergraduate level MTH 2430 Minimum Grade of D and Undergraduate level PHY 2460 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Majors: Education Leadership, Education Specialist, Education and Human Services. Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 6550 - Chemical Microscopy with Applications

Credit Hour(s): 2

Examination of microscopy instrumentation and its applications to the study of surface and interface chemistry. The course will cover fundamentals of instrumentation design and methods. Topics will focus on scanning probe microscopy and its applications, particularly to solid-fluid interfaces.

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 6610 - Synthetic Polymer Chemistry

Credit Hour(s): 2

Step-growth and chain-growth polymerization in homogeneous and heterogeneous media; properties of commercial polymers.

Prerequisite(s): Undergraduate level CHM 2120 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 6650 - Physical Polymer Chemistry

Credit Hour(s): 2

Introduction to the structural and physical aspects of macromolecules; emphasis on the relationship of polymer structure to physical and mechanical properties.

Prerequisite(s): (Undergraduate level CHM 2120 Minimum Grade of D and Undergraduate level CHM 3510 Minimum Grade of D) or (Undergraduate level CHM 2120 Minimum Grade of D and Graduate level CHM 5510 Minimum Grade of D)

Corequisite(s): CHM6650L

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 6650L - Physical Polymer Chemistry Laboratory

Credit Hour(s): 0

Required laboratory for CHM 6650.

Corequisite(s): CHM6650

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lab

CHM 6680 - Experimental Nanomaterials and Nanoscience

Credit Hour(s): 3

This course will provide a series of laboratory experiments similar to the state-of-the-art R&D in nanotechnology and nanoscience. The experiments include 1) fabrication of nanomaterials such as metal nanoparticles and graphene nanoplatelets; 2) characterization of physical and chemical properties by using techniques such as Raman spectroscopy, atomic force microscopy, terahertz spectroscopy, electrochemical analyses etc; and 3) computational modeling of nanoscale physical phenomena.

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional. Must be enrolled in one of the following Colleges: College of Egr & Computer Sci, College of Science & Math.

Level: Graduate

Schedule Type(s): Combination; Lab; Lecture

CHM 6720 - Chemical Crystallography

Credit Hour(s): 3

Methodology and techniques in the determination of crystal and molecular structures using single-crystal x-ray diffraction.

Prerequisite(s): Undergraduate level CHM 3520 Minimum Grade of D or Graduate level CHM 5520 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.
Level: Graduate
Schedule Type(s): Lecture/Lab Combination

CHM 6880 - Independent Reading in Chemistry
Credit Hour(s): 1 to 4
Selected Readings in Chemistry
Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.
Level: Graduate
Schedule Type(s): Independent Study

CHM 6900 - Critical Literature Analysis
Credit Hour(s): 1
For the development of a set of critical thinking skills that will allow for a thorough analysis of current chemical and general scientific literature.
Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.
Level: Graduate
Schedule Type(s): Lecture

CHM 6980 - Chemistry for Educators
Credit Hour(s): 1 to 5
Selected topics in chemical education. Directed readings or one-time offerings of topics related to the teaching of chemistry at various levels using different pedagogical approaches. May include summer workshops or institutes.
Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.
Must be enrolled in one of the following Colleges: College of Ed & Human Services.
Level: Graduate
Schedule Type(s): Independent Study

CHM 7000 - Principles of Instruction in Chemistry

Credit Hour(s): 1

Survey of available instructional materials and discussion of educational theory and techniques leading to more effective instruction. For chemistry majors only.

Restrictions: Must be enrolled in one of the following Majors: Chemistry. Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7010 - Turning Research into a Thesis

Credit Hour(s): 1

The collection, organization and description of chemical data for the process of writing a thesis.

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7020 - Research Perspectives in Chemistry

Credit Hour(s): 1

Lecture/reading course to acquaint new graduate students with the research being carried out by the faculty in the Department of Chemistry.

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7180 - Chemical Processes in the Environment

Credit Hour(s): 3

Skills are developed to predict behavior and movement of chemical contaminants in atmospheric, aquatic, and soil systems. Physical and chemical properties of contaminants and environmental interactions are evaluated to determine their ultimate fate.

Prerequisite(s): Undergraduate level CHM 2110 Minimum Grade of D and Undergraduate level CHM 2110L Minimum Grade of D

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7200 - Advanced Inorganic Chemistry I

Credit Hour(s): 2

Study of the modern theories of valence, structural inorganic chemistry, and the chemistry of nonmetals.

Prerequisite(s): Undergraduate level CHM 3520 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7210 - Advanced Inorganic Chemistry II

Credit Hour(s): 2

Thorough examination of the chemistry of metals stressing the transition elements, ligand field theory, and mechanisms of inorganic reactions.

Prerequisite(s): Graduate level CHM 7200 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7350 - Selected Topics in Analytical Chemistry

Credit Hour(s): 1 to 4

A selected topic in the field of analytical chemistry such as chromatography, electroanalytical chemistry such as trace analysis, bioanalytical chemistry, advanced instrumental analysis, analytical spectroscopy, or separation methodology.

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7440 - Structural Concepts in Organic Chemistry

Credit Hour(s): 2

Study of molecular orbital theory, reactive species, theories of acids and bases, and an introduction to stereochemistry.

Prerequisite(s): Undergraduate level CHM 2120 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7460 - Elements of Organic Reactions

Credit Hour(s): 2

Discussion of the more important organic reactions including their scope, limitations, and mechanisms.

Prerequisite(s): Undergraduate level CHM 2120 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7480 - Synthetic Organic Reactions

Credit Hour(s): 2

Systematic treatment of organic reactions including, where applicable, some theoretical basis for the nature of the reaction. Emphasis on the uses of these reactions in organic synthesis.

Prerequisite(s): Undergraduate level CHM 2120 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7500 - Introduction to Quantum Chemistry

Credit Hour(s): 3

Introduction to the ideas and mathematical techniques of quantum theory, including applications to some simple chemical systems.

Prerequisite(s): Undergraduate level CHM 3520 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7510 - Chemical Kinetics

Credit Hour(s): 2

Characterization of simple and complex kinetic systems; experimental techniques, methods of data analyses; kinetic theories; reactions in gas phase, in solution and chemical chain reactions; deduction of reaction mechanisms from experimental rate laws.

Prerequisite(s): Undergraduate level CHM 3520 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7520 - Thermodynamics

Credit Hour(s): 2

Fundamentals of chemical thermodynamics; first, second, and third laws; applications to solutions.

Prerequisite(s): Undergraduate level CHM 3520 Minimum Grade of D

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7620 - Current Topics in Mass Spectrometry

Credit Hour(s): 2

Current topics in mass spectrometry are discussed with emphasis on theory and state-of-the-art instrumentation and ionization methods.

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7630 - Analytical Separations

Credit Hour(s): 2

Theory of separations techniques are reviewed. The two techniques of gas and liquid chromatography are discussed with emphasis in column technology, inlet systems and detection devices.

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Lecture

CHM 7890 - Continuing Registration

Credit Hour(s): 1

Restrictions: Must be enrolled in one of the following Levels: Graduate, Medical, Professional.

Level: Graduate

Schedule Type(s): Independent Study

CHM 8000 - Seminar

Credit Hour(s): 1

Departmental Seminar

Restrictions: May not be enrolled in one of the following Levels: Undergraduate.

Level: Graduate

Schedule Type(s): Seminar

CHM 8250 - Selected Topics in Inorganic Chemistry

Credit Hour(s): 1 to 4

Selected topic in the field of inorganic chemistry, such as the reactions of substances in nonaqueous solvents, metal chelate compounds, inorganic reaction mechanisms, ligand field theory, or the chemistry of the lanthanides and actinides.

Restrictions: May not be enrolled in one of the following Levels: Undergraduate.

Level: Graduate

Schedule Type(s): Lecture

CHM 8450 - Selected Topics of Organic Chemistry

Credit Hour(s): 1 to 4

Selected topics in the field of organic chemistry, such as organic spectroscopy, heterocyclic chemistry, organometallic chemistry, and the chemistry of natural products.

Restrictions: May not be enrolled in one of the following Levels: Undergraduate.

Level: Graduate

Schedule Type(s): Lecture

CHM 8550 - Selected Topics in Physical Chemistry

Credit Hour(s): 1 to 4

Selected topics in the field of physical chemistry such as molecular spectroscopy, advanced molecular structure, magnetic resonance, X-rays, crystal structure, statistical mechanics, and precision physical-chemical measurements.

Restrictions: May not be enrolled in one of the following Levels: Undergraduate.

Level: Graduate

Schedule Type(s): Lecture

CHM 8960 - Early Start Research

Credit Hour(s): 2

A short-term research project as an introduction to Masters-level chemistry research

Restrictions: May not be enrolled in one of the following Levels: Undergraduate.

Level: Graduate

Schedule Type(s): Independent Study

CHM 8970 - Chemistry Research

Credit Hour(s): 1 to 10

Original research in a CHM faculty laboratory.

Restrictions: May not be enrolled in one of the following Levels: Undergraduate.

Level: Graduate

Schedule Type(s): Independent Study

CHM 8980 - Thesis Research

Credit Hour(s): 1 to 4

Progress and completion of a research project which is suitable for publication.

Restrictions: May not be enrolled in one of the following Levels: Undergraduate.

Level: Graduate

Schedule Type(s): Independent Study

CHM 8990 - Thesis Defense

Credit Hour(s): 2

Public defense of a written thesis that is based on original research in a CHM faculty laboratory.

Restrictions: May not be enrolled in one of the following Levels: Undergraduate.

Level: Graduate

Schedule Type(s): Seminar

C. Description of Comprehensive Exams and Thesis Processes

An oral presentation of the thesis to the faculty in a seminar format is required, and the thesis must be defended before the student's thesis committee (usually composed of three chemistry faculty members). All graduate students are required to pass on oral comprehensive exam based on their coursework. The oral comprehensive exam is typically concurrent with the thesis defense. The specific questions vary for each student and arise during the thesis defense. All graduate students on our campus in programs requiring a thesis or dissertation are required to have a prospectus describing the proposed research approved by their committee, department, and college at least one semester before defending the document.

D. Accreditations

Sam Houston State University is accredited by the Southern Association of Colleges and Schools. The Department of Chemistry is approved by the American Chemical Society (ACS) to offer an ACS-certified B.S. degree, however the ACS does not evaluate graduate programs.

E. Quality of Instruction

Term	#	Title	Instructor	Ob*	T*	C*	Ov*
F11	5361	Physical Organic Chemistry	White	3.8	4.4	3.9	4.0
F11	5374	Chem of Coordination Compounds	Norman	3.9	4.8	4.3	4.3
Sp12	5372	Advanced Biochemistry I	Haines	4.7	4.9	4.9	4.8
Sp12	5385	Nanoscience and Nanosensing	Thompson	4.3	4.9	4.0	4.4
F12	5385	Organometallic Chemistry	Loeffler	4.7	4.9	4.9	4.8
F12	5385	Symmetry and Spectroscopy	Williams	5.0	4.9	4.8	5.0
Sp13	5362	Organic Reaction Mechanisms	Arney	4.5	4.7	4.6	4.6
Sp13	5368	Analytical Spectroscopy	Chasteen	4.7	4.8	4.8	4.8
F13	5374	Chem of Coordination Compounds	Norman	4.3	4.8	4.6	4.5
F13	5385	Polymer Chemistry	Gross	4.5	4.7	4.6	4.6
Sp14	5361	Physical Organic Chemistry	White	3.9	4.5	4.2	4.2
Sp14	5385	Drug and Toxin Biochemistry	Petrikovics	4.4	4.9	4.9	4.7
F14	5372	Advanced Biochemistry I	Haines	4.7	4.9	4.6	4.8
F14	5385	Nanoscience and Nanosensing	Thompson	3.5	3.3	3.3	3.4
Sp15	5362	Organic Reaction Mechanisms	Arney	4.5	4.8	4.6	4.6
Sp15	5368	Analytical Spectroscopy	Chasteen	4.8	4.9	4.9	4.9
F15	5374	Chem of Coordination Compounds	Norman	4.2	4.7	4.5	4.4
F15	5381	Adv Physl Chem Thermodynamics	Williams	4.7	4.7	4.6	4.7
Sp16	5373	Drug and Toxin Biochemistry	Petrikovics	4.0	4.5	4.2	4.2
Sp16	5385	Polymer Chemistry	Gross	4.8	5.0	4.8	4.9
F16	5375	Organometallic Chemistry	Zall	4.5	4.8’	4.8’	4.7
F16	5385	Nanoscience and Nanosensing	Thompson	4.8	4.8’	4.8’	4.8
Sp17	5372	Advanced Biochemistry I	Haines	4.7	5.0’	5.0’	5.0
Sp17	5374	Chem of Coordination Compounds	Norman	4.7	4.9’	4.9’	4.8
F17	5382	Symmetry and Spectroscopy	Williams	NA	NA	NA	NA
F17	5385	Polymer Chemistry	Hobbs	NA	NA	NA	NA

* Higher of the Raw or Adjusted IDEA Scores for Progress on Relevant Objectives (Ob), Excellent Teacher (T), Excellent Course (C), and Summary Evaluation (Ov). 5.0 is the highest score.

‘ Beginning with the Fall 2016 term, we moved from paper to online IDEA forms and only the average of Excellent Teacher and Excellent Course are provided—so the average number is reported for each of these values.

F. Online Course Offerings

The SHSU Department of Chemistry does not offer any online courses.

IV. Faculty

A. Credentials

1. Degrees

(Note: Faculty have post-doctoral experience, which will be listed under 7. Professional experience on page 103, since the positions do not confer degrees).

Benny E. Arney, Jr.	B.A., Summa cum laude in Chemistry and Mathematics, University of Saint Thomas, Houston, Texas, 1982. Ph. D., in Chemistry, 1986, William Marsh Rice University, Houston, Texas. Ph. D. supervisor W. E. Billups. Dissertation: “1-Bromo-2-chlorocyclopropene: A New Cycloproparene Synthon and the Preparation and Chemistry of 1(7)-Bicyclo[4.1.0.]heptene and 1(6)-Bicyclo[4.1.0.]heptene.”
Dustin E. Gross	B.S. in Chemistry, 2003, University of Arizona, Tucson, Arizona Ph.D. in Chemistry, 2009; University of Texas, Austin, Texas Ph.D. supervisor Jonathan L. Sessler Dissertation: " ITC and NMR Spectroscopy Binding Studies of *meso*-Octamethylcalix[4]pyrrole and Its Derivatives”
Donovan C. Haines	B.S in Biochemistry, 1993, Wichita State University, Wichita, KS Ph.D. in Chemistry, 1998; Wichita State University, Wichita, KS Ph.D. supervisor Kandetege Wimalasena Dissertation: "Kinetic and Spectroscopic Studies of Dopamine β-Monooxygenase and Cytochrome B_{561}."
Christopher E. Hobbs	B.S. in Chemistry, 2006, Angelo State University, San Angelo, Texas Ph.D. in Chemistry, 2011; Texas A&M University, College Station, Texas. Ph.D. supervisor David E. Bergbreiter Dissertation: "The Use of Soluble Polyolefins as Supports for Transition Metal Catalysts."

Richard E. Norman	B.S. cum laude with Distinction in Chemistry, 1981, University of Washington, Seattle, Washington M.S. in Chemistry, 1983, University of Washington, Seattle, Washington Ph.D. in Chemistry, 1985, University of Washington, Seattle, Washington. Ph.D. supervisor Norman J. Rose Dissertation: "The Synthesis and Structure of Copper Complexes Derived From Glycine, 1-Methylimidazole, and Dehydroascorbic Acid."
Ilona Petrikovics	M.S. in General Chemistry, L. Kossuth University of Arts and Sciences, Debrecen, Hungary,1979. Ph.D. in Organic Chemistry, (minor: Biochemistry), L. Kossuth Univ. Arts and Sci. Debrecen, Hungary, 1982. Ph.D. Advisor: Joseph Csaba Jaszberenyi. Dissertation: “Synthesis and Structural Elucidation of Penicillin and Cephalosporin Derivatives” Ph.D. in Medicinal Biology, (minors: Pharmacology/Microbiology), University Medical School, Debrecen, Hungary, 1985. Ph.D. Advisor: Ferenc Hernadi. Dissertation: “Investigations of Beta-Lactamase Activity of Penicillanic Acid Derivatives”
David E. Thompson	B.A in Chemistry, 1988, Carleton College, Northfield, Minnesota Ph.D. in Chemistry, 1998, University of Wisconsin, Madison, Wisconsin Ph.D. Supervisor: John C. Wright Dissertation: "Measuring and modeling the contribution of the complex refractive index to infrared four-wave mixing lineshapes in mixtures of fully deuterated benzene and 1,8-nonadiyne."
Tarek M. Trad	B.Sc. in Chemistry,1999, Beirut Arab University, Beirut, Lebanon Ph.D. in Chemistry, 2006, Oklahoma State University, Stillwater, Oklahoma Ph.D. Advisor: Dr. Allen Apblett Dissertation: “Novel Magnetic Extractants For Removal of Pollutants From Water”

Adrian Villalta-Cerdas	B.S. in Chemistry, 2008, University of Costa Rica, San Jose, Costa Rica M.S. in Chemistry, 2012, University of South Florida, Tampa, Florida Ph.D. in Chemistry, 2014, University of South Florida, Tampa, Florida. Ph.D. supervisor Santiago Sandi-Urena Dissertation: "Development and Assessment of Self-explaining Skills in College Chemistry Instruction"
Darren L. Williams	B.S. Chemistry, 1992, University of Texas at Austin, Austin, TX Ph.D. Chemistry, 1997, Oregon State University, Corvallis, OR Ph.D. supervisor Joseph Nibler Dissertation: "High Resolution Infrared and Ab Initio Studies of Aluminum and Beryllium Borohydrides"
Christopher M. Zall	B.A. cum laude in Chemistry, 2008, Carleton College, Northfield, Minnesota M.S. in Chemistry, 2010, University of Minnesota, Minneapolis, Minnesota Ph.D. in Chemistry, 2013, University of Minnesota, Minneapolis, Minnesota. Ph.D. supervisor Connie C. Lu Dissertation: "Design, Synthesis, and Characterization of Transition Metal Compounds Using Binucleating and Bifunctional Ligands: Strategies for the Multi-Electron Reduction of Small Molecules."

2. Summary of Peer-Reviewed Publications

Book/Book chapter	**Book chapter**: 13 **Book**: 4
Articles/Patents	**Articles**: 164 **Patents:** 4
Abstracts/ Scientific notices **Academic conference presentation**	**National/International meeting:** 140 **Regional meetings:** 218
External grant submissions (applied/funded/pending)	**Applied**: $15,245,489 **Awarded:** $8,946,570
Awards/Recognition	**College:** 2 **University**: 6 **Regional:** 1 **National:** 3
Service to the profession: State/regional/national level	**Reviewing Journal Articles:** 134 **Grant Reviewing**: 96 **Society Officer**: 6 Chair: 2 **Vice chair**:1 **Curriculum development**:1

3. External Grant Submissions

See table above/on previous page.

4. Academic Conference Presentations

See table above/on previous page.

5. Awards

See table above/on previous page.

6. Service to the Profession

See table above/on previous page.

7. Professional Experience

Note: Full lists of professional experience including academic positions held can be found in Appendix I on page 221. A summary table of post-doctoral research, government, and industrial positions appears below.

Post-doctoral Research, Government, and Industrial Positions	
Benny E. Arney, Jr.	1986-1987 Postdoctoral Fellow, North Texas State University, Denton, TX with Allan Marchand
Dustin E. Gross	2009-2012 Postdoctoral Fellow, University of Illinois, Urbana, Illinois with Jeffrey S. Moore
Donovan C. Haines	1999-2001 Postdoctoral Fellow, University of Texas Southwestern Medical Center at Dallas, Dallas, TX Dept. of Biochemistry with Julian A. "Bill" Peterson
Christopher E. Hobbs	None
Richard E. Norman	1985-1987 Postdoctoral Fellow, University of London, London, U.K. with Peter Sadler 1987-1989 Postdoctoral Associate, University of Minnesota, Minneapolis with Lawrence Que, Jr
Ilona Petrikovics	1985-1988 Research Fellow, Res. Group of Antibiotics of the Hungarian Academy of Sci., Debrecen, Hungary. 1988-1990 Laboratory Head, Biogal Pharmaceutical Company Debrecen, Hungary. 2002-2003 National Research Council Senior Fellow, U.S. Army Med. Res. Inst. Chem. Defense, Aberdeen, MD. 2006-2007 Battelle Contractor, U.S. Army Medical Research Institute of Chemical Defense, Aberdeen, MD.

David E. Thompson	1991 Chemistry Technician, H.B. Fuller, Vadnais Heights, Minnesota 1999-2002 Postdoctoral Researcher, Stanford University, Stanford, California with Michael D. Fayer
Tarek M. Trad	2007-2008 Postdoctoral Associate, Virginia Commonwealth University, Richmond, Virginia
Adrian Villalta-Cerdas	2006-2008 Chemical Analyst, Treasury Department of Costa Rica
Darren L. Williams	2001 – 2004 Section Scientist, BWXT Pantex LLC (US-DoE facility), Amarillo, TX
Christopher M. Zall	2013-2016 Postdoctoral Associate, Pacific Northwest Natl. Laboratory, Richland, WA with Aaron M. Appel

B. Teaching Load

The following is taken/paraphrased from SHSU Academic Policy Statement 790601 "Faculty Instructional Workload" revised June 2, 2010.

The standard workload at SHSU for tenure-track faculty is based on a normative instructional load of 12 credit hours being equivalent of 1.0 FTE. Tenure-track faculty hired after 2004 are in essence 0.75 FTE for teaching and 0.25 FTE for research (a normative instructional load of 9 credit hours). Faculty hired before 2004 were allowed to remain on the 12-credit hour load if they so desired.

Each hour of lecture is counted as 1/12 FTE, so a 3-hour lecture course counts as 0.25 FTE. A faculty member may receive credit for supervising a formally-scheduled laboratory course when the faculty member directly supervises graduate or undergraduate students who serve as the instructors for the laboratory sections. One clock hour of scheduled laboratory time per week equates to 1/48 FTE per semester for a faculty member who supervised laboratory courses up to a maximum limit of 1/4 FTE for a single course number.

Faculty members may receive a 3-credit-hour-load (1/4 FTE) reduction for direction to completion of five master's theses. Such credit must be taken within a three-year period of the credit will be deleted.

A table of workload for each faculty member by semester appears on the next page.

Table of Faculty Workload

Initials	F11	Sp12	F12	Sp13	F13	Sp14	F14	Sp15	F15	Sp16	F16	Sp17	F17*
BEA	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.42	1.188	1.35	1.188	0.75	0.792	0.958	1.188	1.42	1.188	0.958	1.188	1.292
TGC	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	leave	0.75	retired
	1.52	1.042	1.58	1.125	1.625	1.229	1.625	1.146	1.625	1.33	leave	0.75	retired
DEG			0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
			0.50	0.50	0.708	0.896	1.167	0.896	0.50	0.75	1.167	0.896	0.708
OG							0.75	0.75	left				
							0.75	0.75	left				
DCH	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	0.75	0.79	0.75	0.75	0.75	0.75	0.75	0.75	0.833	0.75	1.00	0.75	0.75
CEH													0.75
													0.50
PAL	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	retired				
	1.125	1.31	1.06	1.31	1.125	1.375	1.125	1.125	retired				
REN	0.50	0.50	0.50	0.25	0.50	0.50	0.50	0.25	0.50	0.50	0.50	0.25	0.50
	0.50	0.50	0.50	0.25	0.50	0.50	0.50	0.25	0.50	0.50	0.75	0.25	0.50
IP	0.50	leave	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.25
	0.50	leave	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.25
DET	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.00	0.75	0.50
	0.75	0.833	0.75	0.833	0.75	0.75	0.75	0.75	0.75	0.75	1.25	0.75	0.50
TMT													0.75
													0.75
AV-C											0.75	0.75	0.75
											0.94	1.125	1.06
RCW	1.00	1.00	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	(0.50	0.50	0.50)
	0.958	1.146	0.708	0.896	1.167	0.896	0.50	0.50	0.708	0.896	(0.50	0.50	0.50)
DLW	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.833	0.75	0.833	0.75	0.833
CMZ											0.75	0.75	0.75
											0.75	0.75	1.69

The first line for each individual is expressed as FTE using the cap of 0.25 per laboratory section, while the second line doesn't cap the load at 0.25 per laboratory section. (Footnotes cont. on next page)

(Table footnotes cont. from previous page:) BEA is Benny Arney, TGC is Tom Chasteen, DEG is Dustin Gross, OG is Ozçan Gulacar, DCH is Donovan Haines, CEH is Christopher Hobbs, PAL is Paul Loeffler, REN is Richard Norman, IP is Ilona Petrikovics, DET is David Thompson, TMT is Tarek Trad, AV-C is Adrian Villalta-Cerdas, RCW is Rick White, DLW is Darren Williams, and CMZ is Christopher Zall.
*During the Fall 2017 term, Ilona Petrikovics and David Thompson received 0.25 release time for M.S. thesis production.
BEA and PAL remained on the 1.00 load.
REN as the Department Chair should have 0.50 in the fall and 0.25 in the spring.
IP pays for a release of 0.25 each term from her grant.
RCW moved from the 1.00 load to the 0.75 load and took early retirement beginning in the Fall 2016 term.

The faculty involved teaching organic laboratories (currently BEA, DEG and CH, but previously including RCW) rotate in and out of the various organic laboratory assignments which affects their teaching loads.

The main reason why individuals have higher loads is due to their involvement supervising undergraduate laboratories. The loads of AV-C and CZ will decrease after we hire a laboratory coordinator for general chemistry.

C. Diversity

Simple demographic information was collected from faculty by anonymous survey. Of the eleven core graduate faculty members, ten are men and one is a woman. Eight identify as White, one as Hispanic, one as International (Lebanese), and one as American Indian/Caucasian. Four of eleven faculty members indicated that they were first-generation college students.

D. Faculty Program Responsibilities

During the time period of this review, Dr. Chasteen had 7 students finish under his direction, Dr. Gross had 6 students finish under his direction, Dr. Haines had 11 students finish under his direction, Dr. Norman had 1 student finish under his direction, Dr. Petrikovics had 6 students finish under her direction, Dr. Thompson had 7 students finish under his direction, Dr. White had 1 student finish under his direction, and Dr. Williams had 5 students finish under his direction. In this same period, one student that worked with Dr. Arney quit the program, one student that worked with Dr. Gross quit the program and one student that worked with Dr. Haines quit the program. For the 6 students currently enrolled in the program, 2 are working with Dr. Gross, 2 with Dr. Petrikovics, 1 with Dr. Thompson and 1 with Dr. Zall.

For the 44 students that completed their master's theses during this time period, there were 44 graduate committees of three faculty members that were involved in the thesis defense and oral comprehensive examination. The faculty member that directed the student chaired the committee. This means that there were then 88 other instances of faculty involvement. During this time period Benny Arney served on 8 committees, Tom Chasteen served on 3 committees, Dustin Gross served on 7 committees, Donovan Haines served on 16 committees, Paul Loeffler served on 2 committees, Richard Norman served on 11 committees, Ilona Petrikovics served on 10 committees, David Thompson served on 22 committees, Rick White served on 2 committees and Darren Williams served on 7 committees. With 10 faculty involved, the average is 8.8 committees.

The students talk to each of the graduate faculty about research, and select the individual with whom they want to work. The faculty member can decline. If the faculty member accepts the student, they become the student's research director and advisor. The student and their director together decide whom to ask to serve on the committee. The selected faculty can decline. It is rare that faculty decline, but it has happened especially during times when lots of students are in the program. It has also happened as a faculty member prepares to retire.

V. Students

A. Admissions Criteria

The requirements listed in the current graduate catalog state:

> Applicants must have a major or minor in chemistry (with at least a 2.5 GPA in their undergraduate chemistry courses typically including Analytical or Quantitative Chemistry, Instrumental Methods, one year of calculus-based Physical Chemistry, and Inorganic Chemistry) or commensurate industrial experience.
>
> For a final admissions decision, a holistic review of each student's application file will be completed on a competitive basis. Currently a 3.0 GPA is required for financial support.

In addition to those requirements, international students are required to get a transcript evaluation by a NACES accredited service (our department has been able to request and pay for this if the rest of the application looks viable, and normally uses World Education Services as we have experience with their evaluations) and if English is not the student's first language the university requires a TOEFL score of 550 for paper-based, 79 for iBt, 6.5 for IELTS, or completion of the English Language Institute program at SHSU.

When an application is complete (or complete except for a transcript evaluation), the College of Sciences and Engineering Technology staff send the packet as a PDF to the Graduate Coordinator. The Coordinator then attaches to the packet a summary sheet (shown below/on next page) and fills it out.

Grad Student Summary Sheet

Name: ________________________________ SamID: ____________________

GRE: Verbal(%)______(____) Quant(%)______(____) Total (old translate): ____(____)

TOEFL/IELTS: __________________

Coursework:

Undergrad GPA: __________ Degree/Major: ______________________________

University: ____

Other GPA: __________ Degree/Major: ______________________________

University: ____

	Lecture (Lab) Grades
Gen Chem I (Lab)	______(____)
Gen Chem II (Lab)	______(____)
Org I (Lab)	______(____)
Org II (Lab)	______(____)
Analytical/Quant (Lab)	______(____)
Instrumental	______(____)
Physical Chem I	______(____)
Physical Chem II	______(____)
Advanced Inorg.	______(____)
(Biochemistry I)	______(____)
Top Math _______________	______(____)

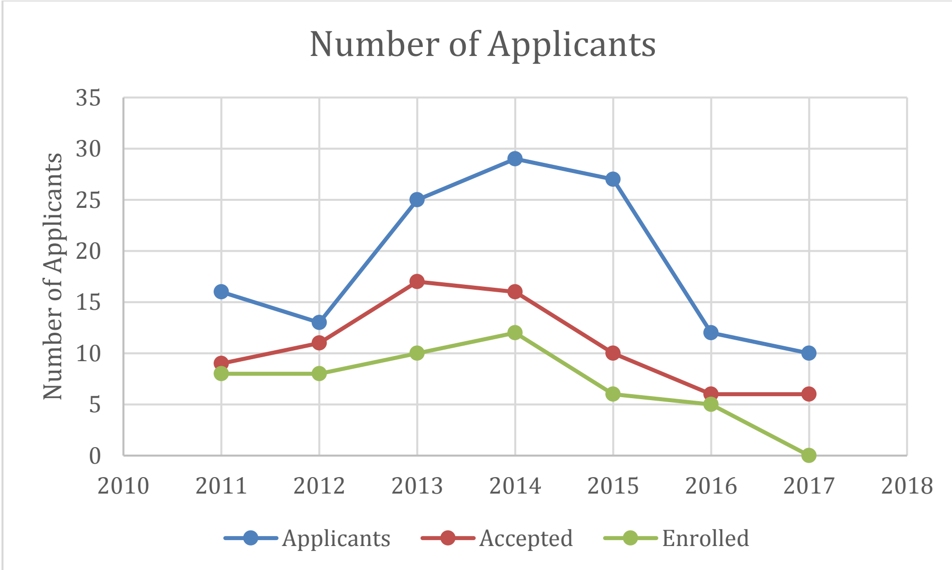
Other Comments/Info:

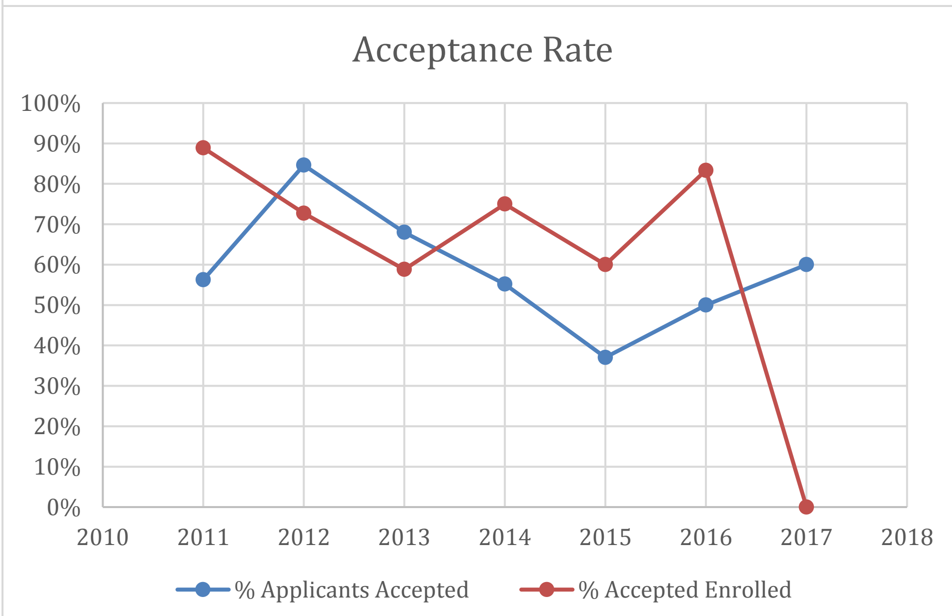
Both the Graduate Coordinator and the Department Chair evaluate each applicant in detail using all parts of their application, but the information on the summary sheet allows them to quickly check that the required classes or their equivalent have been taken. This is especially important with a large fraction of the applicants being from outside the U.S., where undergraduate degree programs and classes taken are much more diverse than domestically. In general, students need to have a B or higher in most of the courses listed on the summary sheet, although students with some C's do get admitted depending on the quality of the rest of the application. The application is viewed holistically, with all the information evaluated. There is not a minimum GRE score required. When there is a question about whether a course is comparable faculty in the sub-area of chemistry that the course is in are often consulted to verify that the course described (often the transcript information is supplemented by a course description on the applicant's university's webpage) provides sufficient background comparable to the listed required course.

B. Number of Applicants for Each Year

Academic Year	Applicants	Accepted	Enrolled	% Applicants Accepted	% Accepted Enrolled
Fall 2011-Summer 2012	16	9	8	56%	89%
Fall 2012-Summer 2013	13	11	8	85%	73%
Fall 2013-Summer 2014	25	17	10	68%	59%
Fall 2014-Summer 2015	29	16	12	55%	75%
Fall 2015-Summer 2016	27	10	6	37%	60%
Fall 2016-Summer 2017	12	6	5	50%	83%
Fall 2017	10	6	0	60%	0%
Average	**19**	**11**	**7**	**59%**	**63%**

Fall 2017 data was added by the department, not from Institutional Effectiveness data. No students accepted our offers for Fall 2017. Graphs of this data appear on the next page.





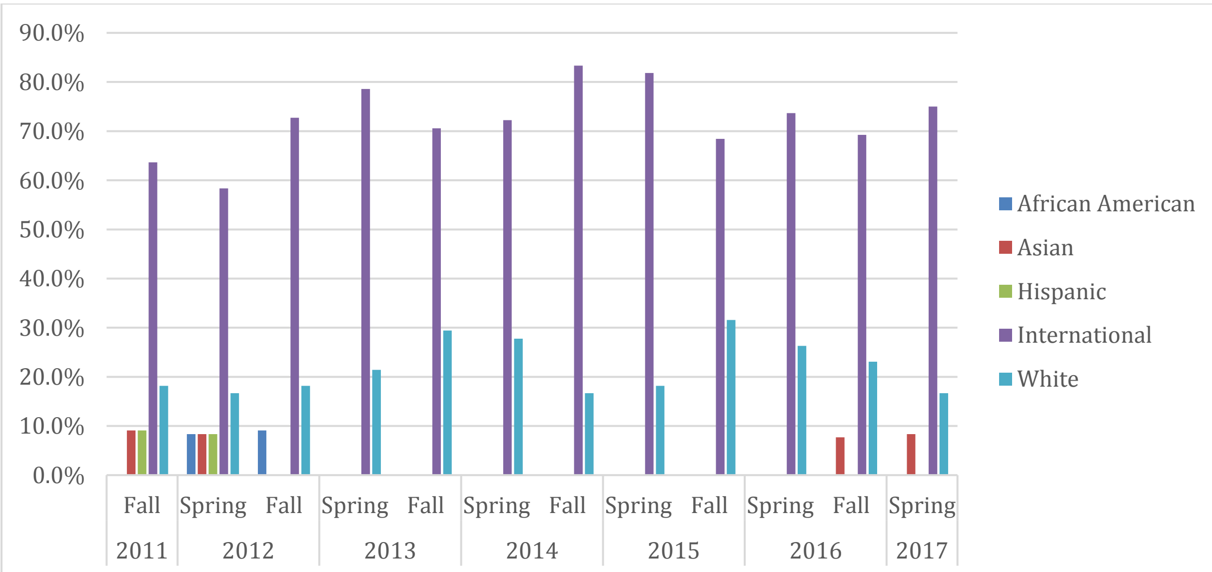
Note that in the above graph, the point for each year represents Fall of that year through summer of the next year, except 2017 which includes fall data only. Fall 2017 data was added by the department, not from Institutional Effectiveness data. No students accepted our offers for Fall 2017.

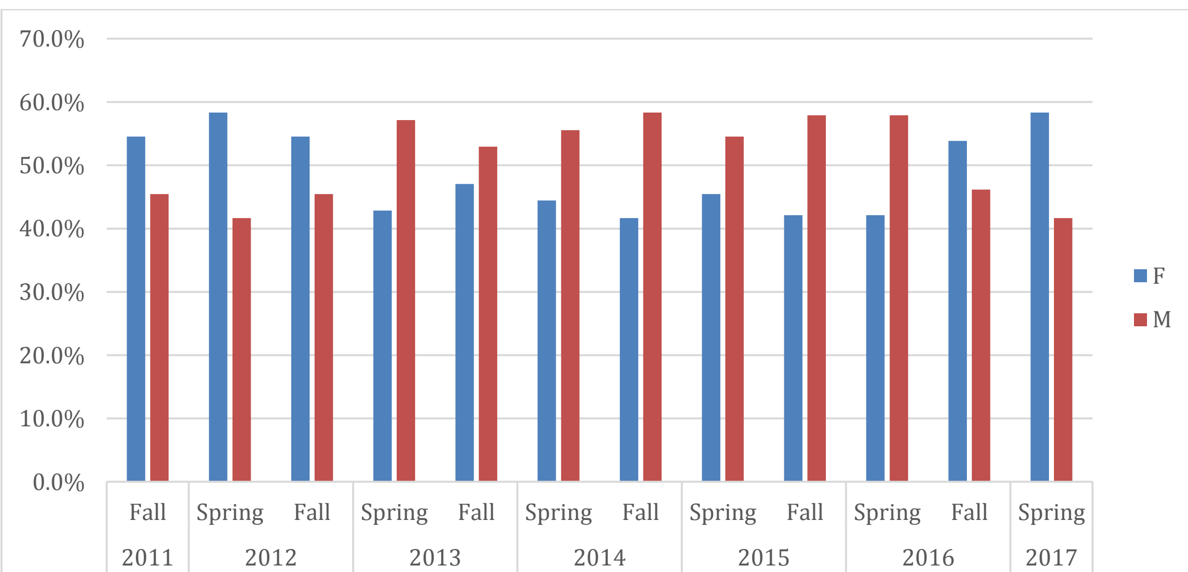
1. Demographics (Applicant)

Note that as the department could not get demographic data on applicants from Institutional Effectiveness before the report was due, the Office of Graduate Studies indicated that the section could be omitted.

C. Profile of Admitted Students

1. Demographics (Admitted Students)





The average age of our students has varied over the self-study period from 27 to 30, with an average age of 28. Students are identified as either "First Generation" college students, or

"Unknown". The average over the period of the self-study is 22% First Generation, 78% Unknown.

For geographic origins of our students, please see IX. Recruitment and Marketing Efforts B. Geographical Origin of Students on page 204.

2. Full Time/Part Time

All students in the program are as full time as they can be. According to University definitions (in the Graduate Catalog), a normal load is nine to twelve credit hours per fall or spring semester and six credit hours in the summer. As mentioned previously, during the first three long semesters, the typical student enrolls in ten credit hours per semester. In their first summer, they are enrolled in three credit hours (of research). In their second summer, they are enrolled in either six semester hours (research and thesis) or just three semester hours (thesis). "Full time" is considered to be at least 9 hours in the fall and spring and 6 hours in the summer. The Department of Chemistry only offers two lecture courses in the fall and spring semesters, and virtually never offers a lecture course during the summer. During the time period of this self-study, one student took a maternity leave of absence (Secondra Holmes began the program in the fall 2010 semester, took maternity leave during the spring, summer and fall 2011 semesters, resuming in the spring 2012 semester and completing the program in the fall semester of 2012).

D. Student Funding

1. Percentage of Full-time Students with Financial Support

Normally 100% of students are on financial support of some kind. In the vast majority of cases, students are on a graduate assistantship for teaching undergraduate laboratories and receive a summer stipend through the department's Welch Foundation grant. Two students during the evaluation period were supported by the SHSU Texas Research Institute for Environmental Sciences (TRIES) doing 20 hours per week contract analytical chemistry work at their analytical lab instead of teaching labs for the department 20 hours per week. A number of faculty are able to provide additional support from their research grants. For example, Dr. Gross supported a student on his PRF grant and Dr. Zall supported a student from his SHSU Faculty Research Grant.

2. Average Support per Full-time Student

Students typically receive a teaching assistantship of $13,005 for the fall and spring semesters combined and a research stipend from the departmental Welch Foundation grant of $2250. There are two main competitive campus scholarships that our students have been eligible for beyond these funds (described in more detail below). Students in the self-study review period (Fall 2011 – Fall 2017) received an average of just over $1000 per year from sources other than their assistantship stipend and summer Welch stipend. The average support was therefore around $16,250 per year.

The College of Sciences and Engineering Technology Special Graduate Student Scholarship provides $1500 a semester (fall and spring) that students can apply for. It is awarded competitively based on a formula involving GRE scores and GPA. The number of Chemistry MS students receiving the scholarship has varied between zero to four students each semester (based on review of records from Fall '15 to Fall '17).

The other main scholarship that some of our students receive comes from the Office of Graduate Studies and awards $1000 per semester. There was a brief period of time (~1.5 years) when most of the MS Chemistry students received this scholarship as the number of applications from many other parts of campus was very low, but in the past few years it has become highly competitive and between one and five chemistry students received this scholarship each semester. Another reason for the lower success rate in recent years is believed to be the introduction of an evaluation rubric that strongly scores work experience relative to traditional measures like grades, and many students in our program lack work experience and are therefore punished by this rubric relative to students from fields where work experience is more common. We have tried to explain that this is unfair to no avail.

3. Number of Assistantships and Description of Duties/Responsibilities

All graduate assistantships require 20 hours of work per week. This work can include work in the chemistry stockroom, work as a tutor, work preparing solutions and materials used in the undergraduate teaching laboratories, and work as a laboratory assistant (commonly referred to as a teaching assistant). The specifics of this latter assignment include contact time in the laboratory, "TA meetings" with the instructor who supervises the laboratory assistants, preparation for the laboratory, grading of laboratory reports, quizzes, etc., grade entry, and, in some cases, mandatory tutoring time. The total time per laboratory section differs. For CHEM 1406 labs, the load is 5 hours per week for the first section and 4 hours per subsequent section. For CHEM 1407 labs, the load is 4 hours per week per section. For CHEM 1411, the load is 7.5 hours per week for the first section and 6.5 hours per subsequent section. For CHEM 1412, the load is 7 hours per week for the first section and 6 hours per subsequent section. For both CHEM 2123 and CHEM 2125, the load is 8 hours per week for the first section and 6 hours per subsequent section. For CHEM 2401, CHEM 3438, CHEM 4260, CHEM 4440, CHEM 4448 and CHEM 4449, the load is 10 hours per week per section.

E. Program Performance Statistics

The period of this self-study covers cohorts from the Fall 2011 semester through the Fall 2015 semester. Students entering the program from outside SHSU begin in either the fall semester (which is the norm) or in the spring semester. Students who have completed their B.S. in chemistry at SHSU may also enter the program during the summer semester. Specifically, we can provide meaningful data on retention and completion for students that began the program in the fall 2011, summer 2012, fall 2012, spring 2013, fall 2013, spring 2014, fall 2014 and fall 2015 semesters. Students have also entered the program in the spring 2016, fall 2016 and spring 2017 semesters.

Cohort	#	# retained after 3 sem.	1-year rate	# graduated within 6 sem.	2-year Rate	# graduated within 9 sem.	3-year Rate	Sem to graduate
F11	5	5	100%	4	80%	5	100%	6.6
Su12	2	2	100%	2	100%	2	100%	6.0
F12	3	2	67%	2	67%	2	67%	6.0
Sp13	4	4	100%	3	75%	4	100%	6.0
F13	8	7	87.5%	7	87.5%	7	88%	6.0
Sp14	2	2	100%	1	50%	2	100%	6.5
F14	12	12	100%	9	75%	11	92%	6.1
F15	5	5	100%	5	100%	5	100%	5.6
Total	41	39	95%	33	80.5%	38	93%	6.1

Cohort	#	# retained after 3 sem.	1-year rate
Sp16	1	1	100%
F16	4	4	100%
Sp17	1	1	100%

(these students are currently enrolled)

In contrast, the following data were provided by the SHSU Office of Institutional Effectiveness (which does not recognize a Summer cohort):

Cohort	#	# retained after 3 sem.	1-year Rate	# graduated within 6 sem.	2-year Rate	# graduated within 9 sem.	3-year Rate
F11	6	5	83%	4	67%	5	83%
F12	4	3	75%	3	75%	3	75%
S13	4	4	100%	3	75%	4	100%
F13	8	6	75%	6	75%	6	75%
S14	2	2	100%	1	50%	2	100%
F14	12	12	100%	9	75%	11	92%
F15	5	5	100%	5	100%	5	100%
S16	1	1	100%	NA	NA	NA	NA

The Office of Institutional Effectiveness reported Average Terms to completion based on semester degree awarded:

Term	#	Average Terms to Completion
F11	0	NA
Sp12	2	NA
Su12	3	6.0
F12	1	7.0
Sp13	0	NA
Su13	4	6.0
F13	0	NA
Sp14	3	6.7
Su14	3	7.0
F14	2	6.0
Sp15	0	NA
Su15	8	6.3
F15	1	6.0
Sp16	3	5.7
Su16	7	6.0
F16	1	7.0
Sp17	3	6.0
Su17	3	6.0

1. Graduation Rate for Each Cohort

During this period, 3 students left the program without completing it. One, with a B.S. from SHSU, left at the end of 1 semester to enter a Ph.D. program. One left at the end of 3 semesters to enter a Ph.D. program. The third resigned for personal reasons and did not enter another program. All of the other students completed their degrees. As can be seen in the table above, the 3-year graduation rate was 100% for all but three cohorts, and overall was 93%. The data provided by the Office of Institutional Effectiveness apparently includes students who were already admitted to the program, students who were returning, and students who weren’t actually admitted.

2. Average Time to Completion for Each Cohort

During this period, one student graduated after 4 semesters, four after 5 semesters, twenty-eight after 6 semesters, two after 7 semesters, two after 8 semesters and one after 9 semesters. As can be seen in the table above, the average time to completion ranged from 5.6 to 6.6 semesters for each cohort, and the overall average time to completion is 6.1 semesters. The data provided by the Office of Institutional Effectiveness compares the average time of completion based on the semester of graduation.

3. Student Retention Rates

As mentioned above, of the 41 students that entered the program from the fall 2011 semester through the fall 2016 semester, all but 3 completed the program. One left after one semester, one left after one year and the third left after seven semesters. Thus the 1-year retention rate is 95%. Since the Office of Institutional Effectiveness data includes students who were already admitted to the program, students who were returning, and students who weren’t actually admitted, the apparent retention rates are different.

4. Post-graduation Outcome

Of the 46 alumni that responded to the alumni survey (see Alumni survey section on page 150), 52% (24 alumni) had had at least one job that used their MS in Chemistry (page 181). Many (39% of the total, 18 alumni) of those that hadn't were still in a PhD program or post-doctoral position. Of the alumni responding, 61 % (28 alumni) had attended or were currently attending a PhD program (page 172). Only one alum (2%) responded that they had tried but had been unable to find employment with their degree, and three (7%) chose other with one indicating that they had just graduated and were still job hunting.

5. Student Publications and Awards

Publications

From the period of fall 2011 to 2017, Master's students in the SHSU chemistry department have had 103 authorships on external presentations and posters, and 29 authorships on peer reviewed publications.

Awards

Numerous students have received awards. Although our department has not kept a formal list of this data, some awards received include:

- Tharaka Wansapura, 2014 SHSU Graduate Research Exchange Best Research Award
- Thenahandi "Deepthi" De Silva, 2015 SHSU Graduate Studies Outstanding Thesis Project Winner
- Harshani Maduwanthi Jayabahu Arachchilage, 2016 SHSU Graduate Studies Outstanding Thesis Project Winner
- Todd Deyne, 2017 SHSU Graduate Studies Outstanding Thesis Project Winner
- Chathuranga Chinthana Hewa Rahinduwage, 2017 SHSU College of Sciences and Engineering Technology Graduate Student Excellence in Research Award

Nominations

- Poorna Wansapura, 2014 SHSU Graduate Studies Outstanding Teaching Assistant Award Nominee

- Sanjaya Lokugama, 2014 SHSU Graduate Studies Outstanding Teaching Assistant Award Nominee
- Manpinder Kaur, 2016 SHSU Graduate Studies Outstanding Teaching Assistant Award Nominee
- Victoria Jackson, 2016 SHSU Graduate Studies Outstanding Teaching Assistant Award Nominee
- Reny Roy, 2016 SHSU Graduate Studies Outstanding Teaching Award Nominee
- Chathuranga Chinthana Hewa Rahinduwage, 2017 SHSU Graduate Studies Outstanding Graduate Student Award Nominee
- Manpinder Kaur, 2017 SHSU Graduate Studies Outstanding Thesis Project Award Nominee

6. Student Participation in Grants

From the period of fall 2011 to 2017, all Master's Students received research support from a generous Welch Foundation grant. Over the same period, 19 Master's students in the SHSU chemistry department contributed to research efforts funded by other granting agencies such as the National Institutes of Health (NIH), and the American Chemical Society Petroleum Research Fund (ACS PRF). This support has provided stipends and helped students travel to meeting to present research results, network, and gain experience.

VI. Resources and Finances

The SHSU Department of Chemistry budget is constructed differently from many other departments. We don't specifically "budget" for travel, or chemicals, or consumables, or office supplies. In addition to the annual budget allocated by the University, the Department has funds from other sources including a Departmental Grant from the Robert A. Welch Foundation, the Friends of Chemistry account, indirect costs and a scholarship account.

A. Travel Funds Annually Available

Travel requests vary from year to year depending upon, for example, the distance to the location of the Southwest Regional Meeting of the American Chemical Society or to the annual Texas Academy of Science meeting—the closer the meeting is, the greater the number of individuals are likely to want to go to the meeting. The Department doesn't have a specified policy or limitation regarding travel. We expect that faculty members will be reasonable with their requests to attend meetings, and all such requests have been funded during the review period. The Department has also funded all student requests for travel funds. Routinely both faculty and students are encouraged to seek funding from other sources first, but if no other funding is available, or if any funding obtained from another source doesn't cover all of the expenses, the Department will cover the remainder.

B. Assistantships

A limited number of graduate assistantships are made available to the Department. That number has increased over the years to 21 available assistantships. The value of the assistantship is $13,005. We supplement this assistantship with a summer fellowship from either the Departmental Grant from the Welch Foundation or from the Departmental Scholarship account. The amount of this fellowship is currently $2,300.

C. Scholarships

As mentioned above, the Department provides a summer fellowship to all of our graduate students. Since our students who are from outside the state of Texas receive a graduate assistantship, the out-of-state portion of tuition and fees are waived. Currently the value of this waiver is $3735 for a 9-hour load and $4150 for a 10-hour load for the fall and spring semesters and $1224 for a 3-hour load for the summer semester. This amounts to $9524 for the first year of the graduate program. There are competitive graduate scholarships available, and many of our students have received them.

D. Overall Program Budget

As implied above, there isn’t a separate budget specifically for the graduate program. The departmental budget is used to support the undergraduate program, the graduate program and the scholarly activities of the tenured and tenure-track faculty. The annual amount of the Departmental budget (excluding funds associated with faculty and staff salaries) was $117,502 in the fall of 2011 and increased to $122,502 in the fall of 2016. A portion of the budget comes from a laboratory fee ($8 per student enrolled in a chemistry laboratory). As our laboratory enrollments grow, our expenses to run these labs increase, and the amount we receive through this fee increases though not as much as the lab expenses increase.

E. Clerical/Administrative Support

The Department has one clerical/administrative staff position. Rachell Haines is the Assistant to the Chair. The Department has three additional staff positions associated with our undergraduate program: a laboratory stockroom coordinator (Rukma Basnayake, official title “Chemical Inventory and Safety Coordinator”), a laboratory coordinator for the non-science majors’ laboratories (Hemantha Siyambalagoda, official title “Chemistry Lab Coordinator”) and a new, as yet unfilled, laboratory coordinator for our general chemistry laboratories.

VII. Facilities and Equipment

A. Facilities (current):

Research Laboratory Space:

Currently each full-time tenured or tenure-track faculty requiring laboratory space has an assigned laboratory of approximately 1350 square feet with one or more high volume fume hoods. Fume hoods and bench spaces are equipped with natural gas, cold water lines, compressed air, and electrical outlets. Over and under the hoods and bench spaces are storage cabinets for equipment and reagents. Storage under the hoods is also ventilated for volatile reagents with some cabinets polyethylene lined for caustic/acidic/corrosive reagents.

Work space is generally sufficient for 4-8 student researchers depending on the bench area required for equipment and performance of laboratory operations. Each laboratory also has at least two desks/personal work areas for the student researchers to store and maintain their personal records/notebooks/ and paperwork.

Instrument Room: The majority of the Department's open-access instrumentation is centrally located in one room accessible to both undergraduate and graduate student researchers as well as the teaching laboratories. The two exceptions are the 300 MHz NMR and the X-Ray Diffractometer which are located in controlled access locations. Most instrumentation belongs to individual research groups, though utilization by other research groups in the department is generally granted as needed.

Central Storeroom and Manager:

The Department employs a Storeroom manager whose duties include;

1. Overseeing the inventory of reagents and equipment for the teaching laboratories.
2. Supervising the preparation of reagents, materials, and equipment for the teaching labs
3. Overseeing the collection and disposal of chemical waste from the teaching and research laboratories.

The Storeroom also provides routine basic reagents, consumables (filter paper, etc.) and equipment for use in the research laboratories.

Water Purification Systems:

(1) Millipore RiOs(TM) 3 Water System Supplying type III water for routine deionized water uses in the teaching labs and research laboratories.
(2) Milli-Q Water System supplying type I and type III water for biochemical and analytical teaching and research laboratories.

Solvent/bulk volatile material Storage Room:

An externally accessible storage room for bulk solvents is maintained by the Department. The room is only accessible from the exterior of the building for safety in the event of spills, ruptures, or other incidents of potential hazard to personnel.

Receiving Dock and Compressed Gases Storage Room:

Our building has a readily accessible receiving dock with direct access to the storage room for compressed gases and cryogens.

Compressed Air:

An air compression system is required for the operation of some instruments (NMR's for example) and as a convenient source of pressure for lab operations such flash chromatography.

Natural gas connections:

In the classroom, natural gas connections are used for the demonstration of operating a Bunsen burner, setting up hot water baths, and for other types of demonstration relevant to the lecture material. In the teaching laboratories, natural gas connections are necessary for operating Bunsen burners for heating objects directly, preparing boiling water baths, desiccating materials, burning off combustible components of mixtures, etc.

Faucet/Sink: A ready source and disposal of running water, in the classroom, is necessary for the performance of various types of demonstrations and training. In the laboratories, the need is many times amplified as water is used as a reaction medium, reagent, cooling source, and cleaning fluid.

Safety Equipment: Each lab (teaching and research) is equipped with a safety shower and an eye-wash station.

Instrumentation:

Delineation of instrumentation will be addressed below, but student access and training on instrumentation is provided through a central instrument room and access to a 300 MHz NMR.

ii. Facilities (limitations and growth):

Office Space:

Additional office space is needed for future faculty/staff growth as there are currently no available spaces.

Research Laboratory Space:

Additional research space is gravely needed as current new faculty members have only been able to gain laboratory space due to the fortuitous retirement of older faculty at the time of their hiring. Expansion of available research space is required for continued growth.

Teaching Laboratory Space:

As Teaching Assistantships are the primary support mechanism for our graduate students, the limits on our ability to offer a greater range of sections/time in the undergraduate laboratories also limits our ability to support growth in the number of our graduate students. Our undergraduate teaching laboratories are maxed in terms of available space and time. Our teaching facilities are the most efficiently utilized and the most consistently in use on this campus. Expansion of available undergraduate teaching laboratories will curtail our turning away undergraduates in the laboratories and provide for support of a growing number of graduate students.

B. Technology and Technology Costs:

1. **Does this program require technology/tech support over and above the normal operations of the University?**

ABSOLUTELY! Chemistry, as a discipline, is focused on the examining, analyzing, identifying, measuring, reacting, preparing, testing, and handling of chemical substances.

i. **Current technology in the department**:

Reagents: Depending on the specific research area and problem, each research group acquires and uses a wide range of chemical reagents. Many are used in significant quantities (solvents, acids, bases, etc.) so storage of bulk is necessary. Many are hazardous, requiring special handling, storage, equipment, and/or inert atmosphere conditions.

Consumables: This category encompasses many areas in chemistry. Chromatography support (silica gel, alumina, etc.), filter paper, septa, disposal pipettes, gloves, etc..

Lab Ware: Lab ware consists primarily of laboratory glassware: flasks, condensers, beakers, graduated cylinders, funnels, pipettes, etc., but may also include heating mantels and controllers, magnetic stirrers, mechanical stirrers, etc..

Compressed Gases: A steady dependable supply of compressed gases such as nitrogen, helium, hydrogen, argon, acetylene, and oxygen are required for the operation of numerous instruments involved in the teaching laboratories and for the research laboratories. The presence of a compressed gases storage/receiving area is noted under Facilities (A).

Cryogens: Liquid nitrogen and liquid helium are required on a continuing basis for the operation of the JEOL 300 MHZ NMR which utilizes a cryogenically cooled superconducting magnet. Liquid nitrogen must be supplied at least on a weekly basis and liquid helium is required every four months.

Current Instrumentation and Technology (within Department):

NMR: JEOL Eclipse+ 300 (300MHz, Broadband, Auto-tune, Auto-shim, variable-temp, Electronics upgraded to all digital system, 2015) Sample data is easily offloaded to other computers and processed using the Delta (TM) software available freely from JEOL.

Anasazi EFT-60 (60 MHz, permanent magnet instrument, capable of proton, C13, basic 2d NMR experiments) Primarily used as a teaching instrument for familiarizing students with the normal routine processing involved in the acquisition of NMR data and spectra.

X-Ray Diffraction:

Rigaku XtaLab mini: provides routine research grade structural determination and crystal structure data for crystalline substrates.

Optical Molecular Spectroscopy:

IR spectrometers:

Bruker Vertex FTIR

ThermoNicolet FTIR 200: equipped with a germanium crystal ATR attachment for analysis for solid samples.

UV-Vis Spectrometers:

Jasco V-730 UV-vis Spectrophotometer

Cary 50 Bio UV-vis Spectrophotometer

Schimadzu UV-2101PC spectrophotometer

Genesys 10 UV spectrophotometer

Fluorescence Spectrometers

Hitachi F-4500

Mass Spectrometry:

GC-Mass Spectrometer.

Agilent 5975C 7890A:

Varian Saturn 2000: Ion trap MS system for routine analysis of volatile reaction mixtures and substance identification.

Chromatography and Separations:

Gas Chromatographs:

HP 6890: Thermal conductivity detector GC for routine analysis of volatile liquids.

Agilent 7890A

Liquid Chromatographs:

Thermo Dionex Ultimate 3000 HPLC

Varian ProStar HPLC

Dionex ICS-1500 LC

Dynamax

Polaris Isocratic LC

Refractive index detector

Gel Electrophoresis:

FischerBiotech FB200

Varioskan Flash MultiMode (Photometric, fluorometric, time-resolved fluorescence) Plater Reader with optional luminescence module and one robotic syringe.

Capillary Electrophoresis:

Beckman Coulter P/ACE

Other:

Radiochemistry:

Vernier Radiation Monitor

Thermal Analysis:

MettlerToledo DSC

Schlenklines and Dry Box Apparatus:

Vigor Scilab Glovebox

Synthware Schlenk line

Imaging Microscopy:

Bruker Hyperion 2000

Raman Spectrometer:

Ocean Optics QEPro

Centrifuge:

Eppendorf 5810R

VWR Galaxy 20R

Autoclave:

Steris Amsco Lab 250

Photochemical Reactors:

Two (2) Rayonet (TM) photoreactors with carousals and 254 nm and 300 nm Hg lamps.

Advanced Instruments Model 3320 Osmometer

Bertin Technologies Precellys 24 Homogenizer

FreeZone 4.5 Freeze dryer

Malvern Zetasizer nano

Hielscher UIS 250V VWR 97048-992

Pion Gut-Box plate stirrer

Emulsiflex B-15 emulsifer

Current Computational Research Facilities (within Department):

Chemistry computer lab:

Houses ten (10) networked MS Windows based workstations with a full complement of desktop software. Each workstation has Gaussian09W and GaussView installed for both instructional and research utilization. Two 24 GB(ram) Linux-based systems with Eight-core Xeon processors and Gaussian09 are also housed in the computer lab. These systems are exclusively for computational work supporting ongoing research.

Other computational Facilities:

Some individual Faculty have procured basic computational workstations within their research laboratories for their work through grant/personal funding.

Research grade Computational Facilities:

Currently, the Department does not possess computational research grade facilities. High level computational work is limited to very small molecules and generally to routine questions relevant to bench chemistry work. Access within the department to dedicated computational equipment for the development and use of research/teaching software is a critical component in going forward. Long-run calculations or software development require systems not only having significant hardware resources but which are also restricted to research/development utilization.

University Resources available to Department:

Instrumentation:

TRIES (Texas Research Institute for Environmental Studies):

We have access to the Texas Research Institute for Environmental Studies (TRIES) Analytical Laboratory, which is a core facility dedicated to advancing and promoting scholarly activities among faculty and students. The lab is a certified contract analytical lab with extensive equipment including two Agilent GC/MS instruments, an LCQ LC/MS, elemental analyzer, ATR-IR, ICP-AA, sample storage and prep space, and multiple staff members. (The TRIES website is http://www.shsu.edu/dept/tries/analytical-laboratory.html.) Chemistry faculty members also serve on various TRIES advisory boards and committees steering the facility and providing data integrity checks. Some chemistry graduate students have worked in this lab (positions funded by TRIES) to gain hands-on experience instead of teaching undergraduate labs for the department.

STAFS (Southeast Texas Applied Forensic Science Facility)

The Southeast Texas Applied Forensic Science Facility is a research facility (one of the nation's few "body farms") in a wooded area near Huntsville, TX with a predominant focus on the study of applications of forensic sciences to the human body. This gated and fenced secure facility is operated by a full-time staff that handles body donation and facility maintenance, as well as administration of non-disclosure agreements, proposal vetting, and ensuring safety compliance and documentation. They also have equipment on-site for extracting tissue samples. Chemistry faculty and students (the Haines Lab primarily) use this unique facility to study the chemistry of decomposition of human bodies, collecting volatile organic compounds, soil samples, and tissue samples at the facility and bringing them to TRIES or to the Chemistry building for instrumental analysis.

Biology/Life Sciences Laboratory Building:

Currently under construction is the new Biology Laboratory Building for the accommodation of expanding needs for the Department of Biological Sciences. Housed in the new facility will be updated/upgraded laboratory space and instrumentation supporting research. Expansion of molecular biology and biochemistry instrumentation/laboratories will strongly enhance available and future research/education. Plans for the collaborative use of the molecular-biology/biochemistry laboratories with the Chemistry Department are already being negotiated and tentative itemization of instrumentation for the new labs is in the development. The shared use of the instrumentation will provide for the greatest efficiency of utilization and promote for a richer collaborative environment for the two departments.

It is hoped that the availability of the new facilities will allow for expansion of the Department's offerings to include BS and MS degrees in Biochemistry. Our current facilities do not allow for the offering of sufficient laboratory courses for a degree specifically in Biochemistry.

ii. Technology Support:

University IT support:

The University IT department currently only supports the technology that falls under their purview; Classroom PC's, Classroom projectors, Office PC's, computing laboratories.

Technology Support:

No University/College/Department level instrument/electronic maintenance exists outside of expensive vendor service contracts or service calls. Maintenance or repair of instrumentation requires securing funds or a very adventurous faculty/staff member going beyond their use of said instrument. A University/College level professional staff member with an extensive electronics background could possibly be a more economical alternative considering the number of instruments with in our college, Chemistry/Physics/Biology/Geology, etc.

Material Science Support:

Our new faculty additions include an Organic, an Inorganic, and an Analytical position in which each person has or is including into their research elements of synthesis, analysis, and study of new macro-materials. Our/their needs for going forward in incorporating material science into the curriculum and research are being determined.

VIII. Assessment Efforts

A. Annual Program Assessment

1. Student Learning Outcomes

Beginning in the fall term of 2012, student learning objectives were entered into the campus assessment system (for SACS data collection purposes). This system was referred to as OATdB (the Online Assessment Tracking dataBase), and a new system (Campus Labs) went into effect in the 2015-2016 academic year. The learning objectives for each class have not changed. With OATdB, we were also required to provide an Indicator, a Criterion and a Finding as well as action(s) to be taken the next time the course would be offered. Since most of the classes have now been offered multiple times (albeit not by the same individual in every instance), we will organize this material by course number. In instances where the number has changed (from 5385 to a specific individual course number), the new number will be used. We will provide the student learning objective title and description followed by the Indicator, and Criterion. After that, we will provide the finding (identified by the semester in which the course was offered) and the proposed action, followed by the subsequent finding(s) and action(s).

CHEM 5361: Demonstrate Advanced Organic Chemistry Knowledge and Skills: Physical organic chemistry is a field of organic chemistry that looks at the physical aspects (heat, light, stereochemistry, bond strengths, acidity, etc.) of bond formation and bond cleavage. This field had its beginnings in the 1930s and is useful to chemists as we try to address problems important in health care, food chemistry, synthesis, photophysical processes, and biochemical research.

Competence in Understanding Physical Organic Chemistry Through Structure-Reactivity Examples: All students in the class are given problem sets to strengthen their understanding of physical aspects of organic chemistry, and to become cognizant of common research approaches to this field through published material on the changes of reactivity with changes in experimental reaction conditions. Competence is demonstrated by correct assessment of 90% of the assigned problems.

Applications Of Key Reaction Intermediates In Organic Chemistry: Exam scores will be used to assess student understanding of the fundamental concepts of the course. These are the experimental results upon changes in reaction conditions (heat, or light). Additional homework may be assigned to those students who show some deficiencies in certain areas. Arriving at the same conclusions of the questions as the authors of the homework assignments will be used to judge the assigned homework.

Spring 2014 Finding and Action: Observed Mastery of Physical Aspects of Organic Chemistry: During the Spring 2014 semester, all students showed a grasp and use of the fundamental concepts of this field as applied to approaches to determining mechanisms of organic reactions on assignments during the course. These were realized by changes in chemistry with respect to structure-reactivity phenomena.

Student Presentations of Experimental Approaches: During the next course offering, peer evaluations of student presentations will be used to address the understanding and dissemination of fundamental concepts common to this field.

CHEM 5362: Demonstrate Advanced Organic Chemistry Knowledge and Skills: Organic reaction mechanisms is a broad area of organic chemistry that requires an understanding of the basic structural-electronic properties of organic molecules. The graduate course CHEM 5362 is focused on the examination of alkylation, oxidation, reduction, substitution, elimination, rearrangement, and electrocyclic processes. As each topic is covered, in-class and out-of-class problems are assigned to give each graduate student ample practice and experience at applying the material. Since application is the central focus, all work involves open access to course materials.

Mastery of Advanced Organic Chemistry Knowledge: All graduate students in this course will demonstrate their mastery of organic reaction mechanisms and their application to specific reactions through multiple applied problem sets and periodic examinations. Evaluation of the student's work is based on the appropriateness and acceptability of their answers based on current literature.

Final Exam Performance in CHEM 5362: All (100%) of the students will score within one standard deviation of the mean or higher and within two standard deviations of the high score on the final examination.

Spring 2013 Finding and Action: CHEM 5362 Results: During the spring 2013 semester, 78% of the students scored one standard deviation of the mean or higher and 67% were within two standard deviations of the high score for the class.
More Elaborate Description: The next time the course is offered, at the beginning of the semester the instructor will outline the requirements for the final examination. A topic-by-topic outline of what is expected from the student by the time the class reaches the final will be presented to the class. The instructor will emphasize the importance of fulfilling the mastery of the outline material from the beginning of the course.

Spring 2015 Finding and Action: CHEM 5362 Results: During the Spring 2015 semester, 100% of the students scored within 10% of the points of the mean or higher and 93% were within 20% of the points of the high percentage for the class on the final.
Inclusion of Small Group Activities for Short In-class Presentations: In future offerings of the class, an increased number of small problem sets will be required in order to emphasize the necessity of applications to the understanding of the mechanism and use of organic reactions.

CHEM 5368: Demonstrate Understanding of the Peer Review Process in Scientific Publications: The process of peer-review of manuscripts for the scientific literature is a fundamental part of science. Students in Analytical Spectroscopy (CHEM 5368, taught every 2 to 2.5 years) read and discuss published peer-reviewed literature articles throughout this course (there is no assigned textbook). One of the objectives of this course is for students to learn the nuts and bolts of the systematic process of scientific peer-review. Mastery of the requirements for modern high quality technical scientific publication is required to meet one of the primary objectives of this graduate course in chemistry.

Examination of Student Understanding of Scientific Peer Review: All students in the class are required to understand and correctly order the sequence of events, identify the players in the process (authors, editors, and reviewers), detail the feedback nature of the review process, and be able to critique both technical writing, figures, schematics, or imagery required in chemical publications.

80% Of Graduate Students Meet Expectations: Eighty percent of graduate students taking the final exam in the class will score within one standard deviation of the mean or higher on a written question on the final designed to evaluate their mastery of the Indicator.

Spring 2013 Finding and Action: Performance on CHEM 5368 Exam Question: In spring 2013, students scored substantially higher than the Criterion (85% scored within 1 standard deviation of mean or higher on the spring 2013's peer-review process question); however, there were common mistakes in understanding about the review feedback process.
Monitor Progress: Subsequent CHEM 5368 classes will be assessed on an ongoing basis for this Indicator. Examples of reviewer feedback from the instructor's own manuscript's anonymous peer reviews will be introduced to the class to provide examples of reviewer feedback to help students in mastering the reviewer feedback step of scientific peer-review. The criterion can be increased in subsequent years after more course-to-course variability has been measured.

Spring 2015 Finding and Action: CHEM 5368 Results: Using a scientific manuscript that had been recently peer-reviewed from work carried out in the instructor's research group, the Spring 2015 CHEM 5368 course was modified to include a detailed description of the steps in the peer-review process, including the temporal variables involved in the process, the subject journal's editor's comments, comments from the anonymous reviewers, and examples of how the (ultimately accepted) manuscript was modified in response to the review process. And as the previous Action requires, a test question involving the peer-review process was included and the results showed an increase in student success from 85% scoring within 1 standard deviation (in Spring 2013) to 90% (in Spring 2015).
Monitor Progress: Monitor the progress of the students and consider tightening the criterion. We raised it from 80% in 2012-2013 to 85% in the current year.

CHEM 5372: Demonstrate Advanced Biochemistry Knowledge and Skills: CHEM 5372 "Advanced Biochemistry I" addresses detailed biochemistry concepts from a chemical perspective. It covers all major macromolecules, but with a strong focus on enzymes using cytochrome P450s as the model enzyme to explore in detail. Students are expected to understand enzymes and how they are studied at a level that allows critical analysis of primary literature in this field.

Ability to Understand and Critically Analyze Primary Literature in Enzyme Biochemistry: Each student will present an appropriate literature article (selected by the student and approved by the instructor). On the final exam, each student will be required to answer questions on five (5) different papers discussed during the semester (out of 24 total). Each question will require the student to first summarize the paper's major findings, then to explain how a technique used in the paper works, then critically evaluate what the authors did not include in the paper that they should have or could have. The students will not know the nature of the questions before the exam, just that there will be one question for each article.

Mastery as Demonstrated on Final Exam Questions: 80% of students will score at least 80% (12 of 15 points) on 80% of the exam questions (4 out of 5 questions each student answered on this section of the final exam). Scoring will be done by the instructor.

Fall 2014 Finding and Action: Observed Mastery of Advanced Biochemistry of Enzymes: During the Fall 2014 semester, 100% of students (24) met the criteria. This is consistent with the instructor's overall evaluation that this was an unusually successful set of students. He deems it unlikely that this would be the case in other semesters.
Increase Level of Material and Stringency of Criteria: During the next course offering, additional detailed material about spectroscopic methods used to study enzymes will be added as the students are capable of handling more material (although the fall 2014 semester was not deemed deficient, there is more material that can be added). Further, the criteria for success in the assessment will be increased to 85% of students scoring at least 85% on 100% of the literature questions.
Spring 2017 Finding and Action: Observed Mastery of Advanced Biochemistry of Enzymes:

During the Spring 2017 semester, 100% of students (13) met the criteria.
Add Take-Home Exam Evaluation: This is the second offering where 100% of the students met the criteria. A review of the questions themselves supports that the questions are detailed and rigorous. Further, students are picking diverse questions (they are not doing well as a result of picking a few easier questions). This semester, each exam including the final exam was split into an in-class portion and a take-home portion to allow more in-depth questions to be included (some of which test literature-searching skills as well). In the next offering, I plan to assess the take-home portion as well, as students spend much more time on it and the questions are more in-depth.

CHEM 5373: Demonstrate Understanding of Drug Development and Drug Antagonism: The course discusses the development of biologically active molecules and antagonists, through the exploration of the state of the art in drug antidotal therapy that employs the addition of exogenous metabolizing enzymes to destroy toxic molecules (e.g. chemical warfare agents) in the body and discussion of drug development following the approach of "Molecules from the Research Labs to the Hands of Doctors to Treat Diseases and Chemical Intoxications."

Examination of Student Understanding of Basic Elements of Industrial Biochemistry: All students in the class are evaluated by a final written comprehensive examination.

Comprehensive Final Exam Performance: Eighty percent of graduate students taking the final exam in the class will score within one standard deviation of the mean or higher on the comprehensive final test.

Spring 2014 Finding and Action: CHEM 5385 Results: During the spring 2014 semester, 18 students took the course (two were from the forensic science M.S. program and the rest were graduate students in chemistry). Ninety-four percent of the students (17 out of 18) met the criterion.
Increased Emphasis on Problem Solving: The next time the course is offered, there will be an increased emphasis on complex problem solving of tasks related to the objective through the use of individual homework and group classroom assignments.

Spring 2016 Finding and Action: During the spring 2016 semester, 25 students (MS and PhD) from different departments took the course: (17 MS Chemistry; 3 MS Forensic; 4 PhD Forensic; 1 MS Agri. Sci & Eng. Tech.). The teaching material was adjusted to the requirements of the diversity of the class, with more emphasis on chemical and biological warfare agents. Originally this topic was planned for a course for the Forensic Science PhD program. Out of the 25 students 23 (92%) met the above criterion. The two students who did not meet the criterion were from Chemistry MS program.
Recommendations for the next Drug and Toxin Biochemistry course: The next time the course is offered, students' progress will be monitored by offering more than just the final exam, and their oral presentations and their participation in the presentations (asking questions, sharing their critiques) will be included in the final grade. In the syllabus the grading criteria will be clearly described.

CHEM 5374: Demonstrate Knowledge of the Electronic Structure of Metal Complexes: CHEM 5374 "Chemistry of Coordination Compounds" is a course about transition metal complexes. An understanding of the nature of the metal-ligand bond is essential for students to address the rest of the material in the course.

Mastery of the MO Diagram for Octahedral Metal Complexes: Graduate students in this course will demonstrate their mastery of the sigma only molecular orbital energy diagram for an octahedral metal complex by constructing such a diagram on an examination given the group theory character tables and the appropriate symmetries of the ligand orbitals.

Exam Performance in CHEM 5374: Over 90% of the students will score over 3 on a 5 point scale on the question "Draw a full molecular orbital energy diagram for $M(NH_3)_6^{n+}$ where M^{n+} is a transition metal. The symmetries of the lone pairs of ammonia are a_{1g}, e_g and t_{1u}."

Fall 2013 Finding and Action: CHEM 5374 Exam Results: Thirteen students scored 5 on the question. Two scored 4 and one scored 2. Thus 15/16 = 94% scored above a 3. The criterion was met.

Monitor Progress: The criterion was met and this material will be emphasized through the use of homework assignments on the construction of molecular orbital energy diagrams the next time the course is offered.

Fall 2015 Finding and Action: Eight students scored 5 on this question. One scored 4.5. Four scored 4. Two scored 3 and 1 scored 1. Thus 10/13 = 77% scored above a 3 and 12/13 = 92% scored a 3 or above. Thus, the criterion was not met.
Monitor Student Preparation and Progress: With the most recent offering of CHEM 5374, the criterion was not met. It turns out that the MO background of the three students who scored 3 or under was relatively weak. In the next offering of the course, an attempt will be made to assess students' background in this area and to provide supplemental materials to those whose background is weak.

Spring 2017 Finding and Action: There were six students in the course, and all six scored 5 on this question. Thus 6/6 = 100% scored above a 3. Thus, the criterion was met.
Monitor Student Preparation and Progress: With the offering of CHEM 5374 during the fall of 2015, the criterion was not met. Consequently, I gave a "placement" exam on the first day of the offering of CHEM 5374 during the spring of 2017 to assess the students' background. Some were quite weak in this area, so I provided supplemental materials and spent more lecture time on the fundamentals. This approach seems to have worked quite well given the results, so I will do the same again the next time the course is offered.

CHEM 5375: To Demonstrate Competence in Organometallic Chemistry and Self-confidence in the Understanding of Technical Material: Modern organometallic chemistry is a subfield of inorganic chemistry that engages chemical principles and concepts of bonding, structure, and reactivity mastered throughout undergraduate and graduate curricula. The graduate-level Organometallic Chemistry course (CHEM 5385) is designed to review many of these principles and concepts in the first half of the semester in a classical lecture format. In the second half of the semester each graduate student is given a subject area covered in a text chapter. The student is tasked with preparing two or three lecture-discussion presentations that include use of

PowerPoint, supported review of the chapter material, and white-board interactive discussion of one or more example problem exercises, as well as extemporaneous responses to class questions.

Presentation of Selected Topics in Organometallic Chemistry: All students in Organometallic Chemistry (CHEM 5385) are required to demonstrate their ability to be professionally conversant within the assigned topic, capable of preparing a professional presentation, and expected to maintain professional bearing while serving as discussion leader. Graduate student presentations are evaluated through peer-evaluation and professor evaluation using a summary, five-point Likert rating scale.

68.2% Of Chemistry Graduate Students Will Meet or Exceed Expectations: A super-majority of chemistry students (68.2%) are expected to have an average evaluation within one standard deviation of the mean or higher than one standard deviation above the mean on their presentation-discussion assignment.

Fall 2012 Finding and Action: Organometallic Chemistry Results: In the fall semester of 2012, the mean Likert evaluation score was 3.38 with a standard deviation of 0.48. Student performance for the fall of 2012 (77.8%) exceeded the evaluation criterion. Of the graduate students in Organometallic Chemistry (CHEM 5385), all but two individuals met or exceeded expectations. One of these individuals was very close to the minimum cut-off score (2.91) with a summary evaluation score of 2.89.

Recommendations for the Next Offering of Organometallic Chemistry: To improve on student performance, refined guidelines for the PowerPoint materials concerning relative numbers of slides and appropriate preparation of figures or tables should be provided.

A new instructor took over CHEM 5375, and the student learning outcome, indicator, and criterion changed significantly, so they are presented here. Demonstrate understanding of organometallic bonding and reaction chemistry: CHEM 5375 “Organometallic Chemistry” addresses the principles of bonding and reactivity in organotransition metal compounds and their use in a variety of catalytic transformations. A key objective is to evaluate the mechanisms of complex catalytic reactions in terms of fundamental principles of bonding, and how the reactivity of a catalyst can be understood and controlled using these principles. The relevant principles are the molecular orbitals formed between the transition metal center and organic ligand; the assignment of oxidation states and electron counts; and the relationship between these factors and molecular stability or reactivity.

Organometallic Chemistry: During the final examination, all students in the course will demonstrate their level of mastery of the concepts of organotransition metal bonding by identifying a key bond-forming and bond-breaking reaction step within the complex mechanism for the catalytic hydrodehalogenation of alkenes.

Over 90% of the students will correctly: identify the oxidative addition step within the multi-step catalytic mechanism and assign the change in oxidation state, electron count, and coordination number that the transition metal center undergoes during this transformation.

Fall 2016 Finding and Action: 100% (10/10) students correctly: identified the oxidative addition step; assigned the change in oxidation state; assigned the change in electron count; and assigned the change in coordination number.
In future offerings of this course, similar assessment indicators will be used, prompting students to identify a key reaction step within a complex catalytic cycle taken from the literature, and students will be required to evaluate changes in the properties of the transition metal complex that result from this step.
To increase the level of rigor, the criteria will be made more specific, evaluating students' ability to assign the specific values for these properties prior to and after the reaction step, rather than simply the change in these values.

CHEM 5381: Demonstrate Advanced Chemical Thermodynamics Knowledge and Skills: CHEM 5381 (Advanced Physical Chemistry: Thermodynamics). Each student will demonstrate molecular, computational, and statistical viewpoints and explanations of thermodynamic phenomena in chemistry.

Mastery of Advanced Thermodynamics Knowledge: All graduate students will demonstrate a mastery of the course material through long problem sets, computational chemistry assignments, Excel modeling assignments, and in-class examinations.

100% Pass the Comprehensive Final Exam with at least a 60% score.

Fall 2015 Finding and Action: Of the 19 graduate students taking the course, 18 successfully met the criterion. One student fell short with a 59% score on the exam. This particular student had a protracted period of absences due to surgery in the middle of the semester. Their performance was compensated by extra effort on the homework assignments, leading to their successful completion of the course.
Development of Tutorial Material: Prepare material for remedial and tutorial use for those students who are struggling with the material or who fall behind.

CHEM 5382: Demonstrate Advanced Symmetry and Spectroscopy Knowledge and Skills: The field of spectroscopy extends into many industrial sectors such as optical communications, chemical analysis, and forensic science. There are too many individual spectroscopic techniques to cover in a single semester, but a focus on quantum mechanics and molecular symmetry unites them all. The graduate course CHEM 5385 – Symmetry and Spectroscopy – covers the quantum roots of spectroscopy, the power of symmetry to elucidate the interpretation of spectroscopic data, and the advanced topic of spectroscopic modeling. Hand-written assignments, short discussion topics, and extensive mathematical assignments in Excel are used to give each graduate student the experience of analyzing real problems in spectroscopy. These assignments push the student beyond a simple knowledge of the topic toward the higher-level skills of synthesis and evaluation as they compare their model results to experimental data.

Mastery of Advanced Symmetry and Spectroscopy Skills: All graduate students in this course will demonstrate their mastery of symmetry-based spectroscopic modeling through multiple applied problem sets and periodic examinations. Evaluation of the student's work is based on the appropriateness and acceptability of their answers based on current literature and experimental data. A final summative modeling assignment will be used to indicate a student's ability to analyze, synthesize, and evaluate the ability of a spectroscopic model to fit experimental data.

Advanced Modeling Assignment in CHEM 5385: All (100%) of the students will score within one standard deviation of the mean or higher and within two standard deviations of the high score on the final modeling assignment.

Fall 2012 Finding and Action: CHEM 5385 Results: This course was taught in the Fall 2012, and a 2-hour final exam was used to track student success toward the objective. The students satisfied the criterion, but the final exam was less comprehensive than it could have been due to the fact that it had to be completed in two hours.
Prepare the Final Modeling Assignment: The final modeling assignment and grading rubric will be prepared from the assignments delivered in previous semesters of this course. This final assignment will allow the student more time to synthesize their model, apply it to the data, and evaluate the strengths and weaknesses of the model using the skills gained in the course. This action will be implemented when this course is taught again in three years.

CHEM 5385: Polymer Chemistry: Demonstrate Knowledge of Advanced Topics in Polymer Chemistry: Polymer chemistry is a multidisciplinary subfield of chemistry. This graduate level course is organic-chemistry-based although it includes aspects of analytical, biological, inorganic, materials and physical chemistry. The first half of the course involves polymer synthesis presented in lecture format and the second half was split equally between polymer characterization in lecture format and student presentations on an advanced topic related to polymer chemistry.

Examination of Student Understanding of Advanced Topics in Polymer Chemistry: All students in the class are evaluated by written examination. One exam in the course is based primarily on the key points from the student presentations on advanced topics.

Advanced Topics Exam Performance: All students will score above one standard deviation below the mean on the advanced topics exam.

Fall 2013 Finding and Action: CHEM 5385 Fall Semester 2013: During the Fall 2013 semester, 88% of the students scored higher than one standard deviation below the mean.
Add Peer Evaluations and Presentation Summaries: The next time this course is offered, students will be required to evaluate and summarize the key points of their peers' advanced topic presentations. These evaluations and summaries will be posted anonymously for the whole class to view. In this way, the students will be more engaged in the presentations and the key points will be more apparent to all students.

The indicator for this course has changed: Examination of Student Understanding of Advanced Topics in Polymer Chemistry: All students in the class are evaluated by written examination. In the past, the third exam in the course was based primarily on the key points from the student presentations on advanced topics. Due to the lower enrollment in the spring 2016 the third exam also contained material from the instructor's lecture and was more comprehensive than the previous time the course was offered.

Spring 2016 Finding and Action: During the Spring 2016 semester, 7 out of 8 students scored higher than one standard deviation below the mean.
Add Peer Evaluations and Presentation Summaries: The action remains the same the next time this course is offered; students will be required to evaluate and summarize the key points of their peers' advanced topic presentations. These evaluations and summaries will be posted anonymously for the whole class to view. In this way, the students will be more engaged in the presentations and the key points will be more apparent to all students.

CHEM 5385: Nanoscience and Nanosensing: Demonstration of Quantitative Proficiency in the Calibration and Validation of Chemical Sensors: CHEM 5385 (Nanoscience and nanosensing) provides an introduction to calibrated measurements of concentration within the context of nanoscience and nanosensing. The course begins by setting up a framework for calibrated measurements of concentration and then examines how the fabrication, design, function, and applications of nanosensors fit into and influence that framework. Readings are assigned from both textbooks and the primary literature. A key objective of the course is that students be able to quantitatively analyze raw sensor data for the purpose of making calibrated measurements of concentration, and that they be able to validate these measurements.

Mastery of Sensor Calibration and Validation Concepts: All students in the course will demonstrate their level of mastery of the concepts of sensor calibration and validation by their performance on a midterm examination devoted to these topics.

Performance on Relevant Midterm Examination in CHEM 5385: 80% of the students will score within 20% of the number of points of the highest scoring student on the relevant midterm exam, provided that the highest score obtains at least 85% of the available points. If the highest score is less than 85% of the available points, then the criterion will be that 80% of the students will score greater than 68% of the points on the exam.

Fall 2014 Finding and Action: Assessment Results from Fall 2014: 91% of the students met the criteria on the relevant midterm exam in the Fall 2014 iteration of the course. The high score on this exam was 100%.
Development of a Greater Range of Explanatory Examples Based on the Primary Literature: In future offerings of this course, more student exercises exploring potential pitfalls of calibration and how these can be identified in the validation procedure will be developed, along with a greater range of supporting problems based on new reports from the primary literature on nanosensors and nanosensing. The rigor and breadth of the relevant midterm exam will be correspondingly expanded.

Fall 2016 Finding and Action: The high score was 95% on the fall 2016 relevant midterm. 100% of the students had scores within 20% of this score and thus met the criterion.
Nano action: An additional exercise discussing the potential pitfall matrix effects was added to the course, along with a discussion of how a matrix effect could be identified in the validation procedure. Extra problems from the primary literature were added. This was reflected on midterm exams.
In the next iteration of the course, we will work on developing one or more additional datasets for the students to work up related to ongoing research in nanosensing.

2. Thesis Quality Reviews

A typical thesis in our department goes through a lot of revision before it is defended. This is a major part of the student's education, learning how to make such a large and involved professional document describing their research and meet stringent formatting and organizational requirements. Complicating this, English is not the first language of many of our students so a great deal of English grammar and style is taught in the process as well. Typically, a student and their research advisor work on the thesis, doing many rounds of revisions and suggestions for drafts. Once their advisor deems it ready to distribute to the rest of their thesis committee (usually two additional faculty in Chemistry), the committee reads it in detail marking it up with suggestions regarding the scientific content as well as grammar, style, and formatting. After the student defends the document, they need to make final changes to the approval of each committee member. The thesis will then go to the College of Sciences and Engineering Technology for approval, and the library does a formatting check before it finally is submitted to the College of Graduate Studies.

Although the department has not carried out additional thesis quality checks beyond this process, there is a very strong culture of engagement in the thesis process compared to most institutions (several faculty in the department of taught at other MS and/or PhD programs prior to coming to SHSU). Further, four years ago the Office of Graduate Studies started awarding an annual Outstanding Thesis award (one or two awards for the entire campus each year). Chemistry MS students won this campus-wide award three out of the first four years the award was given (all during the period of this self-study).

B. Alumni Surveys

Survey Instrument. An alumni survey was carried out for this self-study report. The Graduate Coordinator learned to use Qualtrics, which SHSU subscribes to, and developed the survey instrument shown after this section, starting on page 155.

Survey Distribution. The department did not have an active list of contact information for all alumni. The campus computer system and data from Institutional Effectiveness was used to extract personal email address for 64 alumni including all or nearly all from the self-study period. Dr. Haines maintains a Facebook group “Friends of SHSU Chemistry” which a lot of alumni from the past five to ten years monitor, so he put out a request for updated email addresses and received around 20-25 responses that were used to update this list. The survey was distributed to 64 alumni, with three emails immediately returning as invalid one of which was updated later by the alum in question. That meant that 62 email addresses didn’t bounce after that update, though some likely were email accounts that alumni may not check anymore (the addresses were filed in many cases when they first arrive at SHSU as students). The survey was available for approximately a week and a half, with periodic reminders sent to those that had not yet completed it. The survey was set to anonymize results, so we can’t see what each member’s answers were, but Qualtrics does list who has and has not completed the survey and allows reminders to be sent to only people who haven’t responded.

Survey Results. At the announced close of the survey, 46 alumni had responded (about 3/4th of those sent emails). (At the time of submission of the self-study report, after the announced deadline, an additional 6 responses had been submitted but the data in the report was not updated due to time restrictions and the fact that results were not qualitatively different as a result of the additional submissions.) Of those responding, 76% (35 alumni) self-identified as graduating from Fall 2011 to 2017, 15% (7 alumni) from Fall 2006 to Summer 2011, 4% (2 alumni) from Fall 2001 to Summer 2006, and 4% (2 alumni) from before Fall 2001 (detailed question results on page 171).

Detailed results appear after the survey instrument on the following pages, including some cross-tabulation tables at the end that break down results by the self-reported period the student graduated from the program. A summary of results of particular importance or requiring explanation can be found below:

- Overall, students are very satisfied with the education they received in the MS Chemistry program at SHSU, with 74% strongly agreeing and 97.8% agreeing at some level (the other 2.2% were neutral) (for detailed results see page 168).
- Students would recommend the program to a friend considering an MS in Chemistry, with 63% strongly agreeing and 95.7% agreeing at some level with the rest neutral (detailed results on page 170). However, a number of alumni addressed low stipends and lack of tuition waivers as problems in their final comments (discussed in more detail below) and one bluntly said that "I would strongly recommend the program to other students, if the stipend is sufficient. But the stipend is not sufficient to do the MS at SHSU." (Final comments are shown on page 193.)
- Of the alumni responding, 61 % (28 alumni) had attended or were currently attending a PhD program (page 172).
    - Of those alumni, 100% agreed at some level that they were better prepared for the PhD program as a result of their education at SHSU, with over half strongly agreeing (page 173).
    - Most reported they had a reduced course requirement in the PhD as a result of their MS coursework at SHSU (54% yes, 36% no, 11% not sure) (page 175).
    - A great many passed on advice for students who follow in their footsteps and attend a PhD program, or for SHSU faculty, with some specific comments that recurred or seemed particularly useful (full comment list on pages 177 and 179):
        - Take advantage of the chemistry faculty/expertise and the fact that you have such close access to them compared to a PhD program
        - Focus on gaining research experience
        - Get as much hands-on experience with instruments as possible
        - Practical knowledge from teaching labs is useful

    - The MS degree from SHSU is well respected and helps acceptance at PhD programs
    - Written and oral communications are important, and the department could increase opportunities for students to improve these skills
    - All students should have the goal of leaving with at least one published paper
    - SHSU faculty are very friendly (several comments use the term)
    - SHSU faculty do a ‘great’ job and provide ‘excellent’ mentorship. Dr. Thompson was specially cited for being a very strong mentor.
    - MS courses at times could have more breadth over the subject of the course. The example given was “biochemistry”, likely CHEM 5372 which gets excellent reviews from students on IDEA course reviews (see *E. Quality of* Instruction on page 97 for course review data), though.
    - Organic chemistry courses in the department are very strong.
- Of those responding to the survey, 52% (24 alumni) had had at least one job that used their MS in Chemistry (page 181). Many (39%, 18 alumni) of those that hadn’t were still in a PhD program or post-doctoral position. Only one alum (2%) responded that they had tried but had been unable to find employment with their degree, and three (7%) chose other with one indicated that they had just graduated and were still job hunting. Of those that had been in a job using their degree:
    - 87% agreed at some level that they were better prepared for the career in chemistry than their typical coworkers (page 182), with 57% strongly agreeing. The 13% that didn’t agree were all neutral, no one disagreed.
    - 100% agreed at some level that SHSU taught them the subject matter of chemistry well, with 52% strongly agreeing (page 183).
    - 91% agreed at some level that during their studies they had adequate instrumentation to train on, and none disagreed (page 184), though a number pointed out in comments that SHSU should increase student access to instrumentation.
    - 96% agreed at some level that at SHSU they had access to appropriate experts to train with, with only 1 alum disagreeing (“somewhat disagree”) (page 185).

- 74% agreed at some level that they got career advice at SHSU that was accurate and served them well (page 186), with 17% neutral and 9% (2 alumni) somewhat disagreeing.
- 92% agreed at some level (61% strongly) that SHSU helped them gain skills and knowledge other than the direct subject matter of chemistry that helped them in their jobs (page 187). One person was neutral and one disagreed.
- Many students offered advice on what our program could do or add that would better prepare students for careers (page 188 and page 190). Highlights include:
  - A few students commented that better help with writing resumes and job applications would be useful
  - A number indicated that more hands-on instrument experience would be useful, with several citing specifically the techniques like LCMS, GCMS, Q-TOF MS, Dart AccuTOF MS, and NMR.
  - A couple of students suggest training chemists for chemical business, perhaps with a special program (minor or degree). Subjects include intellectual property, accounting, product costing, and operational management.
  - Training in quality control/quality assurance and validation would be helpful
  - Expose students more to industry through tours, networking opportunities, etc.
  - One suggested advanced statistics should be taught, including principal component analysis (PCA), cluster analysis, control charting, “big data’ data analysis, and basic six sigma
  - Indications that SHSU does a good job teaching students to be independent relative to other graduate programs
- When asked about the stipend and financial aid at SHSU, alumni split into two groups with opposing opinions (page 192). 56% (25 alumni) agreed at some level that the aid (stipends and scholarships) available during their studies at SHSU was sufficient, but 44% disagreed at some level. It is interesting to compare this to the current student survey (page 249) where 100% of current students found

availability of aid to be unavailable/inadequate or somewhat sufficient/detracted from studies. An analysis of how the money students have left after receiving the stipend and paying tuition and fees has been significantly dropping over recent years will be presented in the last section of this self-study report (see B. Items/Areas of Concern, page 213). Although the alumni survey results had slightly more positive than negative responses, this question was a clear outlier where students were not overwhelming positive like the other questions. Further, many students made specific comments about the low stipend and lack of full tuition waivers combining as a major problem for them during their studies, and in at least one case an alum specifically said that although they were very happy with the education they received, they couldn't recommend the program to their friends because of the inadequate financial package.

F2017 MS Chemistry Program Self-Study Alumni Survey

Start of Block: Intro Block

Q1 ***Sam Houston State University MS Chemistry Alumni Survey*** The Department of Chemistry at Sam Houston State University is carrying out a survey of recent alumni in order to identify areas of strength and areas with an opportunity for improvement. We would appreciate it if you would answer the following questions to help us pursue that goal. The results of the survey will be incorporated into a graduate program self-study report to be produced by the end of the current semester.

Note: The survey software has been set to anonymize the results, so information about your identity will not be attached to your answers to the survey questions. Also, if you start the survey and leave you have one week to return and finish or the software will automatically submit the partially completed survey.

If you have any questions or concerns, please do not hesitate to contact Dr. Donovan Haines at haines@shsu.edu or by phone at 936-294-1530.

Q2 How much do you agree or disagree with the following statement? *Overall, I am satisfied with the education I received in the MS Chemistry program at SHSU.*

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q17 *If a friend of mine were considering earning an MS in Chemistry today, I would recommend SHSU's program to them.*

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q31 What year did you graduate with your MS in Chemistry from SHSU? (This will help us group the anonymous results to those just for alumni who graduated during the self-study period, etc.)

- ◯ Fall 2011 to 2017 (1)
- ◯ Fall 2006 to Summer 2011 (2)
- ◯ Fall 2001 to Summer 2006 (3)
- ◯ Before Fall 2001 (4)

End of Block: Intro Block

Start of Block: PhD block

Q4 After receiving my MS in Chemistry at SHSU, I attended a PhD program.

- ◯ Yes (1)
- ◯ No (2)

Skip To: End of Block If After receiving my MS in Chemistry at SHSU, I attended a PhD program. = No

Display This Question:

If After receiving my MS in Chemistry at SHSU, I attended a PhD program. = Yes

Q5 How much do you agree or disagree with the following statement? *I feel I was better prepared for success in graduate school, compared to other graduate students in my PhD program, as a result of my education at SHSU.*

- ◯ Strongly agree (1)
- ◯ Agree (2)
- ◯ Somewhat agree (3)
- ◯ Neither agree nor disagree (4)
- ◯ Somewhat disagree (5)
- ◯ Disagree (6)
- ◯ Strongly disagree (7)

Display This Question:

If After receiving my MS in Chemistry at SHSU, I attended a PhD program. = Yes

Q9 How far into your PhD studies are you?

- ◯ First year (1)
- ◯ Second year (4)
- ◯ Beyond second year (5)
- ◯ Completed (3)

Display This Question:

If After receiving my MS in Chemistry at SHSU, I attended a PhD program. = Yes

Q26 Did some of your MS coursework transfer or otherwise reduce the time it will take (or took) you to complete your PhD?

- ◯ Yes (1)
- ◯ No (2)
- ◯ Not sure (3)

Display This Question:

If How far into your PhD studies are you? = Completed

Q11 Did you carry out or are you carrying out postdoctoral training?

- ◯ I have not done postdoctoral training, and do not plan to. (1)
- ◯ I am currently doing a post-doc. (2)
- ◯ I did at least one post-doc position, and have since moved on to other positions. (3)

Q30 Do you have any specific advice you would like us to pass on to students who, like you, may go on to PhD programs after their SHSU MS degree?

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Display This Question:

If After receiving my MS in Chemistry at SHSU, I attended a PhD program. = Yes

Q10 Mentorship is very important in our program. Are there any other specific suggestions or experiences you want to relate to the SHSU faculty that would help the SHSU Chemistry Department better prepare students for PhD programs?

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End of Block: PhD block

Start of Block: Industry Block

Q14 Have you had at least one job since leaving SHSU that used your MS in Chemistry?

- ○ Yes (1)
- ○ No, I am still in a PhD program or Post-doc position (2)
- ○ No, I tried but was unable to find employment that required my degree (3)
- ○ Other (4) ____

Skip To: End of Block If Have you had at least one job since leaving SHSU that used your MS in Chemistry? = No, I am still in a PhD program or Post-doc position
Skip To: End of Block If Have you had at least one job since leaving SHSU that used your MS in Chemistry? = No, I tried but was unable to find employment that required my degree

Display This Question:

If Have you had at least one job since leaving SHSU that used your MS in Chemistry? = Yes

Q15 I feel that as a result of my education at SHSU, I was better prepared for my career in chemistry than my typical coworkers.

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Display This Question:

If Have you had at least one job since leaving SHSU that used your MS in Chemistry? = Yes

Q16 I think SHSU taught me the subject matter of chemistry well.

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Display This Question:

If Have you had at least one job since leaving SHSU that used your MS in Chemistry? = Yes

Q23 I feel that during my studies at SHSU I had adequate access to instrumentation to train on.

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Display This Question:

If Have you had at least one job since leaving SHSU that used your MS in Chemistry? = Yes

Q24 I feel that during my studies at SHSU I had adequate access to experts to train with.

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Display This Question:

If Have you had at least one job since leaving SHSU that used your MS in Chemistry? = Yes

Q25 I feel that career advice I received while at SHSU was accurate and served me well.

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Display This Question:

If Have you had at least one job since leaving SHSU that used your MS in Chemistry? = Yes

Q18 I think SHSU helped me gain skills and knowledge, other than the direct subject matter of chemistry, that served me well in my jobs since graduating. (Communication, working on research teams, and other skills that transferred to the workplace.)

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Display This Question:

If Have you had at least one job since leaving SHSU that used your MS in Chemistry? = Yes

Q19 What are the most important things SHSU could do or add to the MS Chemistry program that would better prepare students for their careers?

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Display This Question:

If Have you had at least one job since leaving SHSU that used your MS in Chemistry? = Yes

Q20 Do you have any other comments to pass on that would help SHSU Chemistry better prepare students for their careers?

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End of Block: Industry Block

Start of Block: Final Block

Q28 Do you agree or disagree with the following statement: *The level of financial aid, considering stipends and scholarships, available during my studies at SHSU was sufficient.*

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q21 If you have any final comments that might be useful to the Chemistry Department, please provide them here. Also, if there is a question that you wish we had asked on the survey but we didn't, please let us know here and we'll consider it for our next self-study survey (probably in five years).

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Q22 We thank you for your time and feedback! If you have any additional questions or concerns, please do not hesitate to contact Dr. Donovan Haines at haines@shsu.edu or by phone at 936-294-1530.

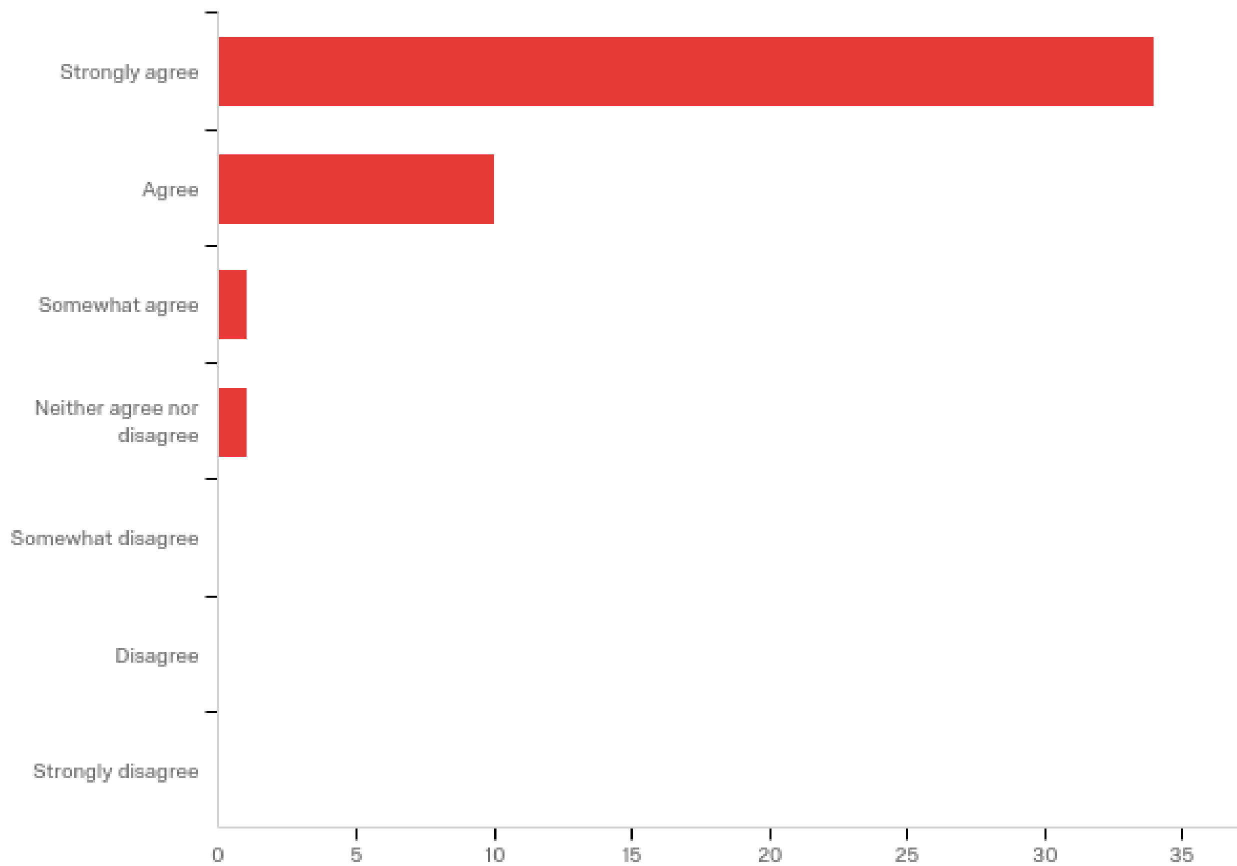
End of Block: Final Block

Survey Results Report

F2017 MS Chemistry Program Self-Study Alumni Survey

October 23rd 2017, 7:49 am MDT

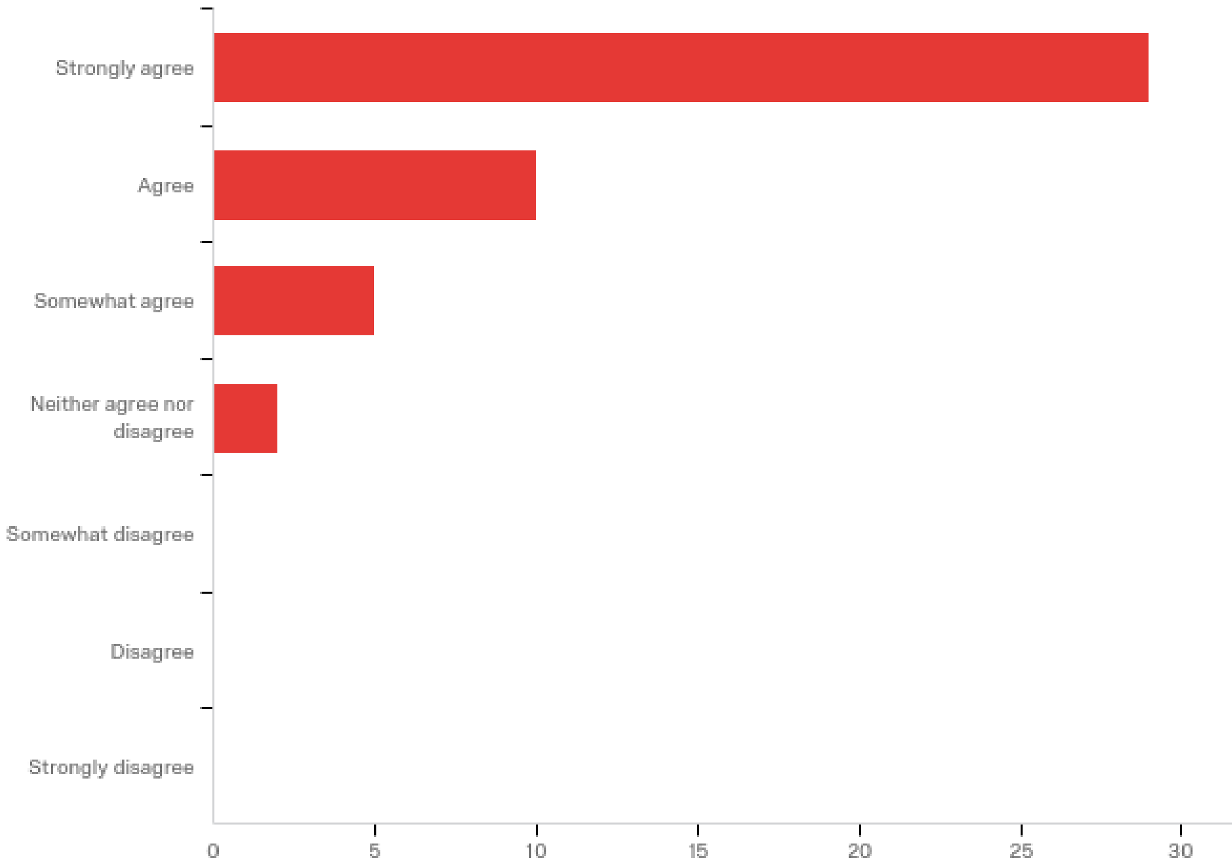
Q2 - How much do you agree or disagree with the following statement? Overall, I am satisfied with the education I received in the MS Chemistry program at SHSU.



#	Answer	%	Count
1	Strongly agree	73.9%	34
2	Agree	21.7%	10
3	Somewhat agree	2.2%	1

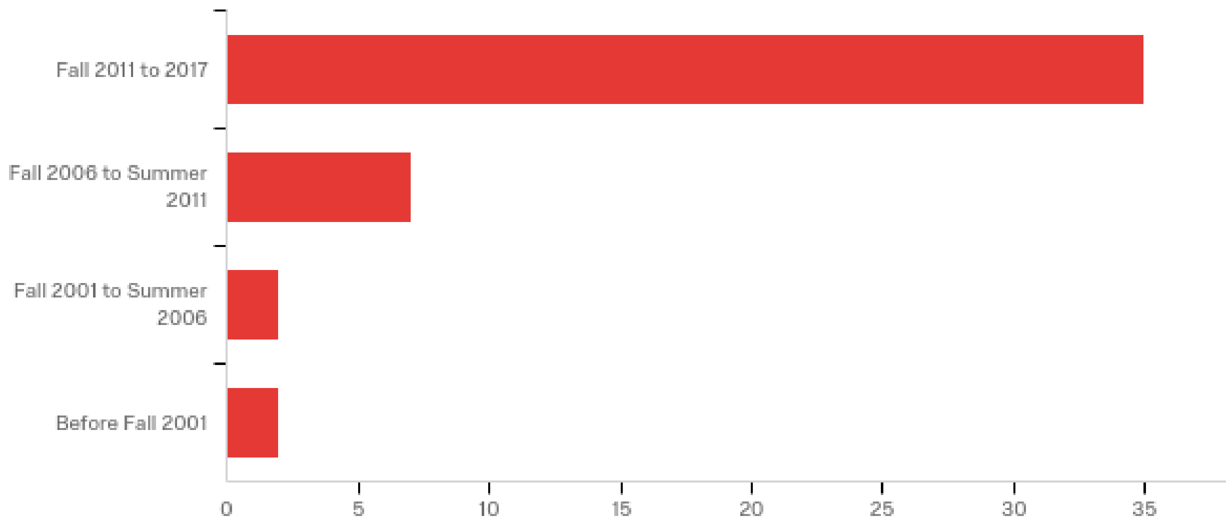
4	Neither agree nor disagree	2.2%	1
5	Somewhat disagree	0.0%	0
6	Disagree	0.0%	0
7	Strongly disagree	0.0%	0
	Total	100%	46

Q17 - If a friend of mine were considering earning an MS in Chemistry today, I would recommend SHSU's program to them.



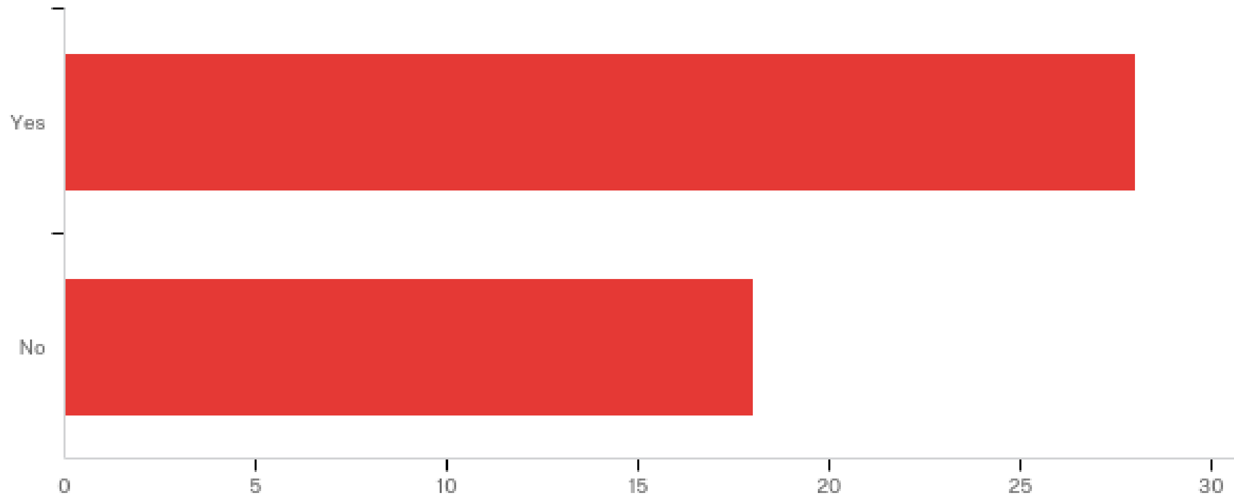
#	Answer	%	Count
1	Strongly agree	63.0%	29
2	Agree	21.7%	10
3	Somewhat agree	10.9%	5
4	Neither agree nor disagree	4.3%	2
5	Somewhat disagree	0.0%	0
6	Disagree	0.0%	0
7	Strongly disagree	0.0%	0
	Total	100%	46

Q31 - What year did you graduate with your MS in Chemistry from SHSU? (This will help us group the anonymous results to those just for alumni who graduated during the self-study period, etc.)



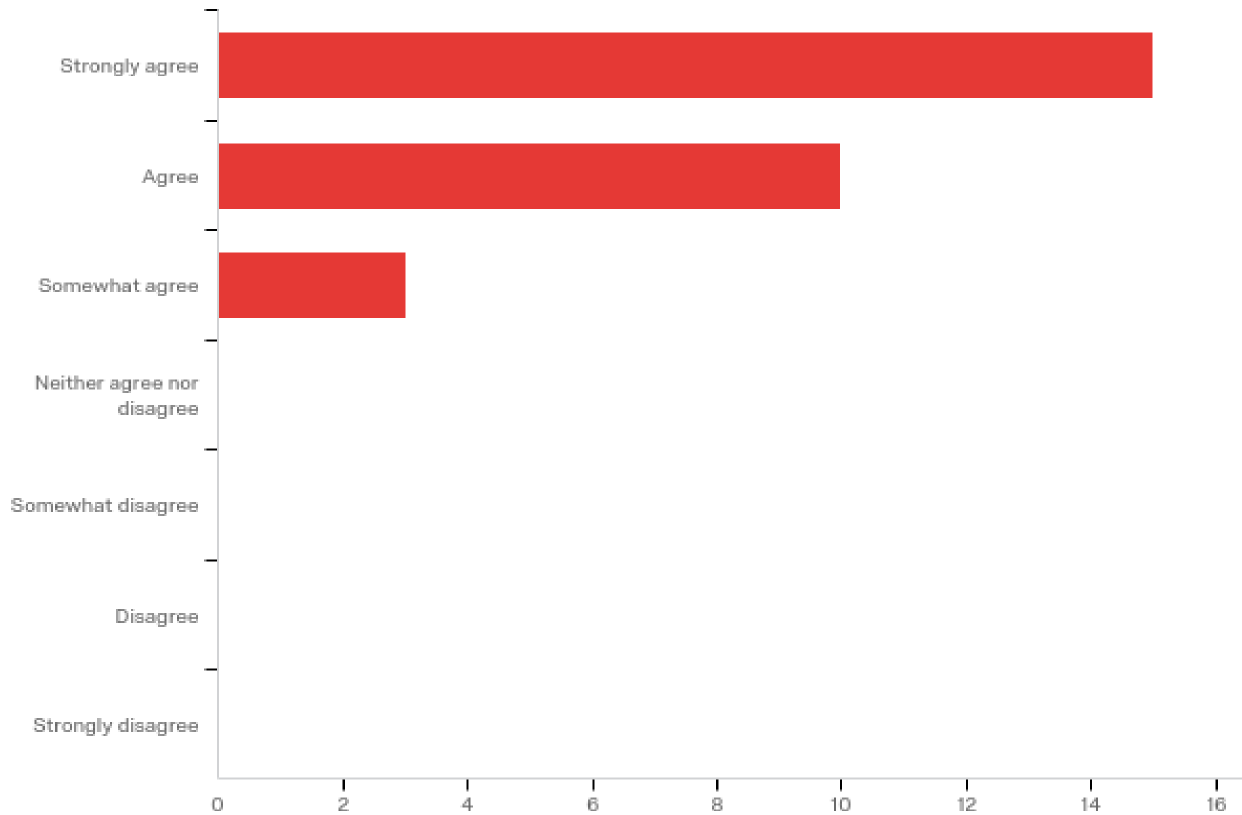
#	Answer	%	Count
1	Fall 2011 to 2017	76.1%	35
2	Fall 2006 to Summer 2011	15.2%	7
3	Fall 2001 to Summer 2006	4.3%	2
4	Before Fall 2001	4.3%	2
	Total	100%	46

Q4 - After receiving my MS in Chemistry at SHSU, I attended a PhD program.



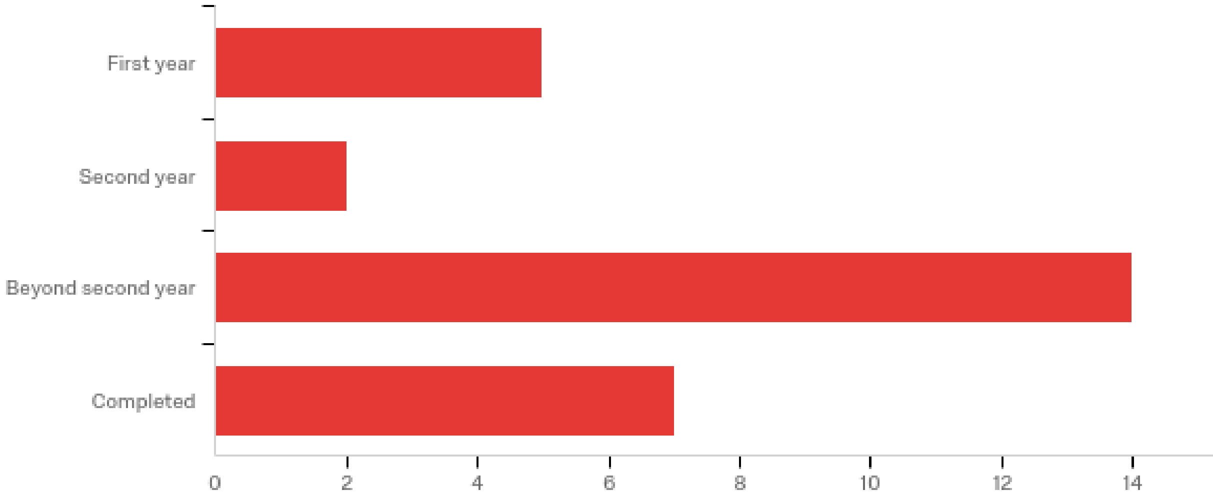
#	Answer	%	Count
1	Yes	60.9%	28
2	No	39.1%	18
	Total	100%	46

Q5 - How much do you agree or disagree with the following statement? I feel I was better prepared for success in graduate school, compared to other graduate students in my PhD program, as a result of my education at SHSU.



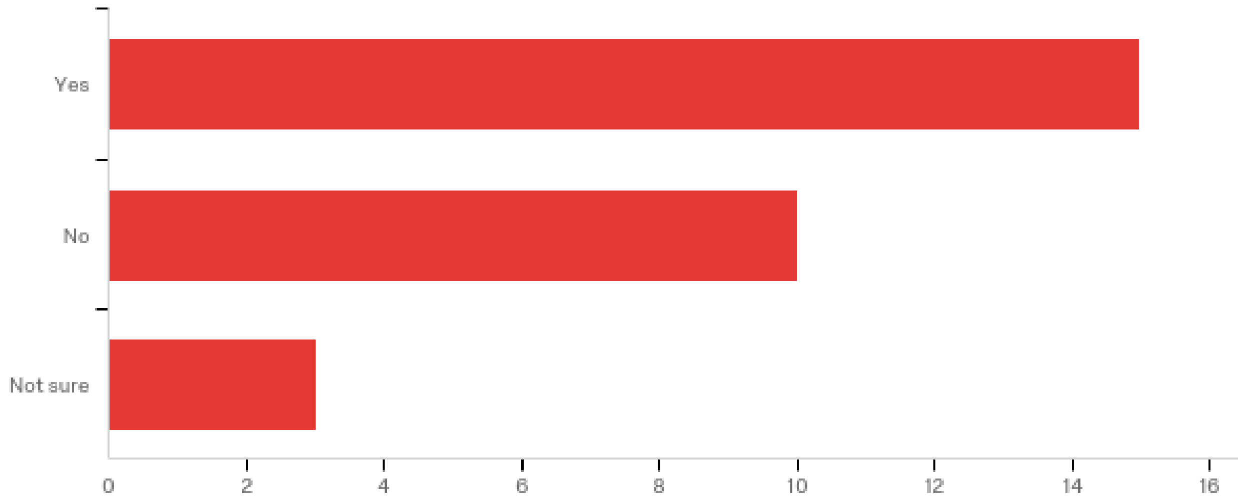
#	Answer	%	Count
1	Strongly agree	53.6%	15
2	Agree	35.7%	10
3	Somewhat agree	10.7%	3
4	Neither agree nor disagree	0.0%	0
5	Somewhat disagree	0.0%	0
6	Disagree	0.0%	0
7	Strongly disagree	0.0%	0
	Total	100%	28

Q9 - How far into your PhD studies are you?



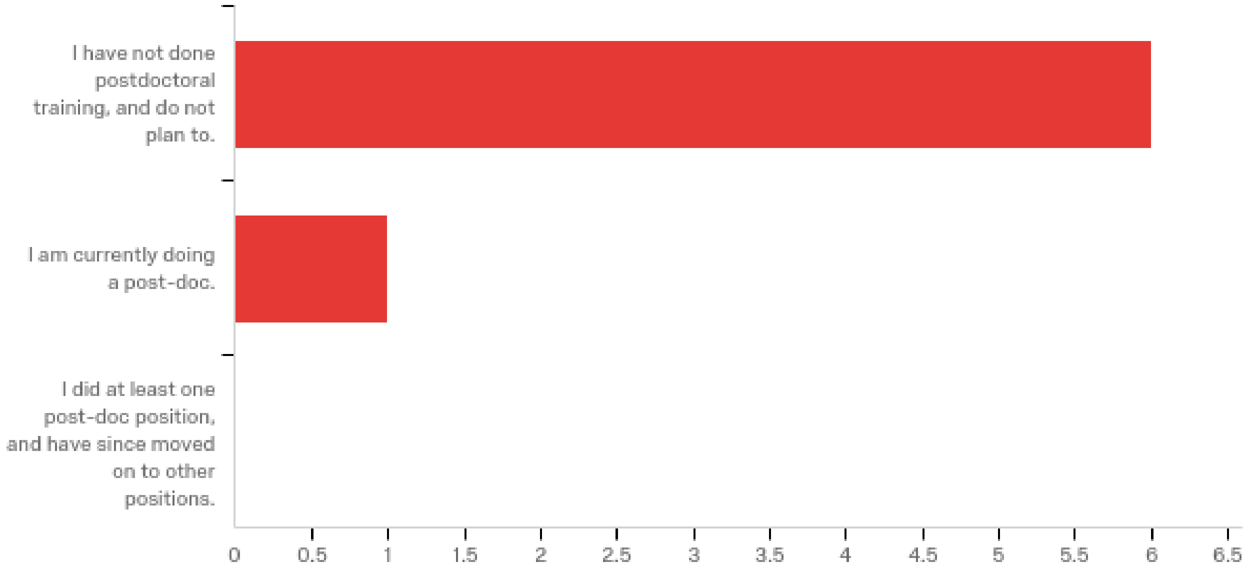
#	Answer	%	Count
1	First year	17.9%	5
4	Second year	7.1%	2
5	Beyond second year	50.0%	14
3	Completed	25.0%	7
	Total	100%	28

Q26 - Did some of your MS coursework transfer or otherwise reduce the time it will take (or took) you to complete your PhD?



#	Answer	%	Count
1	Yes	53.6%	15
2	No	35.7%	10
3	Not sure	10.7%	3
	Total	100%	28

Q11 - Did you carry out or are you carrying out postdoctoral training?



#	Answer	%	Count
1	I have not done postdoctoral training, and do not plan to.	85.7%	6
2	I am currently doing a post-doc.	14.3%	1
3	I did at least one post-doc position, and have since moved on to other positions.	0.0%	0
	Total	100%	7

Q30 - Do you have any specific advice you would like us to pass on to students who, like you, may go on to PhD programs after their SHSU MS degree?

Do you have any specific advice you would like us to pass on to students wh...
Use your MS degree as a bridge between your BS and PhD program. Then it will help you to reduce the stress in a PhD program. Few things that I would like to suggest are, serious focus on your MS research work, get the advantage of friendly talented SHSU chemistry professors (all of them are really helpful and it is really hard to find "friendly professors" in PhD programs), learn scientific writing, develop your presentation skills, apply for good quality PhD programs.
This is a great opportunity for everyone that should have. You can get a good research experience, knowledge and skills from SHSU that is useful for your PhD.
I would encourage the students to start their research as soon as they join the MS program at SHSU. In that way they can have two long years of research experience which is very much essential in finishing up PhD program early.
Gain the research experience well.
Earn your skills at your Masters thoroughly and it will definitely put you up in the PhD level. Definitely help you to work independently.
Do the MS program very well and keep high GPA. It was easier for me to get in to Ph.D program. Also research that you have done in SHSU will improve your potential to get good grad school.
I would say to get as much experience with instruments as possible. While I was at SHSU, I was the Integrated Lab TA for a semester. This allowed me more access than normal and unusual amount of practice with our 300MHz. During my initial evaluation at my PhD program, I was able to convey my expertise with NMR and was immediately assigned a research assistantship in our NMR facility rather than becoming a teaching assistant for the first few years of my program. Not having to teach at random times during the day or grading papers, and most importantly having unlimited access to the NMR Facility dramatically increased my research efficiency and productivity affording me an early graduation. Many large PhD programs have instrument facilities (NMR, Mass Spec, and X-Ray at mine) that are in need of experienced RAs,

thus these positions are highly desirable and normally go to the 4th and 5th years unless a first year can demonstrate a higher level of proficiency. I would also suggest scoring as high as possible on entrance exams at your PhD Program (meaning study the summer before you begin) if your program administers such exams to place you in your required graduate classes. In my program, if you scored above a certain percentage, you were able to exempt from these classes. I exempted from 4 of my classes which was the entire first year of my PhD Program. These exams at my PhD program were the ACS Exams in each discipline of chemistry which study guides and practice exams are available.

Focus more on improving fundamental knowledge and the research skills in the related research areas where you plan the doctaral research. Improve communicational skills.

Apply before the due dates, select few good grad schools which suit for your intrests

I would like to address the fact that practical knowledge (from teaching lab and doing research) I gather from the lab at SHSU really helped me to understand the theory behind it. So, doing experiment was the key factor for my learning. So, my suggestion to any student who wants to do well in future research career (Since chemistry Ph.D. is a research-oriented program) needs to be well accustomed to experimenting as much as possible.

Work hard for research training that you can get from SHSU faculty. There is no other school you can get the full research training directly from your PI. That's amazing.

I would like to tell, specially International students, you don’t need to apply many PhD schools (maximum would be 5-6). Because MS degree in SHSU has high validity and you’ll probably get the acceptance from most universities. So, don’t waste extra money for many applications.

No, I do not have any advice.

The exit exam from SHSU was excellent preparation for the entrance exams I took in the beginning of my PhD.

Incorporating more information about industrial chemistry would be very helpful for future graduates.

Q10 - Mentorship is very important in our program. Are there any other specific suggestions or experiences you want to relate to the SHSU faculty that would help the SHSU Chemistry Department better prepare students for PhD programs?

Mentorship is very important in our program. Are there any other specific s...
SHSU chemistry MS program is really good and they have good mentors. Collaborative research in chemistry is one thing we can introduce to the department.
The department could help foster the development of networking skills and teach students how to navigate bureaucracy for successful academic careers. Also, a writing grants workshop might be beneficial. Students with Masters aren't eligible for some fellowships so mastering this type of writing gives them an advantage for those they can apply for
I think the faculty was very nice and are really good in balancing both course work and research work. I would particularly ask all the faculty to see the MS students get at least one first author paper during their stay at SHSU so they can have some experience in writing literature which I believe one of the most important things in PhD.
SHSU chemistry faculty give great support and knowledge to the students. If there is a way to improve proposal writing experience that would be great.
I think all the faculty members in SHSU are excellent in guiding students towards the end of the course. I like the way they teach and handle the program. Should mention that thy are very friendly and very nice.
This suggest relates back to my previous suggestion about getting as much experience with instruments as possible. The gap between teaching theory and practical application needs to be better bridged. I can not tell you how many new graduate students come into our program with great grades but when we get them in the lab, they have no idea what they are doing. I would also suggest working more with students that need help with their presentation/public speaking skills. Just doing seminar isn't good enough. It doesn't with the nervousness or the tendency to read off slides if a student only has to present once a semester.
Faculty is doing a wonderful job with the available resources. That is amazing compared to most

of other MS programs. May be introducing a zero credit course (or a training) to develop scientific communication skills will help the students.

Any mentoring seminars, like "how to apply for PhD programs, life in grad school," etc

Considering research, SHSU chemistry faculty provide excellent mentorship. However, some of the courses are not suitable for graduate level (very few courses). So it's better to introduce new advanced courses rather than simple chemistry calculus classes. Also the advanced classes need to cover overall background of the subject. For a instance, it's better have advanced biochemistry course which cover all the areas in biochemistry rather than covering single topic/protein. The organic chemistry classes are excellent in the department.

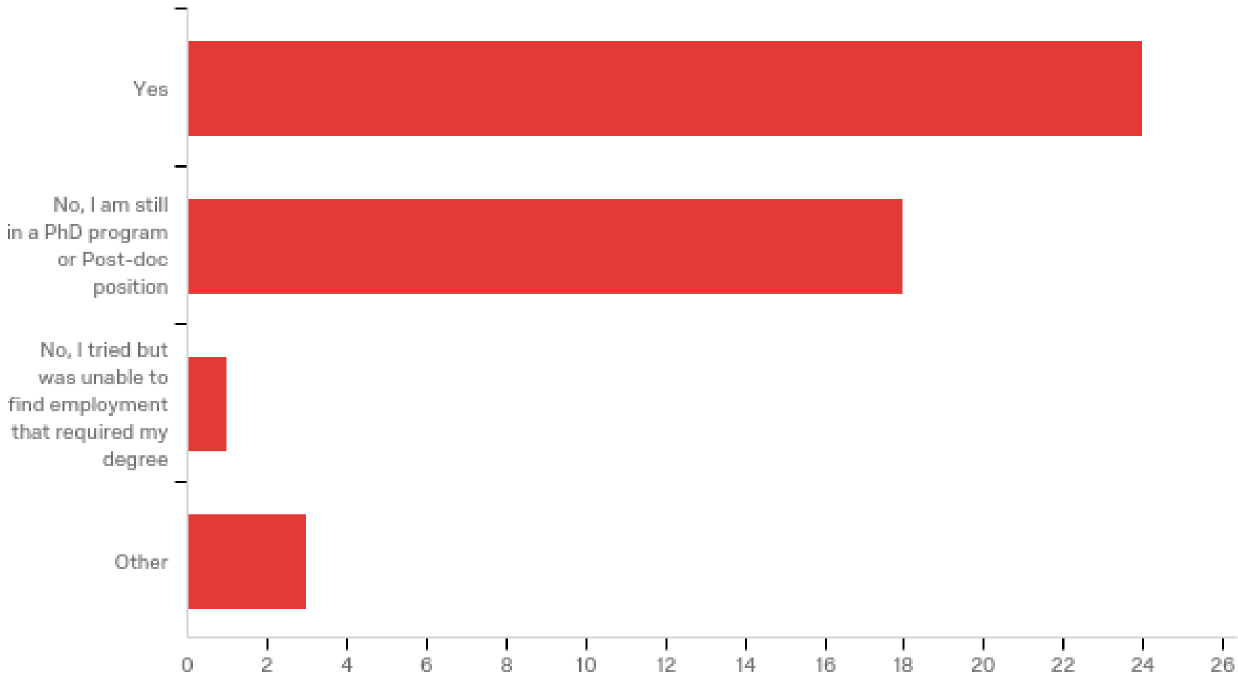
No.

I feel like the relationship I had with the faculty at SHSU during my bachelor's and MS was valuable in my decisions to strive to become a future faculty member. I think bigger universities and bigger programs become less personal and the students receive less mentorship.

I really liked how much one on one guidance and teaching I received at SHSU. It really helped prepare me for industry and PhD studies.

I learnt a lot from Dr. David Thompson and his insights still help me in every aspect of my studies. I am still in contact with him and consider him as one of my mentors

Q14 - Have you had at least one job since leaving SHSU that used your MS in Chemistry?

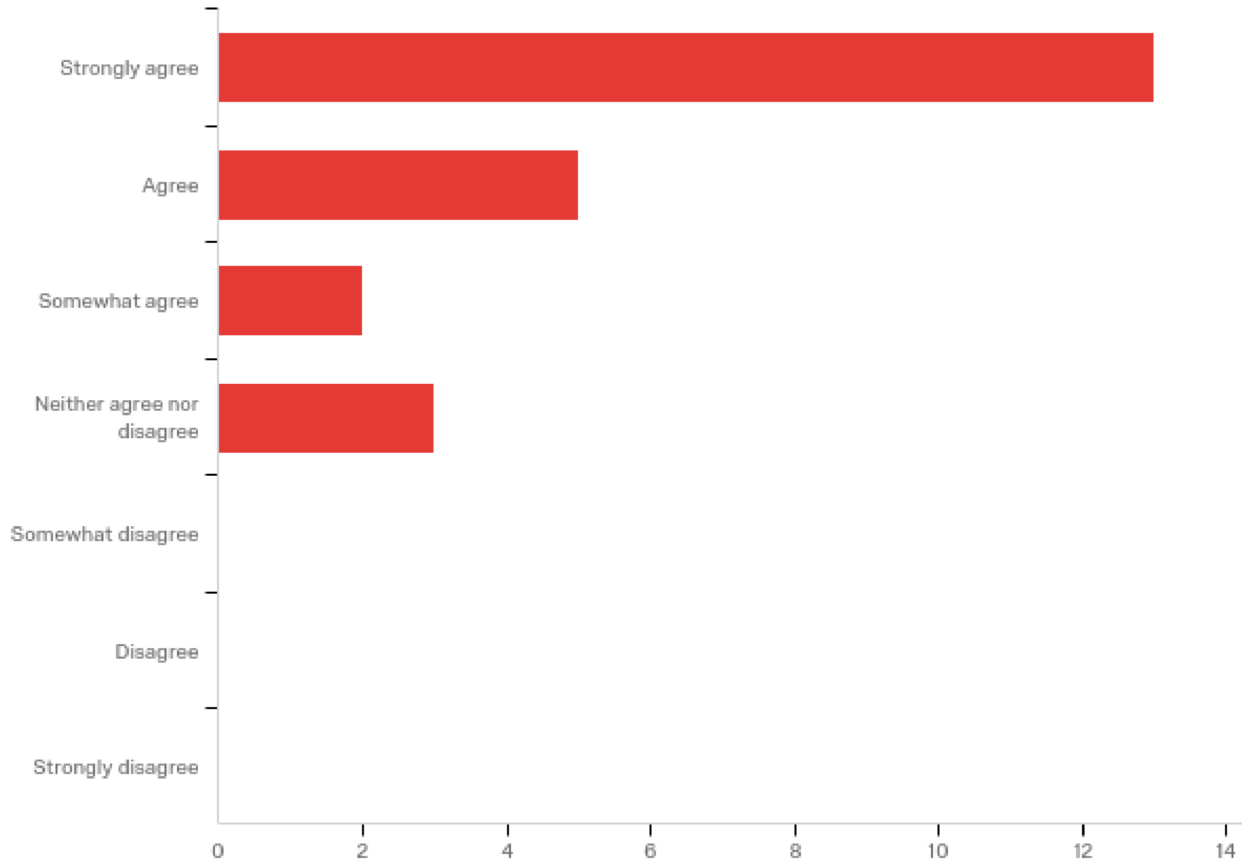


#	Answer	%	Count
1	Yes	52.2%	24
4	Other	6.5%	3
3	No, I tried but was unable to find employment that required my degree	2.2%	1
2	No, I am still in a PhD program or Post-doc position	39.1%	18
	Total	100%	46

Other

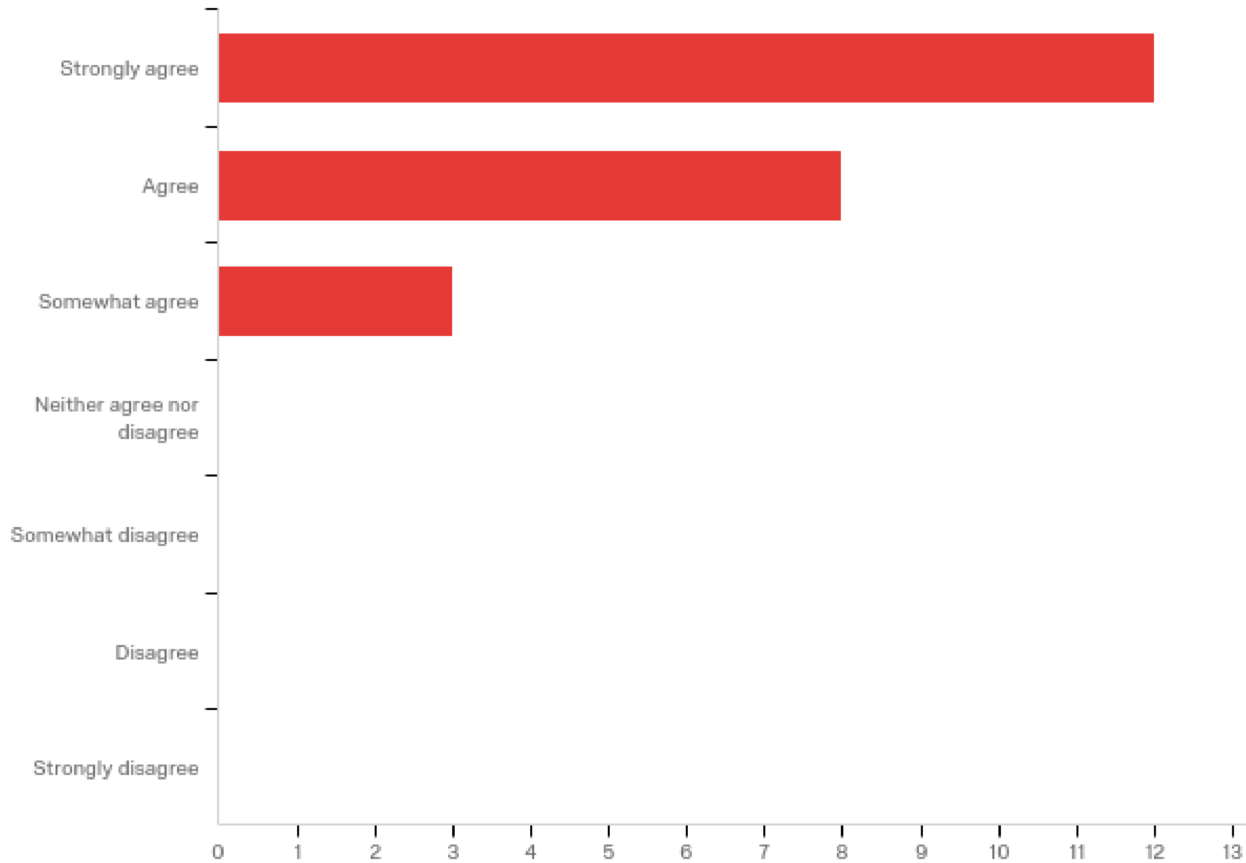
Other
Recently graduated. Still job hunting.

Q15 - I feel that as a result of my education at SHSU, I was better prepared for my career in chemistry than my typical coworkers.



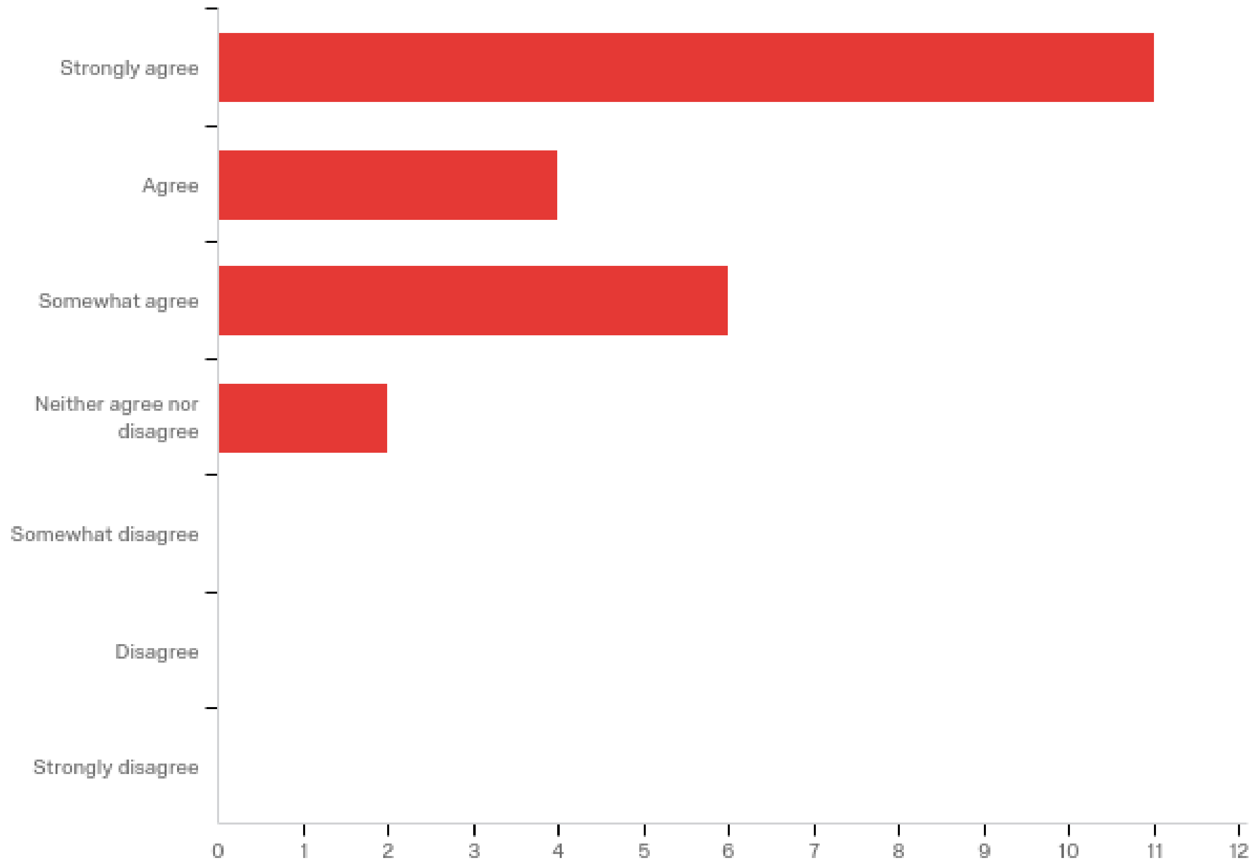
#	Answer	%	Count
1	Strongly agree	56.5%	13
2	Agree	21.7%	5
3	Somewhat agree	8.7%	2
4	Neither agree nor disagree	13.0%	3
5	Somewhat disagree	0.0%	0
6	Disagree	0.0%	0
7	Strongly disagree	0.0%	0
	Total	100%	23

Q16 - I think SHSU taught me the subject matter of chemistry well.



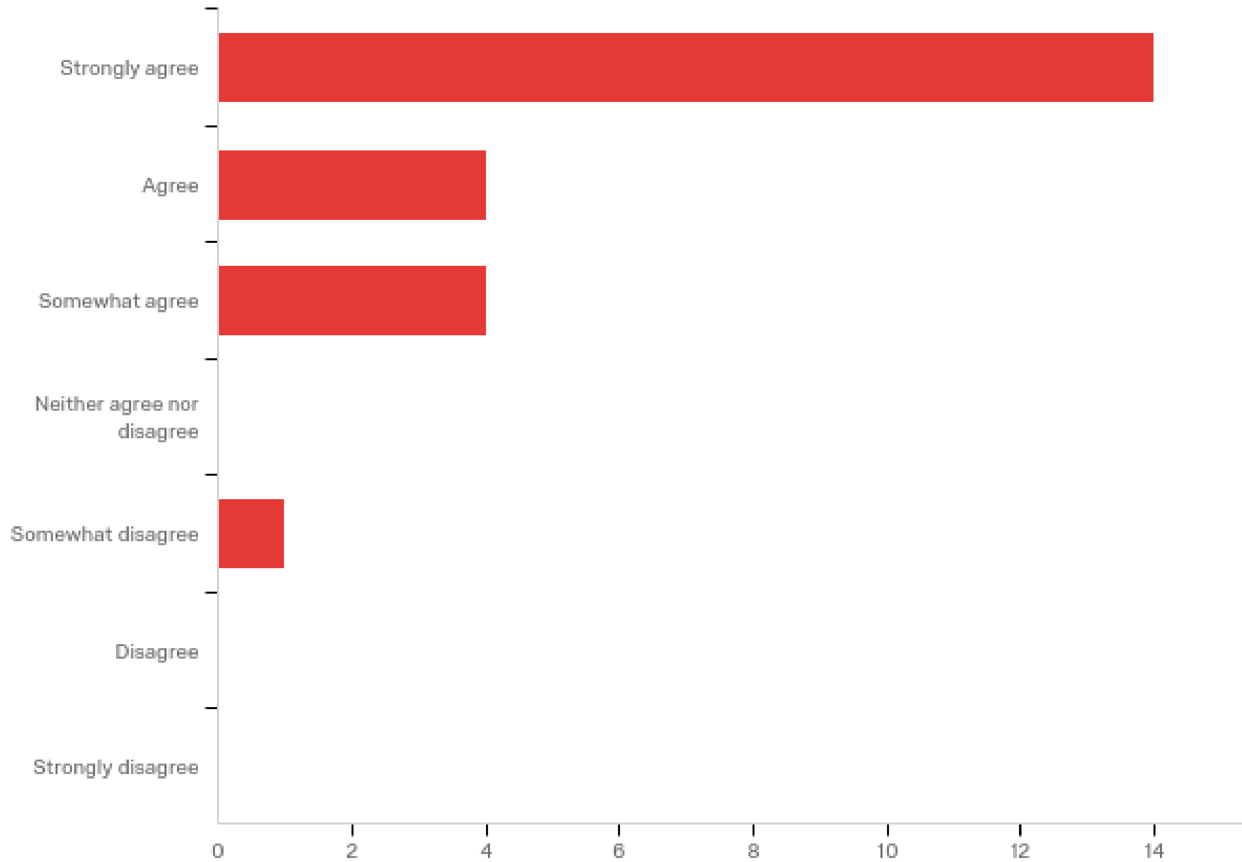
#	Answer	%	Count
1	Strongly agree	52.2%	12
2	Agree	34.8%	8
3	Somewhat agree	13.0%	3
4	Neither agree nor disagree	0.0%	0
5	Somewhat disagree	0.0%	0
6	Disagree	0.0%	0
7	Strongly disagree	0.0%	0
	Total	100%	23

Q23 - I feel that during my studies at SHSU I had adequate access to instrumentation to train on.



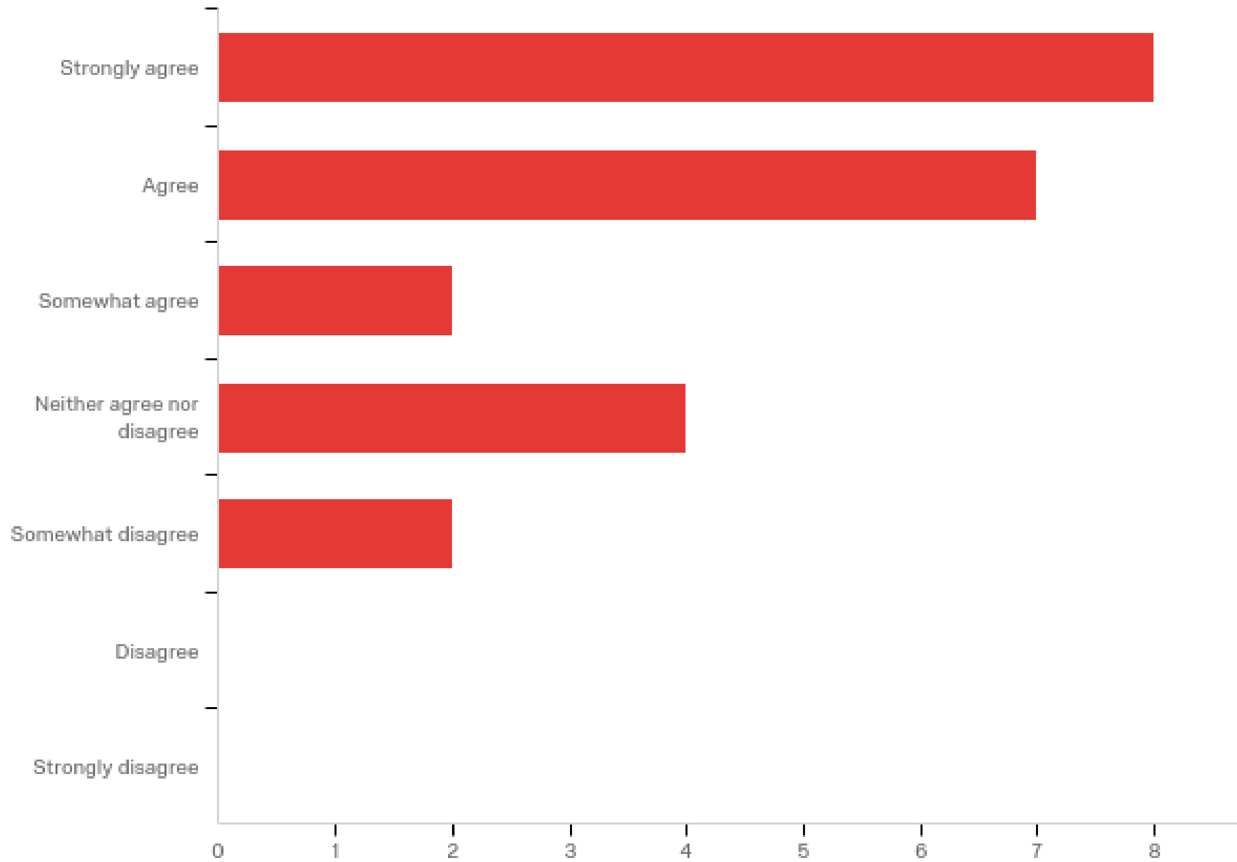
#	Answer	%	Count
1	Strongly agree	47.8%	11
2	Agree	17.4%	4
3	Somewhat agree	26.1%	6
4	Neither agree nor disagree	8.7%	2
5	Somewhat disagree	0.0%	0
6	Disagree	0.0%	0
7	Strongly disagree	0.0%	0
	Total	100%	23

Q24 - I feel that during my studies at SHSU I had adequate access to experts to train with.



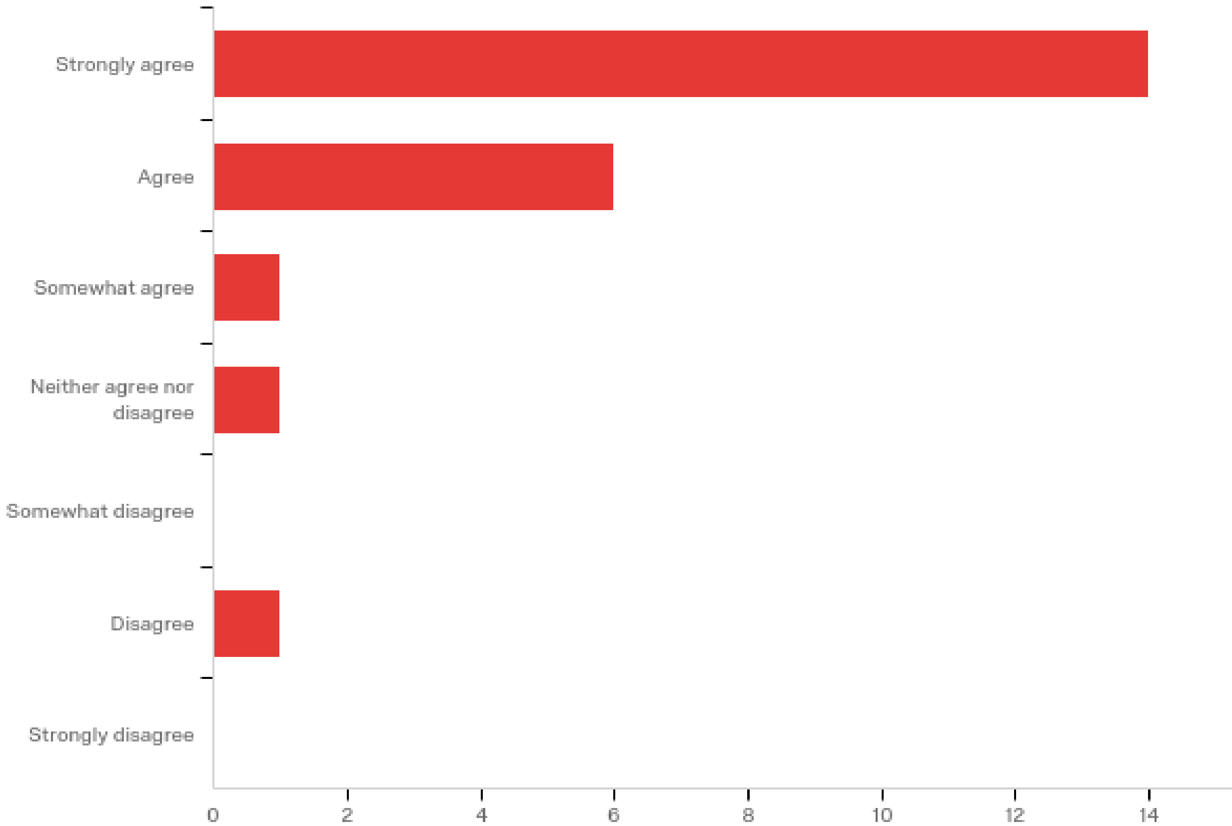
#	Answer	%	Count
1	Strongly agree	60.9%	14
2	Agree	17.4%	4
3	Somewhat agree	17.4%	4
4	Neither agree nor disagree	0.0%	0
5	Somewhat disagree	4.3%	1
6	Disagree	0.0%	0
7	Strongly disagree	0.0%	0
	Total	100%	23

Q25 - I feel that career advice I received while at SHSU was accurate and served me well.



#	Answer	%	Count
1	Strongly agree	34.8%	8
2	Agree	30.4%	7
3	Somewhat agree	8.7%	2
4	Neither agree nor disagree	17.4%	4
5	Somewhat disagree	8.7%	2
6	Disagree	0.0%	0
7	Strongly disagree	0.0%	0
	Total	100%	23

Q18 - I think SHSU helped me gain skills and knowledge, other than the direct subject matter of chemistry, that served me well in my jobs since graduating. (Communication, working on research teams, and other skills that transferred to the workplace.)



#	Answer	%	Count
1	Strongly agree	60.9%	14
2	Agree	26.1%	6
3	Somewhat agree	4.3%	1
4	Neither agree nor disagree	4.3%	1
5	Somewhat disagree	0.0%	0
6	Disagree	4.3%	1
7	Strongly disagree	0.0%	0
	Total	100%	23

Q19 - What are the most important things SHSU could do or add to the MS Chemistry program that would better prepare students for their careers?

What are the most important things SHSU could do or add to the MS Chemistry...
Networking and resume writing courses
Letting students know where their talent lies, and help them find a way to pursue it.
More hands on instrumentation experience. Most groups are only exposed to what instrumentation their research requires. Dr. Chasteen's Advanced Instrumentation course hits the theories very well but the hands on and software is a learning curve in the workforce. Knowing and truly understanding the theories did allow me to get assigned more responsibilities in my early career over coworkers.
1. Add hands on instrumentation training to the curriculum instead of relying solely on research to provide it. 2. Offer three lecture courses each semester to give students more opportunity to learn the subjects that they are really interested in, and will use in their future careers.
More focus on instrumentation (general use as well as trouble shooting) especially LCMS, GCMS and NMR as these are the most valuable things which are required to get a job after MS.
It would be better if SHSU graduate syllabus contains a special program in management for chemist such as accounting, product costing and operational management.
Supply them with instrumentation. For example, at least 600MHz NMR or a Q-TOF MS (GC or LC), or the newest craze a DART AccuTOF.
1) Intellectual property coursework. This is absolutely essential to any chemist in industry, even those pursuing jobs in analytical or OC labs. Knowing how a company produces, uses, and safeguards its IP imbues a candidate with a business acumen that is differentiable. Though it is becoming more of an expected quality every year. 2) Advanced statistical analyses as they apply to chemistry (principal component analysis, cluster analysis, control charting, basic intro to six sigma). As industry advances ever farther toward a more sophisticated IoT, so called "Big Data" and, more importantly, the statistical methods to mine it for useful information and knowledge will become necessary to differentiate the job candidates of the future.

.

I think having a more scientifically directed technical writing class would be great.

Provide more insight into industrial chemistry.

Being a smaller department and small student body gave tremendous faculty and expert access to the students and this was the best part of the program for me. I still feel during my time instrument training was lacking and also students did not have access many tools that might help them to conduct thorough analysis of the their research

Q20 - Do you have any other comments to pass on that would help SHSU Chemistry better prepare students for their careers?

Do you have any other comments to pass on that would help SHSU Chemistry be...
Identify the type of chemistry that they would specialize in upon graduation. The job that I have now, I believe that I would not have been considered if not for my extra knowledge into Analytical and Biochemistry.
Leave all your options open/explore all areas. Just because you got a masters does not mean that you have to go for a PhD. Although, if you really have a curiosity in a certain area of chemistry, then pursue it.
The ability to learn other things quickly and the ability to teach yourself has helped me in my advance in my career. The topic of my research, which I loved, has nothing to do with my current responsibilities. My PI was a little distant to encourage me to step-up, take the lead, and make decisions. In the long run that has helped me tremendously. I work with a chemist from UTEP that was held by the hand the entire way through their MS and it shows. The skill-set I learned from the professors at SHSU has helped me advance quicker in my career than coworkers that have earned a MS or PhD. That being said, if I were to go back and have to chose a MS Program again it would be SHSU.
More exposure to different kinds of chemical analysis instruments and techniques. Not just those which are available in one lab which you joined for research.
Apply early for you career, if you are that good and lucky they will wait for you to graduate. High light specific experiences with instrumentation in your resume, and taylor it to the job. And network network network! You are much more likely to get the job if the person reading your application knows you. Oh, I was surprised at how much my job centers around validation, quality control, and quality assurance of the methods I develop as much as it does doing the actual chemistry. I have found now that I have worked in both academia and government that former focuses much more on the discovery while in the latter the focus is on QA/QC.
Think beyond the academic utility of a chemical, a reaction, an instrument, or apparatus. Think of the industrial/practical uses of such things. What problems might be solved with that

technology? How would you make/use it such that it could be cost effective? Think of "entrepreneurial chemistry."

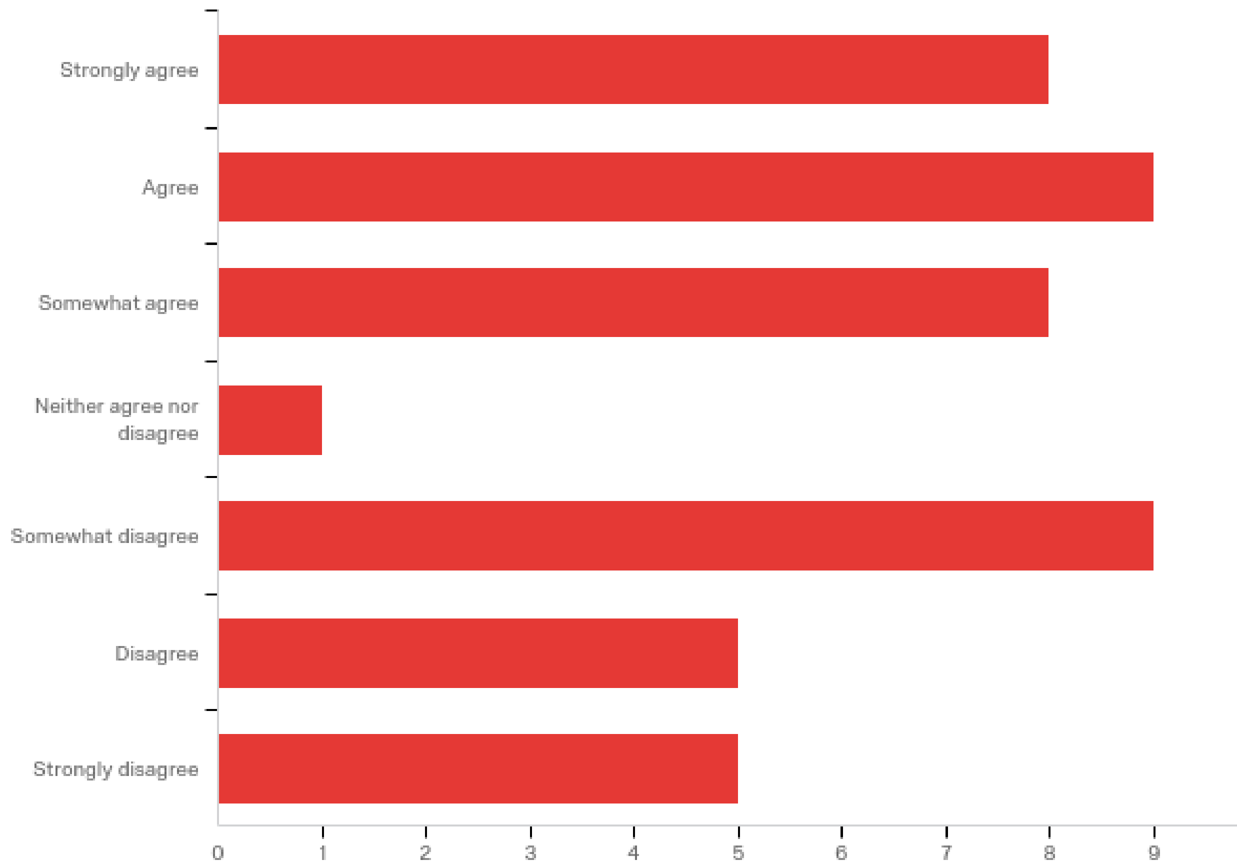
.

Being open to non-traditional science jobs is something I initially struggled with coming out of SHSU. I've now moved to a career in education and couldn't be happier! Although it wasn't a laboratory job or becoming a science teacher, it has utilized my degree in a way I never expected. I think preparing students to look for career opportunities outside of the lab would be very helpful.

Some kind of career services would help out greatly. It should not be treated as a traditional career services where resumes are collected and reviewed and this if lucky a job posting comes up but more of a long term program to show the student what to expect when they are finally able to make that push into industry. This could involve lab tours, invited speakers, mentoring, and internships. Undergraduate and graduate research should still be a focus along with the student's involvement in the chemistry department.

I would suggest that graduate students get there degree as fast as possible so they can enter into industry and start making money.

Q28 - Do you agree or disagree with the following statement: The level of financial aid, considering stipends and scholarships, available during my studies at SHSU was sufficient.



#	Answer	%	Count
1	Strongly agree	17.8%	8
2	Agree	20.0%	9
3	Somewhat agree	17.8%	8
4	Neither agree nor disagree	2.2%	1
5	Somewhat disagree	20.0%	9
6	Disagree	11.1%	5
7	Strongly disagree	11.1%	5
	Total	100%	45

Q21 - If you have any final comments that might be useful to the Chemistry Department, please provide them here. Also, if there is a question that you wish we had asked on the survey but we didn't, please let us know here and we'll consider it for our next self-study survey (probably in five years).

If you have any final comments that might be useful to the Chemistry Depart...
In my opinion, the level of financial aid, considering stipends available during my studies at SHSU was not sufficient. The stipend was a constant while all the other payments were not, including school fees, rent, etc. I would like to suggest, either give comparable stipend or suitable relief on school payments. Most of the current students do not encourage prospective students/ their friends to apply SHSU MS due to financial difficulties, which is not a good situation for the program. However, the quality and depth of chemistry MS program is really good and the only problem is the financial hurdle.
Keep pushing the students. Encourage them to learn more than what is in your research lab and be flexible on pausing current tasks and starting new tasks. I would ask: What field of chemistry are you currently in? How long did it take to start working as a chemist after earning your MS?
I'm really glad to be a MS student of the SHSU Chemistry Department. The faculty was really nice, friendly and helpful. I would like to comment bit about the scholarships and fellowships. It would be nice if you can aware all the graduate students during the year that might be really good. Eat 'em up, Kats!
Funding is sufficient enough considering the expenses in Huntsville.
It may be useful if there are questions about "optional subjects" SHSU could offer in future.
The TA stipend that is given to graduate students is not enough at all.
The amount that I pay back as tuition and insurance were little bit high. It was hard for me to manage money during studies and used credit card to pay most of the bills.
Your last question reminded me about something. SHSU would do well to provide MS Chemistry students tuition waivers. Most programs provide that in addition to a highly competitive stipend. I recall some financial issues during my MS program that made my time there more difficult than it needed to be.

I think you ought to ask the level of education of the work peers of the survey respondent. This should be important as an MS graduate in a peer group of BS graduates probably values their degree/experience in a different way than if their peers are PhDs. The MS/PhD boundary is fraught with friction at the industrial level. I think you ought to segment for industry/academia as well. I expect those who have continued a career in academic instruction would value their degree different than those who have gone to industry.

In a point of a international student, it is very hard to survive at SHSU with current financial support. If I explain it roughly with figures, an international TA gets about 1350$ per month as their salary. They have to pay back about 1000$ for the tuition and insurance in every month(about 1200$ in fall and 800$ in spring, in average about 1000$). In every month they have about 350$ left for the expenses. Expenses include apartment fee (minimum of 400$ in a shared single bedroom, very hard to find and live in them), food and transportation (minimum of 300$), and othere expenses (this include medical, cloths, stationaries, community activities and etc. Minimum of 100$). Total is about 800$. In summer students get about 1500$ I am doing a simple evaluation of common expenses without considering any exceptional costs. If someone looks into the statistics of internatinal students enrolment into the program they will identify that there is some underlying reason for the significant decrease. The financial barrier I am trying to explain is that reason.

.

The current program seems to be more diverse and offer more educational opportunities that when I attended. The growth in the department is exciting to see.

Everything except the financial aid is good in the program. As a graduate student, the annual stipend is enough but still they don't waive the tuition fee from graduate student. I highly recommend to the administration to waive the tuition fee then student will have a very good atmosphere to continue their studies. And another thing is courses collaboration should be more fair. It means all disciplines of chemistry courses should be added to each and every student course content.

My suggestion is not to have a coursework in the 4th semester of the master program. Instead allow the students to have the thesis defense in the fourth semester (spring) and let them graduate in the spring semester.

I would strongly recommend the program to other students, if the stipend is sufficient. But the stipend is not sufficient to do the MS at SHSU. Other chemistry MS programs in the country cover higher percentage of student tuition than SHSU. That's the problem. If student tuition is covered at higher percentage, the stipend is enough. Tuition, living cost is increasing with time. But not the stipend. If it's not possible to increase the stipend, at least cover the tuition at higher percentage. Not just 50%.

In order to help prepare a student for a career it is important to know what their personal goals are. Some individuals want to go onto a PhD program while others just want to teach at the public school level. There are others hat are looking into a complete change in career and others that are young and are committed to a career in industry. With varying goals it is almost impossible to make changes to a program that will make everybody happy. As an alumni I could offer another set of idea now that I am established in my career. I would be interested in continuing education programs either by a web based format or utilizing The Woodlands campus or maybe a focus/study groups where alumni sit together to discuss trends in the industry and this could be a format to get undergraduate and graduate students involved.

Cross-Tabulation of Survey Data by Cohort

		What year did you graduate with your MS in Chemistry from SHSU? (This will help us group the anon...				
Item in survey	**Option**	**Fall 2017 to Fall 2011**	**Summer 2011 to Fall 2006**	**Summer 2006 to Fall 2001**	**Fall 2001 and Before**	**Total**
How much do you agree or disagree with the following statement? Overall, I am satisfied with the...	Strongly agree	26 74%	4 57%	2 100%	2 100%	34 74%
	Agree	8 23%	2 29%	0 0%	0 0%	10 22%
	Somewhat agree	0 0%	1 14%	0 0%	0 0%	1 2%
	Neither agree nor disagree	1 3%	0 0%	0 0%	0 0%	1 2%
	Somewhat disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Strongly disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Total	35 100%	7 100%	2 100%	2 100%	46 100%
If a friend of mine were considering earning an MS in Chemistry today, I would recommend SHSU's p...	Strongly agree	23 66%	4 57%	1 50%	1 50%	29 63%
	Agree	8 23%	2 29%	0 0%	0 0%	10 22%
	Somewhat agree	2 6%	1 14%	1 50%	1 50%	5 11%
	Neither agree nor disagree	2 6%	0 0%	0 0%	0 0%	2 4%
	Somewhat disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Strongly disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Total	35 100%	7 100%	2 100%	2 100%	46 100%
After receiving my MS in Chemistry at SHSU, I attended a PhD program.	Yes	21 60%	5 71%	0 0%	2 100%	28 61%
	No	14 40%	2 29%	2 100%	0 0%	18 39%
	Total	35 100%	7 100%	2 100%	2 100%	46 100%
Have you had at least one job since leaving SHSU that used your MS in Chemistry?	Yes	15 43%	5 71%	2 100%	2 100%	24 52%
	No, I am still in a PhD program or Post-doc position	17 49%	1 14%	0 0%	0 0%	18 39%
	No, I tried but was unable to find employment that required my degree	1 3%	0 0%	0 0%	0 0%	1 2%
	Other	2 6%	1 14%	0 0%	0 0%	3 7%
	Total	35 100%	7 100%	2 100%	2 100%	46 100%

		What year did you graduate with your MS in Chemistry from SHSU? (This will help us group the anon...				
Item in survey	**Option**	**Fall 2017 to Fall 2011**	**Summer 2011 to Fall 2006**	**Summer 2006 to Fall 2001**	**Fall 2001 and Before**	**Total**
Do you agree or disagree with the following statement: The level of financial aid, considering st...	Strongly agree	7 20%	1 17%	0 0%	0 0%	8 18%
	Agree	4 11%	3 50%	1 50%	1 50%	9 20%
	Somewhat agree	7 20%	0 0%	1 50%	0 0%	8 18%
	Neither agree nor disagree	1 3%	0 0%	0 0%	0 0%	1 2%
	Somewhat disagree	8 23%	1 17%	0 0%	0 0%	9 20%
	Disagree	5 14%	0 0%	0 0%	0 0%	5 11%
	Strongly disagree	3 9%	1 17%	0 0%	1 50%	5 11%
	Total	35 100%	6 100%	2 100%	2 100%	45 100%

Item in survey	Option	What year did you graduate with your MS in Chemistry from SHSU? (This will help us group the anon... Fall 2017 to Fall 2011	Summer 2011 to Fall 2006	Summer 2006 to Fall 2001	Fall 2001 and Before	Total
How much do you agree or disagree with the following statement? I feel I was better prepared for…	Strongly agree	11 52%	3 60%	0 0%	1 50%	15 54%
	Agree	8 38%	1 20%	0 0%	1 50%	10 36%
	Somewhat agree	2 10%	1 20%	0 0%	0 0%	3 11%
	Neither agree nor disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Somewhat disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Strongly disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Total	21 100%	5 100%	0 100%	2 100%	28 100%
How far into your PhD studies are you?	First year	5 24%	0 0%	0 0%	0 0%	5 18%
	Completed	2 10%	3 60%	0 0%	2 100%	7 25%
	Second year	2 10%	0 0%	0 0%	0 0%	2 7%
	Beyond second year	12 57%	2 40%	0 0%	0 0%	14 50%
	Total	21 100%	5 100%	0 100%	2 100%	28 100%
Did some of your MS coursework transfer or otherwise reduce the time it will take (or took) you t...	Yes	13 62%	1 20%	0 0%	1 50%	15 54%
	No	5 24%	4 80%	0 0%	1 50%	10 36%
	Not sure	3 14%	0 0%	0 0%	0 0%	3 11%
	Total	21 100%	5 100%	0 100%	2 100%	28 100%

		What year did you graduate with your MS in Chemistry from SHSU? (This will help us group the anon...				
Item in survey	**Option**	**Fall 2017 to Fall 2011**	**Summer 2011 to Fall 2006**	**Summer 2006 to Fall 2001**	**Fall 2001 and Before**	**Total**
Did you carry out or are you carrying out postdoctoral training?	I have not done postdoctoral training, and do not plan to.	2 100%	2 67%	0 0%	2 100%	6 86%
	I am currently doing a post-doc.	0 0%	1 33%	0 0%	0 0%	1 14%
	I did at least one post-doc position, and have since moved on to other positions.	0 0%	0 0%	0 0%	0 0%	0 0%
	Total	2 100%	3 100%	0 100%	2 100%	7 100%

		What year did you graduate with your MS in Chemistry from SHSU? (This will help us group the anon...				
Item in survey	**Option**	**Fall 2017 to Fall 2011**	**Summer 2011 to Fall 2006**	**Summer 2006 to Fall 2001**	**Fall 2001 and Before**	**Total**
I feel that as a result of my education at SHSU, I was better prepared for my career in chemistry...	Strongly agree	8 53%	1 25%	2 100%	2 100%	13 57%
	Agree	4 27%	1 25%	0 0%	0 0%	5 22%
	Somewhat agree	2 13%	0 0%	0 0%	0 0%	2 9%
	Neither agree nor disagree	1 7%	2 50%	0 0%	0 0%	3 13%
	Somewhat disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Strongly disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Total	15 100%	4 100%	2 100%	2 100%	23 100%
I think SHSU taught me the subject matter of chemistry well.	Strongly agree	8 53%	2 50%	1 50%	1 50%	12 52%
	Agree	5 33%	1 25%	1 50%	1 50%	8 35%
	Somewhat agree	2 13%	1 25%	0 0%	0 0%	3 13%
	Neither agree nor disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Somewhat disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Strongly disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Total	15 100%	4 100%	2 100%	2 100%	23 100%

		What year did you graduate with your MS in Chemistry from SHSU? (This will help us group the anon...				
Item in survey	**Option**	**Fall 2017 to Fall 2011**	**Summer 2011 to Fall 2006**	**Summer 2006 to Fall 2001**	**Fall 2001 and Before**	**Total**
I feel that during my studies at SHSU I had adequate access to instrumentation to train on.	Strongly agree	8 53%	0 0%	2 100%	1 50%	11 48%
	Agree	1 7%	3 75%	0 0%	0 0%	4 17%
	Somewhat agree	4 27%	1 25%	0 0%	1 50%	6 26%
	Neither agree nor disagree	2 13%	0 0%	0 0%	0 0%	2 9%
	Somewhat disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Strongly disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Total	15 100%	4 100%	2 100%	2 100%	23 100%
I feel that during my studies at SHSU I had adequate access to experts to train with.	Strongly agree	10 67%	2 50%	1 50%	1 50%	14 61%
	Agree	2 13%	0 0%	1 50%	1 50%	4 17%
	Somewhat agree	3 20%	1 25%	0 0%	0 0%	4 17%
	Neither agree nor disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Somewhat disagree	0 0%	1 25%	0 0%	0 0%	1 4%
	Disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Strongly disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Total	15 100%	4 100%	2 100%	2 100%	23 100%

		What year did you graduate with your MS in Chemistry from SHSU? (This will help us group the anon...				
Item in survey	**Option**	**Fall 2017 to Fall 2011**	**Summer 2011 to Fall 2006**	**Summer 2006 to Fall 2001**	**Fall 2001 and Before**	**Total**
I feel that career advice I received while at SHSU was accurate and served me well.	Strongly agree	7 47%	0 0%	0 0%	1 50%	8 35%
	Agree	3 20%	2 50%	1 50%	1 50%	7 30%
	Somewhat agree	2 13%	0 0%	0 0%	0 0%	2 9%
	Neither agree nor disagree	2 13%	1 25%	1 50%	0 0%	4 17%
	Somewhat disagree	1 7%	1 25%	0 0%	0 0%	2 9%
	Disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Strongly disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Total	15 100%	4 100%	2 100%	2 100%	23 100%
I think SHSU helped me gain skills and knowledge, other than the direct subject matter of chemist...	Strongly agree	10 67%	2 50%	1 50%	1 50%	14 61%
	Agree	4 27%	0 0%	1 50%	1 50%	6 26%
	Somewhat agree	1 7%	0 0%	0 0%	0 0%	1 4%
	Neither agree nor disagree	0 0%	1 25%	0 0%	0 0%	1 4%
	Somewhat disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Disagree	0 0%	1 25%	0 0%	0 0%	1 4%
	Strongly disagree	0 0%	0 0%	0 0%	0 0%	0 0%
	Total	15 100%	4 100%	2 100%	2 100%	23 100%

C. Employer Surveys

The Department of Chemistry has not carried out an employer survey to date, only an alumni survey and current student survey.

D. Student Publications/Grants/Presentations

From the period of fall 2011 to 2017, Master's students in the SHSU chemistry department have had 103 authorships on external presentations and posters, and 29 authorships on peer reviewed publications. During that period, all Master's students received research support from a generous Welch Foundation grant to the department. Over the same period, 19 Master's students in the SHSU chemistry department contributed to research efforts funded by other granting agencies such as the National Institutes of Health (NIH), and the American Chemical Society Petroleum Research Fund (ACS PRF).

IX. Recruitment and Marketing Efforts

A. Demand for Graduates

The unemployment rate for new chemistry graduates overall from 2011 to 2015 was around 13%. The unemployment rate for new chemistry Master of Science graduates was the most volatile due to the smaller numbers of MS graduates reported in these surveys (5% of sample). The rates ranged from 7.4% in 2014 to 18.9% in 2015, but were still similar (13.9%) to the overall average (13.2%).

The Houston-The Woodlands-Sugarland Metropolitan Statistical Area includes Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties in Texas. Unemployment in this metropolitan area according to the Bureau of Labor Statistics is quite low compared to the national average for the sector of manufacturing, which is the sector that covers most of the available chemistry positions. The BLS does not track chemistry positions, but it does list chemical engineering positions. The Houston regional area employs chemical engineers at 6 times the national average. (17-487-DAL Report, https://www.bls.gov/regions/southwest/news-release/OccupationalEmploymentandWages_Houston.htm)

Because of the robust manufacturing industry in the greater Houston area, our graduates who have entered industry have experienced less unemployment than the national average. Similarly, our M.S. graduates who have wanted to enter Ph.D. programs have been able to continue their studies in programs nationwide.

B. Geographical Origin of Students

Data obtained from SHSU Institutional Effectiveness (differentiated for whether students were admitted and enrolled) during the period of the self-study appear on the next page. The majority of our applicants and of our students are from Texas and Sri Lanka.

	Admitted and Enrolled?		
Applicant Nation	**No**	**Yes**	**Total**
United States	36	22	58
Sri Lanka	26	23	49
India	4	3	7
Bangladesh	2	3	5
China (Mainland)	2	1	3
Iran		1	1
Jordan	1		1
Taiwan	1		1
Turkey	1		1
Namibia	1		1
Nigeria	1		1
Korea, South	1		1
Total	**76**	**53**	**129**

	Admitted and Enrolled?		
Applicant State	**No**	**Yes**	**Total**
Texas	28	19	47
Mississippi	2		2
California		1	1
South Carolina		1	1
Wisconsin		1	1
Oregon	1		1
Oklahoma	1		1
Illinois	1		1
Georgia	1		1
Arizona	1		1
Missouri	1		1
Grand Total	**36**	**22**	**58**

C. Marketing and Recruitment Efforts and their Effectiveness

The number of university-supported teaching assistantships (TAs) and grant-supported research assistantships (RAs) are typically filled by spontaneous applications. Therefore, a marketing and recruitment effort has not been necessary. The CHEM 4395 Undergraduate Research course is the most effective recruiting tool for our SHSU students who stay for a graduate degree because of their lab experience and working relationship with our faculty. In Fall 2016 and Fall 2017, the department started having a recruiting table at the Southwest Regional Meeting of the American Chemical Society with the graduate coordinator staffing the table to answer questions and hand out materials to prospective students. It is unclear at this point how much of an impact that is having on applications, since it is very new for the department. It is also worth noting in 2017 the competition for graduate students has heightened significantly, as the number of applications from oversees has dropped as reported in reports from the Council on Graduate Studies and articles in newspapers including the Houston Chronicle.

D. Current Markets

According to the 2015 Employment Survey conducted by the American Chemical Society, from 2011 to 2015 nationally, new graduates have entered the following employment sectors: Industry (76%), Academia (17%), and Government (7%). The median annual salaries for inexperienced new graduates in chemistry adjusted for inflation for full-time permanent employment in these sectors were $42,500, $40,000, and $41,000 for industry, academia, and government, respectively.

By degree the median starting salary for inexperienced graduates in 2015 was $40,000 (B.S.), $50,000 (M.S.), and $75,000 (Ph.D.), showing a 25% increase in pay for a Master’s degree over a Bachelor’s.

For all new chemistry graduates in 2015, 32% entered full-time permanent employment, 12% full-time temporary employment, 34% entered graduate school or post-doctoral studies, 12% were seeking employment, and the remaining percentages were scattered among part-time work and not employed/not seeking.

Although we don’t have comparable detailed data on our graduates, about 60% of the alumni responding to the alumni survey reported that they attended a PhD program after receiving their MS at SHSU. Of those that had sought employment (directly with the MS or after receiving a PhD), only one student reported that they could not find employment that used their MS degree (plus one indicated that they had just started their job search).

E. Potential New Markets

Although new markets are appearing in fields such as nanotechnology and additive manufacturing, it will be some time before these markets add any significant jobs when compared to the existing markets for M.S. graduates.

In preparation for the growth in composites and additive manufacturing, we are adding a course in polymer chemistry (Dr. Dustin Gross).

F. Enrollment Plan for the Next 5 Years

We are negotiating to be able to give increased stipends to fewer (maximally) students, capping our potential number of assistantships at 15. This would make the offer to potential students more attractive, helping recruiting efforts. Note that a few more than 15 simultaneous students could be enrolled when other sources of funds are reliably available (i.e. funded position for a graduate student at the TRIES analytical lab as has been done for a couple of students in the past or funding of research assistants off faculty grants).

G. Alumni and Donor Relations

The department utilizes email contact with the Chair of Chemistry and social media to stay in touch with alumni. A public Friends of the SHSU Chemistry Department Facebook group has 179 members. Almost all of our M.S. graduates from 2011 to the present are members of this group.

This Facebook group is used to announce departmental news such as successful publication of articles, photos of presentations at research meetings, and announcements of thesis defenses.

We have six named scholarships in our department:

- Chemistry Alumni Scholarship: $750 per year. Given to the undergraduate sophomore chemistry major with the second highest gpa.
- Moore Scholarship: $750 per year. Given to the undergraduate sophomore chemistry major with the highest gpa.
- Jeffery Zagone Endowed Scholarship: $1000 per year. Given to the undergraduate junior chemistry major with the highest gpa.
- Ray E. Humphrey Scholarship: $1500 per year. Given to undergraduate senior chemistry major with the second highest gpa.
- J.C. Stallings Scholarship: $1500 per year. Given to undergraduate senior chemistry major with highest gpa.
- Earl H. Burrough Endowed Scholarship: Number of scholarships and amounts vary. Applicants must be undergraduates majoring in Chemistry or Physics, native born U.S. citizen and a resident of Texas, full-time enrollment at SHSU (not including elective hours), an overall 3.60 GPA, and demonstrate financial need.

The Department Chair communicates with the donors or their representatives occasionally to answer any questions and to brief them on the students who have benefitted from their generous donations.

The department also regularly participates in the annual American Chemical Society Southwest Regional Meeting, at which we typically encounter 3-7 recent graduates (most are in PhD programs at other schools in the region).

X. Outreach

A. Service Learning

Dr. Paul Loeffler had an embedded service-learning component in his advanced inorganic course that was certified by the Sam Houston State University Center for Community Engagement. He retired at the end of the 2015-2016 academic year. Presently, the department does not have another certified service-learning course.

B. Internships

Through the generous ongoing support of the Welch foundation, and the leadership of Dr. Richard Norman, the department has been able to fund 10-15 undergraduate and 5-10 graduate student research fellowships each summer. Additionally, in collaboration with the Greater Houston Local section of the American Chemical Society, the department has sponsored 1 or 2 ACS project SEED fellows each summer for the past six years (Dr. David Thompson).

C. Professional Outreach

Outreach efforts of the department have included: sponsorship of the vibrant J. C. Stallings Chemical Society, which is an official Student Affiliate of the American Chemical Society; sponsorship of the student chapter of the Society for the Advancement of Material and Process Engineering (Dr. Darren Williams); sponsorship of numerous Boy Scout events providing an avenue for boy scouts to obtain the merit badge in chemistry (Dr. Darren Williams); departmental instrument maintenance (Dr. Benny Arney, Dr. Tom Chasteen); hosting of exchange students in organic chemistry from Germany (Dr. Rick White; Dr. Donovan Haines); promotion of study abroad opportunities through close collaboration with the German academic exchange service, DAAD (Dr. Rick White); collaborative hosting and oversight of Texas University Interscholastic League Science Contests (Dr. Donovan Haines, Dr. David Thompson, Dr. Adrian Villalta-Cerdas); development of a chemical cleaning workshop for outreach to professionals in the discipline for Spring 2018 (Dr. Darren Williams); launching of a STEM Center at SHSU with the goal of strengthening student learning, research exposure, and long term success in the STEM disciplines (Dr. David Thompson, Dr. Villalta-Cerdas in collaboration with PI Dr. Brian Loft in mathematics and others, NSF DUE-IUSE award number 1725674); organizing workshops of integration of cooperative project-based experiments in the General

Chemistry laboratory programs for professionals in the higher education in Fall 2016 and Spring 2017 (Dr. Villalta-Cerdas).

XI. Program Specific Issues

There are no program-specific issues that haven't been covered elsewhere. The program does not have a professional accrediting body or other external agency with additional requirements for the program.

XII. Summary

A. Strengths and Good Practices to Retain

1. Mentorship & Strong Research Advisor:Student Relationship

One of the wonderful things about working in the MS Chemistry program is the close professional interactions that faculty get to have with students. In the survey of current students, faculty mentorship was given a perfect 100% “strongly agree” that research advising and mentorship is available, adequate, and supported their studies (the only item in both surveys to get a perfect score). Students also agreed 100%, with 2/3rd strongly agreeing, that graduate academic advising was also good. Further, numerous alumni commented that one of the department’s strengths is the close interaction students get to have with faculty, and ready availability of faculty to students. The mentor-mentee relationship is extraordinarily important in science, and the SHSU Chemistry program does this very well.

2. Rigorous Education on Fundamental Chemistry

Current students and alumni both reviewed the quality of education they obtained at SHSU in the fundamentals of chemistry very favorably. Like mentorship, this is a strength of the department that we work hard to maintain. Of alumni, 98% agreed that they were satisfied with the education they received, 100% of those that subsequently attended a PhD program agreed that they were better prepared than their peers, and 87% of those who had a job agreed that they were better prepared for their career than their coworkers as a result of their education at SHSU. More specifically, 100% of alumni that had at least one job related to their degree agreed that SHSU taught them the subject matter of chemistry well, with over half strongly agreeing.

3. Preparation of Students for PhD

As noted above, 100% of alumni that went on to PhD programs agreed with the statement that “I was better prepared for success in graduate school, compared to other graduate students in my PhD program, as a result of my education at SHSU.” Students commented at length about how the close mentorship had served them well, and how the research experience at SHSU and the experience of writing their thesis made them better prepared to be productive in their PhD program.

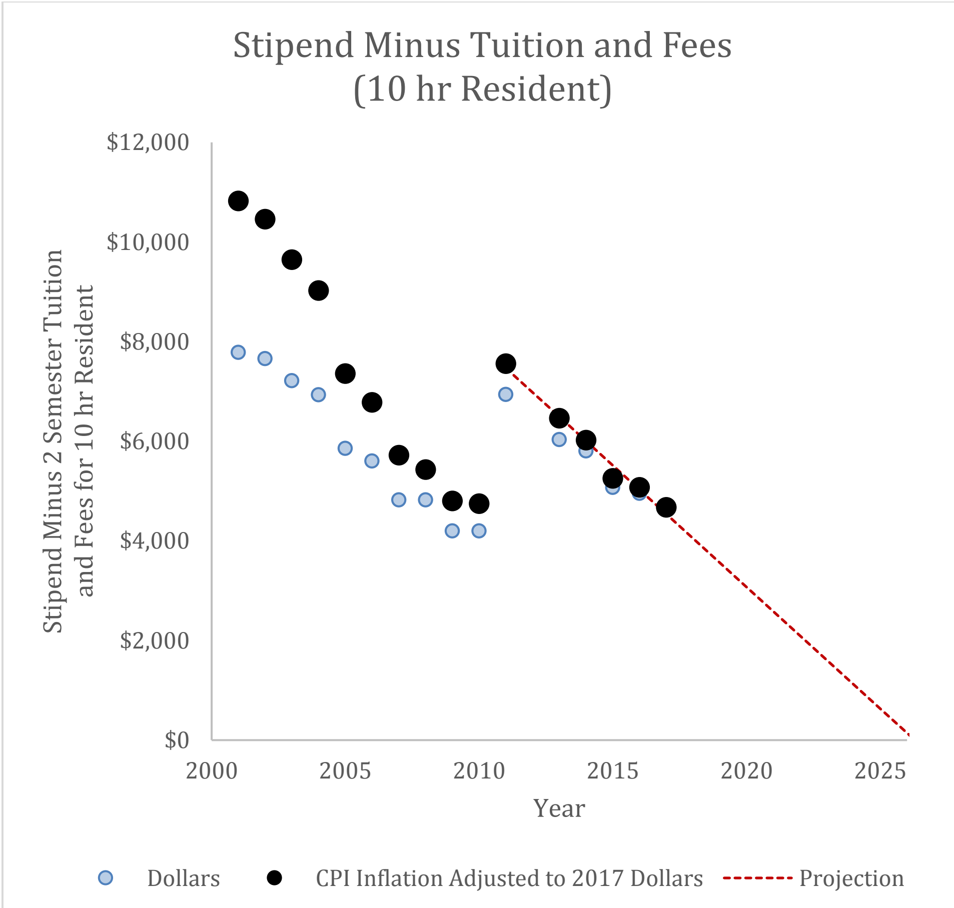
B. Items/Areas of Concern

1. Stipends/Finances of students

The following data provides insight into the stipend and tuition problems faced by the program. The MS stipend has only increased once since 2001 (though there was an increase for 2001 as well). Currently it is $13,005. That one increase in 2011 was significant (~32%), but was a single step up when the tuition and fees, as well as a number of other expenses, have increased nearly every year. Students do not receive in-state tuition waivers (though international students have out-of-state tuition waived to in-state prices), so they have to pay the majority of this stipend back to the university and that fraction has been increasing at an alarming rate.
A graph and table illustrating the problem follow, but a few highlights/takeaways are:

- In CPI-inflation-adjusted terms, MS students on stipend are living on less than half the funds today that they were in 2011, and only about 60% of the funds they received in 2011. It is just 43% of what MS students at SHSU had left after paying tuition and fees in 2001 in CPI-adjusted dollars.
- In inflation-adjusted dollars after tuition and fees, today's students have less money for expenses than any cohort in the 17-year period we collected stipend and tuition data for, starting in 2001. Students are currently left with approximately $380/month to pay for rent, food, health insurance, international fees, and other expenses if they receive only the stipend.
- If current trends (2011-2017) continue, MS students will pay more in tuition and fees to the university than the university pays them in stipend within the next ten years.
- Responses to the alumni survey reveal that the number of alumni who disagree at some level with the statement that "The level of financial aid, considering stipends and scholarships, available during my studies at SHSU was sufficient." has increased from 25% (1 of 4) for those graduating before 2006, to 33% (2 of 6) for those graduating

between 2006 and 2011, to 46% (16 of 35) for those graduating between 2011 and 2017. A similar question to current students about financial aid including stipends and scholarships demonstrates that100% find them “inadequate or insufficient” or “somewhat insufficient/detracted from studies”. Although the number of people reporting is low in some of those groups, it appears to match the pattern (high disagreement when funds are low) in the graph below of how much money students have after receiving their stipend and paying tuition and fees over time (graph below). Multiple students/alumni in both surveys indicated in general response questions that the low stipends and/or lack of tuition waivers were a significant problem, with one alumni bluntly stating that “I would strongly recommend the program to other students, if the stipend is sufficient. But the stipend is not sufficient to do the MS at SHSU.” Another spoke at length about this problem in their final comments: “In a point of an international student, it is very hard to survive at SHSU with current financial support. If I explain it roughly with figures, an international TA gets about 1350$ per month as their salary. They have to pay back about 1000$ for the tuition and insurance in every month (about 1200$ in fall and 800$ in spring, in average about 1000$). In every month, they have about 350$ left for the expenses. Expenses include apartment fee (minimum of 400$ in a shared single bedroom, very hard to find and live in them), food and transportation (minimum of 300$), and othere expenses (this include medical, cloths, stationaries, community activities and etc. Minimum of 100$). Total is about 800$. In summer students get about 1500$ I am doing a simple evaluation of common expenses without considering any exceptional costs***. If someone looks into the statistics of internatinal students enrolment into the program they will identify that there is some underlying reason for the significant decrease. The financial barrier I am trying to explain is that reason.***” (Emphasis added during writing of this report.)


Stipend Minus Tuition and Fees
(10 hr Resident)
Stipend Minus 2 Semester Tuition and Fees for 10 hr Resident
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
2000
2005
2010
2015
2020
2025
Year
Dollars
CPI Inflation Adjusted to 2017 Dollars
Projection

	Graduate Resident Tuition and Fees, 10 hr, per Semester	Per year	MS Stipend	Stipend Minus Tuition and Fees	Stipend Minus Tuition and Fees in 2017 Dollars (*)	Percent of 2001	Percent of 2011
2017	$4,167	$8,333	$13,005	$6,316	$4,672	43%	62%
2016	$4,027	$8,053	$13,005	$6,037	$5,075	47%	67%
2015	$3,966	$7,932	$13,005	$5,917	$5,254	49%	70%
2014	$3,601	$7,202	$13,005	$5,188	$6,022	56%	80%
2013	$3,487	$6,974	$13,005	$4,961	$6,461	60%	85%
2011	$3,034	$6,068	$13,005	$4,057	$7,558	70%	100%
2010	$2,824	$5,647	$9,846	$3,637	$4,747	44%	63%
2009	$2,824	$5,647	$9,846	$3,638	$4,801	44%	64%
2008	$2,513	$5,026	$9,846	$3,018	$5,430	50%	72%
2007	$2,513	$5,026	$9,846	$3,019	$5,722	53%	76%
2006	$2,123	$4,246	$9,846	$2,240	$6,779	63%	90%
2005	$1,995	$3,990	$9,846	$1,985	$7,359	68%	97%
2004	$1,458	$2,916	$9,846	$912	$9,026	83%	119%
2003	$1,316	$2,632	$9,846	$629	$9,645	89%	128%
2002	$1,095	$2,190	$9,846	$188	$10,457	97%	138%
2001	$1,031	$2,062	$9,846	$61	$10,824	100%	143%

(*) Inflation adjustments calculated from https://data.bls.gov/cgi-bin/cpicalc.pl.

Notes: Data for 2012 was not readily available. Tuition per year does not include summer tuition.

2. Marketing/Number of Apps/Number of Students

As noted in the section on I. Program Profile D. Faculty/Student ratio on page 14, V. Students B. Number of applicants for each year on page 111, and IX. Recruitment and Marketing Efforts C. Marketing and recruitment efforts and their effectiveness on page 206, the number of applications to the program increased early in the self-study period, but peaked and has decreased since and there are limited effective marketing opportunities for the department. Moving forward, the department will need to work on identifying new avenues for attracting students.

In the past two years, we have started targeting the American Chemical Society Southwest Regional Meeting, with the program coordinator staffing a recruiting table with brochures and other information about the program. Faculty have also attended these meetings in part to recruit students via research conversations at talks, posters, and social activities associated with the meeting. This has generated 10-15 contacts to follow up each meeting, but it is too early to tell how many actual students will result (the second one just finished as the draft of this report was written). A strong presence at these meetings has the side-benefit of advertising our program to regional faculty at other institutions who have students that are looking for graduate programs.

One thing that will be useful in support of recruiting and marketing efforts in the coming years is the data generated from the current student and alumni surveys. The overwhelmingly positive response about the quality of our program and experience our students gain is something we can make sure to advertise to prospective students. The graduate coordinator will draw up draft materials emphasizing these points for use in emails, recommendation letters, brochures, and other communications.

3. How do we better prepare students for industry?

Although overwhelmingly giving the department a favorable evaluation for preparing students for careers in chemistry, a few alumni indicated that they thought that the department could do better and this is clearly an area the department could improve on. The alumni had differing ideas on what would need to be added/covered, though. Some that were mentioned included

QA/QC/GLP, statistics (PCA, cluster analysis), business accounting, more attention to applied chemistry, & entrepreneurship.

One alumni would like to see the department look at offerings that might attract alumni and other area chemists to the university for additional training opportunities. One model discussed by the faculty in generating this report that might be expanded or duplicated is based on an industrial cleaning workshop hosted by Dr. Williams that brings in industrial chemists to learn from his expertise on cleaning solvent selection. Such workshops also present an opportunity to have current students mix with practicing chemists, generating opportunities for information-transfer and for professional networking.

4. Experience on and/or Access to Instruments

A common problem for any science department is that they should ideally get students experience on many instruments that cost very large sums of money to obtain and to maintain. A number of students indicated that this is an area where the program can improve.

One model that has been changing on our campus is the increased use of core facilities, and the faculty look forward to working with the Office of Sponsored Projects on enhancing facilities. In addition, faculty have expressed a willingness to work together to bring additional instruments to campus through increased grant-writing and related activities and to discuss other ways in which we may expose students to instrumentation. One way to increase access to instrumentation is through collaborations that allow students to perform some of their research off-site, at a collaborating institution. For instance, a student working for Dr. Zall participated in a collaboration with the Pacific Northwest National Laboratory (PNNL) in the summer of 2017 that allowed her to conduct research at the PNNL campus. This project provided her with hands-on experience using high-field nuclear magnetic resonance (NMR) spectrometers and a custom high-pressure NMR setup developed at PNNL. The US Army Medical Research Institute of Chemical Defense (USAMRICD) provided the Petrikovics lab with a Malvern ZetaSizer Nano for their work on cyanide poisoning antidotes. Another example is a very preliminary interaction between Dr. Haines, Dr. Hobbs, and employees from Rigaku at the recent ACS

Southwest Regional Meeting that may lead to an SHSU student spending the summer at Rigaku doing research on Dr. Haines' enzyme using Rigaku's Biological Small-Angle X-Ray Scattering (SAXs) instrumentation. Interactions like these don't always work out, but can simultaneously get students experience and increase connections to industry and other institutions for the department.

5. Computational Infrastructure

Similar to instrument availability, the department needs increased computational infrastructure (current capabilities are described on page 131). Several faculty members carry out quantum mechanical calculations, molecular mechanics calculations, and advanced machine learning ensemble analysis that require more computing power than the typical desktop computer.

6. Policy Problems

There were a number of campus policy issues that we would like to see corrected, but obviously do not have much control over. These issues and proposed solutions were summarized in "Analysis of the Impacts of the Various Policies" on page 45.

7. Lab facilities and space

One of the more pressing problems for the department is that its undergraduate population has grown significantly over the years (the number of undergraduate majors has doubled to 400), but the amount of faculty office and lab space has not significantly increased. This has limited the hire of new faculty, both in terms of positions and in terms of areas of chemistry that could be hired (limited to those few that do not require wet lab space). As chemistry requires significant safety equipment, especially fume hoods, the space required tends to be specialized and requires significant advanced planning for expansion.

8. Alumni and Donor relations

The fact that over 80% of the alumni that we sent survey links to responded, and responded very positively, even though we know some of the email addresses we had were outdated really underscored a willingness on their part to support the department. Several comments suggested a willingness to interact with the department more. This presents an opportunity for us. Faculty are discussing how best to capitalize on this. One example being discussed is to have willing alumni form a network to provide ongoing advice to the department and our students, and perhaps a more specific role as an external student mentor. We are also discussing being more organized and intentional with bringing alumni in to give seminars, something that has been done but on a limited basis when the faculty and alumni decide to set it up. Finally, although the university carries out fundraising activities on our behalf, the department has in general been reactive to opportunities presented to us but not very proactive about generating opportunities. We could do better to interact with the university fundraisers and work with alumni to generate opportunities, though the department is very cautious about pressuring alumni and damaging the very good relationship that exists.

9. Employer Interactions/Surveys

One of the items in this report that the department has not done previously to our knowledge is an employer survey. We did not feel that a meaningful survey could be implemented given the time constraints for production of this self-study report and the fact that we don’t have an available contact list of people to send the survey to like we did for our current student survey and alumni survey. Our students generally go to a diverse set of employers, and there are complications like the fact that some of our alumni work for military contractors and cannot discuss major aspects of their jobs for security reasons. As we move past the report submission, however, we will explore how this survey would work. We will discuss further who would be reasonable to ask to fill out such a survey and what we should ask them.

Appendix 1: Faculty Vitae

Benny E. Arney, Jr.
Professor of Chemistry
(936)-294-1531
chm_bea@shsu.edu

Education:

B.A., Summa cum laude in Chemistry and Mathematics, University of Saint Thomas, Houston, Texas, 1982.

Ph. D., in Chemistry, 1986, William Marsh Rice University, Houston, Texas.
Ph. D. supervisor W. E. Billups.
Dissertation: : 1-Bromo-2-chlorocyclopropene: A New Cycloproparene Synthon and the Preparation and Chemistry of 1(7)-Bicyclo[4.1.0.]heptene and 1(6)-Bicyclo[4.1.0.]heptene.

Post-Doctoral Research under A.P. Marchand, North Texas State University, Denton, Texas, Aug. 1986-87.

Professional Experience:

1982	Lecturer	University of Saint Thomas, Houston TX
1982-1986	Graduate Assistant	William Marsh Rice University, Houston, TX
1986-1987	Postdoctoral Fellow With Allan Marchand	North Texas State University, Denton, TX
1987-1988	Lecturer/Instructor	Louisiana School for Math, Science, and the Arts, Natchitoches, LA
1988-1994	Assistant Professor	Sam Houston State University, Huntsville, TX
1994-2000	Associate Professor	Sam Houston State University, Huntsville, TX
1994	Granted Tenure	Sam Houston State University, Huntsville, TX
2000-now	Professor	Sam Houston State University, Huntsville, TX

Grant History: Applied for $2,075,598 in 26 separate applications. Awarded $1,019,000.

Publications/Presentations: 49 talks, 27 posters, and 29 publications,

Students Supervised: 14 M.S. and 23 undergraduate researchers

Dustin E. Gross
Assistant Professor of Chemistry
(936) 294-4067
deg013@shsu.edu

Education

B.S. in Chemistry, 2003, University of Arizona, Tucson, Arizona

Ph.D. in Chemistry, 2009; University of Texas, Austin, Texas
Ph.D. supervisor Jonathan L. Sessler
Dissertation: " ITC and NMR Spectroscopy Binding Studies of *meso*-Octamethylcalix[4]pyrrole and Its Derivatives

Professional Employment History

2001-2003	Undergraduate Assistant (Teaching Assistant, Research Associate)	University of Arizona, Tucson, Arizona
2003-2009	Graduate Assistant (Teaching Assistant, Research Associate)	University of Texas, Austin, Texas
2009-2012	Postdoctoral Fellow with Jeffrey S. Moore	University of Illinois, Urbana, Illinois
2012-now	Assistant Professor	Sam Houston State University

Grant History: Applied for $175,000 in 5 separate applications. Awarded $55,000.

Publications/Presentations: 7 talks, 21 posters or student presentations, and 39 publications.

Students Supervised: 9 M.S. and 22 undergraduate researchers.

Donovan C. Haines
Associate Professor of Chemistry
(936) 294-1530
haines@shsu.edu

Education
B.S in Biochemistry, 1993, Wichita State University, Wichita, KS

Ph.D. in Chemistry, 1998; Wichita State University, Wichita, KS
Ph.D. supervisor Kandetege Wimalasena
Dissertation: "Kinetic and Spectroscopic Studies of Dopamine β-Monooxygenase and Cytochrome B_{561}."

Professional Employment History

1994-1998	Graduate Assistant	Wichita State University, Wichita, KS (Teaching Assistant, Research Associate)
1999-2001	Postdoctoral Fellow	University of Texas Southwestern Medical Center at Dallas, Dallas, TX With Julian A. "Bill" Peterson, Dept. of Biochemistry Subject: Cytochrome P450 Biochemistry and Biophysics, Lipid Hormones (esp. Eicosanoids and *N*-Acylamino acids)
2001-2008	Assistant Professor	University of Texas at Dallas
2008-2014	Assistant Professor	Sam Houston State University
2014-	Associate Professor	Sam Houston State University

Grant History: Applied for $7,660,042 in 21 separate applications (one under review). Awarded $433,884 in 6 funded grants.

Publications/Presentations: 22 talks, 7 posters, more than 31 external talks and posters by students, and 23 publications.

Students Supervised: 2 Ph.D. + 1 in-progress (co-chair), 18 completed M.S., 3 MS that did not complete, and 88 undergraduate researchers.

Christopher E. Hobbs
Assistant Professor of Chemistry
(936) 294-3750
chobbs@shsu.edu

Education

B.S. in Chemistry, 2006, Angelo State University,
San Angelo, Texas

Ph.D. in Chemistry, 2011; Texas A&M University, College Station, Texas.
Ph.D. supervisor David E. Bergbreiter
Dissertation: "The Use of Soluble Polyolefins as Supports for Transition Metal Catalysts."

Professional Employment History

2011-2014	Assistant Professor	Angelo State University, San Angelo, TX
2014-2017	Assistant Professor	Texas A&M University-Kingsville, Kingsville, TX
2017-now	Assistant Professor	Sam Houston State University, Huntsville, TX

Awards/Funding: Applied for $1,793,639 in 5 separate applications. Awarded $229,395.

Publications/Presentations: 11 talks (3 invited) and 13 publications.

Students Supervised: 5 M.S. and 12 undergraduate researchers.

Richard E. Norman
Chair and Professor of Chemistry
(936) 294-1527
norman@shsu.edu

Education

B.S. cum laude with Distinction in Chemistry, 1981, University of Washington, Seattle, Washington

M.S. in Chemistry, 1983, University of Washington, Seattle, Washington

Ph.D. in Chemistry, 1985; M.S. University of Washington, Seattle, Washington.
Ph.D. supervisor Norman J. Rose
Dissertation: "The Synthesis and Structure of Copper Complexes Derived From Glycine, 1-Methylimidazole, and Dehydroascorbic Acid."

Professional Employment History

1981-1985	Graduate Assistant	University of Washington, Seattle
	(Teaching Assistant, Research Associate, Predoctoral Lecturer)	
1985-1987	Postdoctoral Fellow With Peter Sadler	University of London, London, U.K.
1987-1989	Postdoctoral Associate With Lawrence Que, Jr.	University of Minnesota, Minneapolis
1989-1990	Assistant Professor	University of Arkansas at Little Rock
1990-1996	Assistant Professor	Duquesne University, Pittsburgh, PA
1997-1999	Assistant Professor	Northeast Louisiana University, Monroe, LA
1999-2004	Associate Professor	University of Louisiana at Monroe (note name change)
2000	granted tenure	University of Louisiana at Monroe
2004	Professor	University of Louisiana at Monroe
2005-now	Professor and Chair	Sam Houston State University

Grant History: Applied for $2,906,055 in 35 separate applications. Awarded $680,263.

Publications/Presentations: 7 talks, 21 posters, 50 publications and 2 data deposits.

Students Supervised: 1 Ph.D., 15 M.S. and 27 undergraduate researchers.

Ilona Petrikovics
Professor of Chemistry
(936) 294-4389
ixp004@shsu.edu

Education
M.S. in General Chemistry, L. Kossuth University of Arts and Sciences, Debrecen, Hungary,1979.
Ph.D. in Organic Chemistry, (minor: Biochemistry), L. Kossuth Univ. Arts and Sci. Debrecen, Hungary, 1982.
Ph.D. Advisor: Joseph Csaba Jaszberenyi.
Dissertation: "Synthesis and Structural Elucidation of Penicillin and Cephalosporin Derivatives"
Ph.D. in Medicinal Biology, (minors: Pharmacology/Microbiology), University Medical School, Debrecen, Hungary, 1985.
Ph.D. Advisor: Ferenc Hernadi.
Dissertation: "Investigations of Beta-Lactamase Activity of Penicillanic Acid Derivatives"
Professional Employment History
1985-1988 Research Fellow, Res. Group of Antibiotics of the Hungarian Academy of Sci., Debrecen, Hungary.
1988-1990 Laboratory Head, Biogal Pharmaceutical Company Debrecen, Hungary.
1990-1992 Research Associate, Dept. Med. Pharm. Toxicology, Texas A&M University, College Station, TX.
1992-2002 Assistant Research Scientist, Dept. Med. Pharm. Toxicology. Texas A&M University, College Station, TX.
2002-2003 National Research Council Senior Fellow, U.S. Army Med. Res. Inst. Chem. Defense, Aberdeen, MD.
2003-2004 Research Analytical Chemist, College of Vet. Medicine, Texas A&M University, College Station, TX.
2004-2005 Associate Research Scientist, Dept. Biochemistry & Biophysics, TAMU, College Station, TX.
2004-2006 Research Fellow, Dept. Anat. Physiol. Pharm. College of Vet. Medicine, Auburn University, AL.
2006-2007 Battelle Contractor, U.S. Army Medical Research Institute of Chemical Defense, Aberdeen, MD.
2007-2014 Associate Professor of Chemistry, Sam Houston State University, Huntsville, TX.
2014-Present Professor of Chemistry, Sam Houston State University, Huntsville, TX.
Grant History: Applied: $3,532,766 in separate applications, Awarded: $2,517,353
Publications, Presentations: 55 articles, 8 book-chapters, 8 proceedings, 11 patent applications, 86 presentations at national, international scientific meetings, 63 presentations at regional meetings by my students.
Students Supervised: 10 MS, 68 undergrads, 9 postdocs.
Honors and Awards: College of Sciences Faculty Excellence in Research Award at SHSU (2013); SHSU Faculty Excellence in Scholarly and Creative Accomplishment Award, (2013); ORSP Recipient (2013).

David E. Thompson
Associate Professor of Chemistry
(936) 294-3270
david.thompson@shsu.edu

Education

B.A in Chemistry, 1988, Carleton College, Northfield, Minnesota

Ph.D. in Chemistry, 1998, University of Wisconsin, Madison, Wisconsin
Ph.D. Supervisor: John C. Wright
Dissertation: "Measuring and modeling the contribution of the complex refractive index to infrared four-wave mixing lineshapes in mixtures of fully deuterated benzene and 1,8-nonadiyne."

Professional Employment History

1988-1990	U.S. Peace Corps Secondary School Science Teacher, Juaso, Ghana
1990	U.S. Peace Corps Trainer for Science Teachers, Cape Coast, Ghana
1991	Chemistry Technician, H.B. Fuller, Vadnais Heights, Minnesota
1991-1992	Teaching Assistant, University of Wisconsin, Madison
1993-1998	Research Assistant, University of Wisconsin, Madison
1999-2002	Postdoctoral Researcher, Stanford University, Stanford, California With Michael D. Fayer
2002-2009	Assistant Professor of Chemistry, Lawrence University, Appleton, Wisconsin
2006	Fall semester sabbatical, Northwestern University, Evanston, IL With Richard Van Duyne
2009-2015	Assistant Professor of Chemistry, Sam Houston State University, Huntsville, Texas
2015	Granted Tenure
2015-present	Associate Professor of Chemistry, Sam Houston State University, Huntsville, Texas

Grant History: Applied for $4,436,000 in 8 separate applications. Awarded $2,518,000.

Publications/Presentations: 25 talks, 44 posters, 25 publications.

Students Supervised: 8 M.S., 40+ undergraduate researchers.

Tarek M. Trad
Associate Professor of Chemistry
Department of Chemistry
Sam Houston State University
College of Science and Engineering Technology
Office: (936)294-1533 ; Email: tmt033@shsu.edu

Education

Ph.D., Chemistry, Oklahoma State University, Stillwater, Oklahoma Ph.D. Advisor: Dr. Allen Apblett Dissertation: "Novel Magnetic Extractants For Removal of Pollutants From Water"	December 2006
B.Sc., Chemistry, Beirut Arab University, Beirut, Lebanon	June 1999

Professional Employment History

Associate Professor, Department of Chemistry, Sam Houston State University, Huntsville, Texas	09/2017 - Present
Associate Professor, Department of Chemistry, The University of Texas – Rio Grande Valley (UTRGV)	2015-2017
Associate Professor, Department of Chemistry and Environmental Sciences, The University of Texas at Brownsville	2014-2015
Assistant Professor, Department of Chemistry and Environmental Sciences, The University of Texas at Brownsville	2008-2014
Postdoctoral Associate, Virginia Commonwealth University, Richmond, Virginia	2007-2008
Chemistry Lecturer, Oklahoma State University, Stillwater, Oklahoma	08/2006-12/2006
Research Assistant, Oklahoma State University, Stillwater, Oklahoma	2003-2006
Teaching Assistant, Oklahoma State University, Stillwater, Oklahoma	2000-2003

Grant/Donation History: Applied for $738,759 in 8 separate applications. Awarded $458,759.

Publications/Presentations: 12 talks, 12 posters, 12 publications

Students Supervised: 1 M.S., 14 undergraduate researchers

Service to the Profession:

- Reviewed more than 5 articles for the American Society for Mechanical Engineers, and 1 proposal for the ACS Research Petroleum Fund.
- Served as the south Texas local section chair for the American Chemical Society (1 year)

Adrian Villalta-Cerdas
Assistant Professor of Chemistry
(936) 294-2556
axv067@shsu.edu

Education

B.S. in Chemistry, 2008, University of Costa Rica,
San Jose, Costa Rica

M.S. in Chemistry, 2012, University of South Florida, Tampa, Florida

Ph.D. in Chemistry, 2014, University of South Florida, Tampa, Florida.
Ph.D. supervisor Santiago Sandi-Urena
Dissertation: "Development and Assessment of Self-explaining Skills in College Chemistry Instruction"

Professional Employment History

2006-2007	Chemical Analyst	University of Costa Rica
2006-2008	Chemical Analyst	Treasury Department of Costa Rica
2008-2010	Graduate Assistant	Clemson University
2010-2011	Graduate Assistant	University of Texas at El Paso
2011-2014	Graduate Assistant	University of South Florida
2014-2016	Lecturer in Chemistry	California State University, Bakersfield
2016-now	Assistant Professor	Sam Houston State University

Grant History: Applied for $2,915,000 in 4 separate applications. Awarded $2,028,000 for “A Comprehensive Model for Improving the Success of STEM Majors through the STEM Center” NSF-DUE-IUSE-Development and Implementation Tier for Engaged Student Learning & Institution and Community Transformation, funded September, 2017 to date.

Publications/Presentations: 24 talks, 5 posters, 13 publications.

Students Supervised: 1 undergraduate researcher.

Darren L. Williams
Professor of Chemistry
(936) 294-1529
williams@shsu.edu

Education

B.S. Chemistry, 1992, University of Texas at Austin, Austin, TX
Ph.D. Chemistry, 1997, Oregon State University, Corvallis, OR
Ph.D. supervisor Joseph Nibler
Dissertation: "High Resolution Infrared and Ab Initio Studies of Aluminum and Beryllium Borohydrides"

Professional Employment History

1997 – 2001	Assistant Professor	West Texas A&M University, Canyon, TX
2001 – 2004	Adjunct Professor	West Texas A&M University, Canyon, TX
2001 – 2004	Section Scientist	BWXT Pantex LLC (US-DoE facility), Amarillo, TX
2004 – 2010	Assistant Professor	Sam Houston State University, Huntsville, TX
2010 – 2016	Tenured, Assoc. Professor	Sam Houston State University, Huntsville, TX
2016 – pres.	Full Professor	Sam Houston State University, Huntsville, TX

Grant History: Since 2004, 8 different external funding sources, $498,000 in external funding, and $60,000 in internal funding.

Publications/Presentations: 29 presentations and posters; 30 publications, magazine articles, and book chapters; and 2 patents.

Students Supervised: 9 M.S. students supervised, 7 M.S. students completed, and 36 undergraduate researchers.

Awards: Nominated for excellence awards in teaching and service at the college and university levels, 2016 recipient of the College of Science excellence in service award. Recipient of teaching awards from Phi Sigma Pi, Alpha Chi, and Oregon State University.

Christopher M. Zall
Assistant Professor of Chemistry
(936) 294-1525
zall@shsu.edu

Education
B.A. cum laude in Chemistry, 2008, Carleton College, Northfield, Minnesota

M.S. in Chemistry, 2010, University of Minnesota, Minneapolis, Minnesota

Ph.D. in Chemistry, 2013, University of Minnesota, Minneapolis, Minnesota.
Ph.D. supervisor Connie C. Lu
Dissertation: "Design, Synthesis, and Characterization of Transition Metal Compounds Using Binucleating and Bifunctional Ligands: Strategies for the Multi-Electron Reduction of Small Molecules."

Professional Employment History

2008-2013	Graduate Assistant (Teaching Assistant, Research Associate)	University of Minnesota, Minneapolis, MN
2013-2016	Postdoctoral Associate With Aaron M. Appel	Pacific Northwest Natl. Laboratory, Richland, WA

Grant History Applied for $128,000 in 4 separate applications. Awarded $18,000.

Publications/Presentations
2 talks and 2 posters at national conferences (American Chemical Society National Meeting, Gordon Research Conference, and Gordon Research Seminar), 5 talks at departmental/institutional symposia
5 publications in peer-reviewed journals (Journal of the American Chemical Society, ACS Catalysis, Dalton Transactions, and Inorganic Chemistry).

Students Supervised
1 M.S. and 2 undergraduate researchers.

Service to the Profession, 2011-present
Peer reviewer for 1 article in *Chemistry: A European Journal (2017);* Member, American Chemical Society, for 4 years; Participant at two national workshops for faculty and curriculum development:

- General Chemistry Performance Expectations Workshop, Washington DC, September, 2017
- Cottrell Scholars Collaborative New Faculty Workshop, Washington DC, August, 2016

Mid-Columbia Science and Engineering Fair, Kennewick, WA, 2015; Science Judge at Mid-Columbia Regional Science Bowl, Washington State University-Tri Cities, 2015; Chemistry Graduate Student Workshop Committee, Written Exam Workshop, University of Minnesota, 2011-2012; Student Seminar Committee, Chemistry Department, University of Minnesota, 2011

Appendix 2: Current Student Poll

During October 2017 a Qualtrics survey of current students was created and conducted to support the self-study. A survey instrument appears on the following pages, followed by raw results of the survey. At the time of the survey there was an unusually small number of graduate students in the program (six), all of whom responded to the survey.

As can be seen from the survey results, students were overall very happy with the program as seen from the results for the first question: "How much do you agree or disagree with the following statement: Overall, I am satisfied with the MS Chemistry graduate program." Five out of six current students strongly agreed and one somewhat agreed with the statement.

The results for more detailed items can be seen on the following pages, but a few items of interest or warranting explanation will be discussed here.

- Given the importance of the research advisor as a mentor to a Chemistry graduate student, the fact that all 6 students gave "Research Advising & Mentorship" the highest rating is a strong indication that individual research advisors in the department are doing a good job mentoring students.
- In general, nearly every rating of aspects internal to the Department of Chemistry rated pretty high to very high, with external factors rating lower.
- The strongest negative response among all the topics is "Financial Support Availability", which was rated "Unavailable/inadequate" or "Somewhat insufficient, detracted from studies" by all six students.
- Graduate program advising also received a very high rating, with four out of six giving the highest rating and two giving the next highest rating.
- The second strongest negative response was for the Office of Financial Aid.
- Both relevant colleges, College of Science and Engineering Technology and Office of Graduate Studies, were rated somewhat favorably.

- Availability of travel funds was rated somewhat negatively, with four out of six students rating it “somewhat insufficient, detracted from studies”. It may be worth noting, however, that rules for travel awards were made more complicated this year (with the administration of fund by the Office of Graduate Studies and Graduate Council instead of being distributed to the colleges for administration) and the students were waiting to hear if they received awards during the survey. Their uncertainty about whether they would receive funds that were nearly automatically awarded (with certain rules and restrictions) in the past likely affected their rating. Near the end of the survey period all students found out their applications were awarded, but most had submitted their responses earlier.

F2017 MS Chemistry Program Self-Study Current Student Survey

Start of Block: Default Question Block

Q7
SHSU MS Chemistry
Student Survey

The Department of Chemistry is conducting this survey of our current MS Chemistry students as part of a program self-study. This self-study will be used to identify what areas the program does well in, and what areas we should focus on improving to best support our students.

Q5 How much do you agree or disagree with the following statement: *Overall, I am satisfied with the MS Chemistry graduate program.*

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q2 For each of the following, indicate how the aspect has impacted your experience in the M.S. program.

	Was unavailable or inadequate (1)	Somewhat insufficient, detracted from studies (14)	Neutral (5)	Mostly sufficient, supportive (15)	Available/adequate and supported studies (3)
Quality of Instruction (1)	○	○	○	○	○
Course Availability (2)	○	○	○	○	○
Administrative Support (3)	○	○	○	○	○
Degree Planning (4)	○	○	○	○	○
Graduate Program Advising (5)	○	○	○	○	○
Research Advising & Mentorship (6)	○	○	○	○	○
Financial Support Availability (Financial Aid, Stipends, etc.) (7)	○	○	○	○	○

Research Consumables Availability (chemicals and related small items) (8)	○	○	○	○	○
Research Equipment Availability (9)	○	○	○	○	○
Availability of Travel Funds (10)	○	○	○	○	○
Access to Faculty (11)	○	○	○	○	○
Opportunities to develop communication skills (12)	○	○	○	○	○
Opportunities to develop research skills (13)	○	○	○	○	○
Office of Financial Aid (14)	○	○	○	○	○
Enrollment (15)	○	○	○	○	○
Office of Admissions (16)	○	○	○	○	○

Registrar (17)	○	○	○	○	○
Office of Graduate Studies (18)	○	○	○	○	○
College of Science and Engineering Technology (19)	○	○	○	○	○
Availability of Housing (20)	○	○	○	○	○
Availability of Parking (21)	○	○	○	○	○
Opportunities to interact with students from outside the department (22)	○	○	○	○	○
Service/Volunteer opportunities (23)	○	○	○	○	○

Q6 Please provide any additional feedback you may have for the department.

____

____

____

____

____

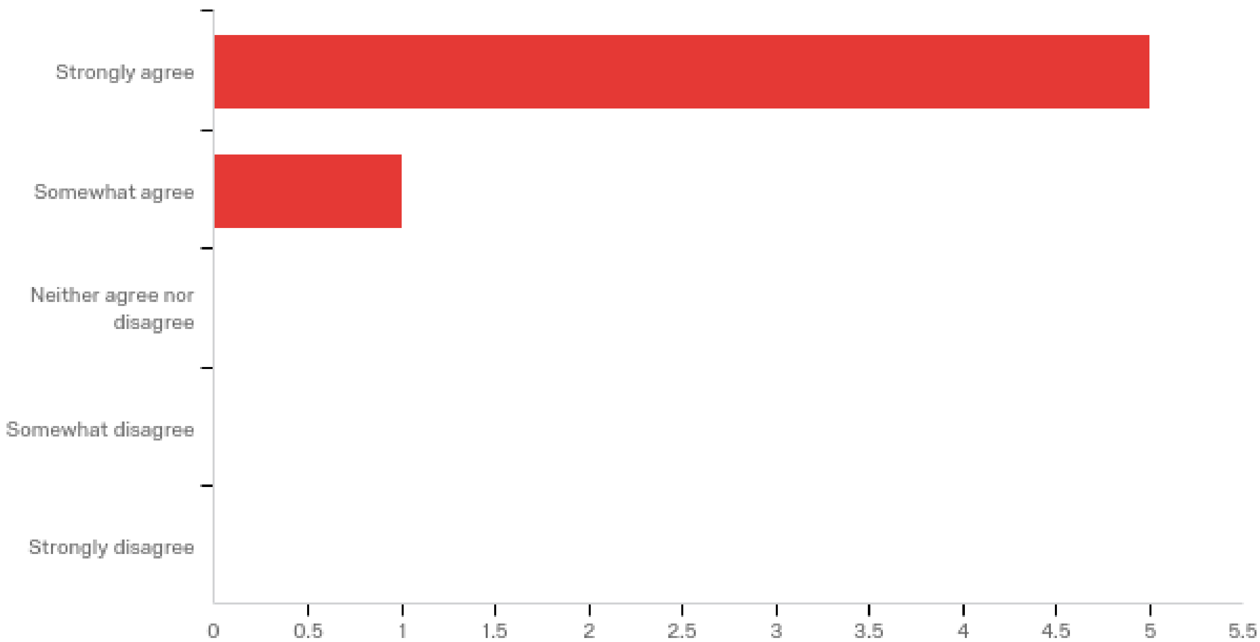
End of Block: Default Question Block

Survey Results Report

F2017 MS Chemistry Program Self-Study Current Student Survey

October 22nd 2017, 6:38 pm MDT

Q5 - How much do you agree or disagree with the following statement: Overall, I am satisfied with the MS Chemistry graduate program.



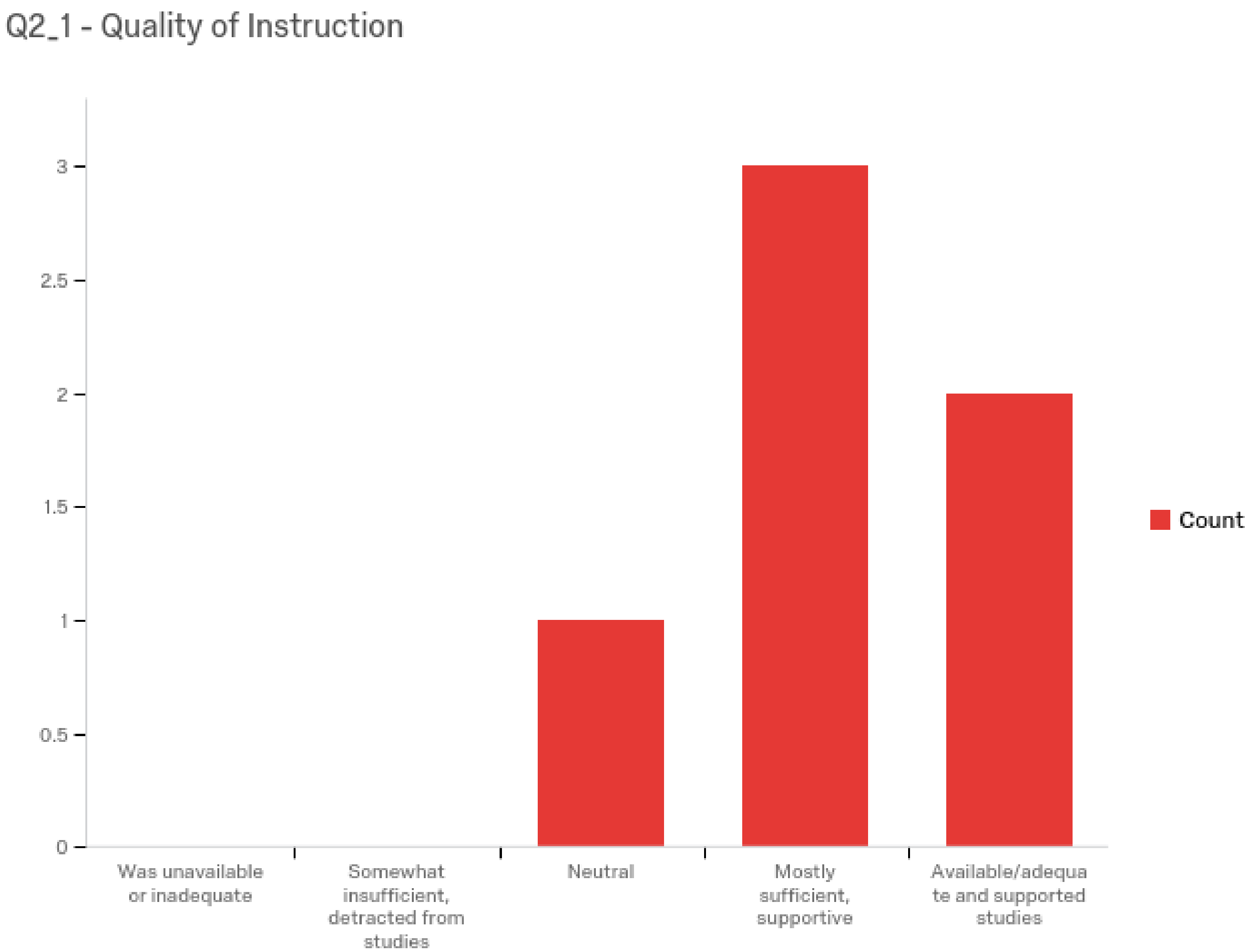
#	Answer	%	Count
1	Strongly agree	83.3%	5
2	Somewhat agree	16.7%	1
3	Neither agree nor disagree	0.0%	0
4	Somewhat disagree	0.0%	0
5	Strongly disagree	0.0%	0
	Total	100%	6

Q2 - For each of the following, indicate how the aspect has impacted your experience in the M.S. program.

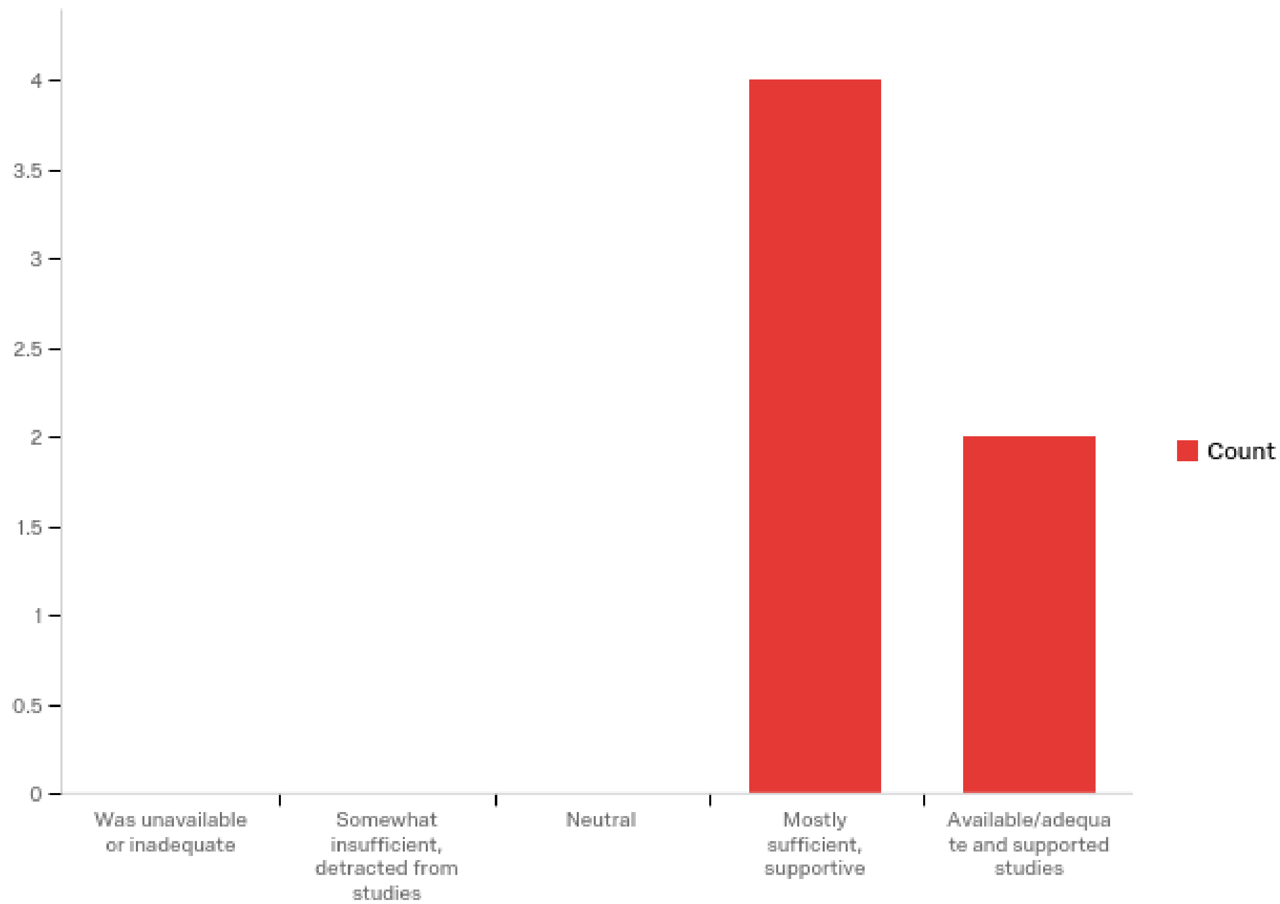
#	Question	Was unavailable or inadequate		Somewhat insufficient, detracted from studies		Neutral		Mostly sufficient, supportive		Available/adequate and supported studies		Total
1	Quality of Instruction	0.0%	0	0.0%	0	16.7%	1	50.0%	3	33.3%	2	6
2	Course Availability	0.0%	0	0.0%	0	0.0%	0	66.7%	4	33.3%	2	6
3	Administrative Support	0.0%	0	0.0%	0	16.7%	1	33.3%	2	50.0%	3	6
4	Degree Planning	0.0%	0	0.0%	0	16.7%	1	50.0%	3	33.3%	2	6
5	Graduate Program Advising	0.0%	0	0.0%	0	0.0%	0	33.3%	2	66.7%	4	6
6	Research Advising & Mentorship	0.0%	0	0.0%	0	0.0%	0	0.0%	0	100.0%	6	6
7	Financial Support Availability (Financial Aid, Stipends, etc.)	33.3%	2	66.7%	4	0.0%	0	0.0%	0	0.0%	0	6
8	Research Consumables Availability (chemicals and related small items)	0.0%	0	0.0%	0	33.3%	2	50.0%	3	16.7%	1	6
9	Research Equipment	0.0%	0	0.0%	0	0.0%	0	50.0%	3	50.0%	3	6

	Availability											
10	Availability of Travel Funds	0.0%	0	60.0%	3	20.0%	1	20.0%	1	0.0%	0	5
11	Access to Faculty	0.0%	0	0.0%	0	0.0%	0	33.3%	2	66.7%	4	6
12	Opportunities to develop communication skills	0.0%	0	0.0%	0	16.7%	1	33.3%	2	50.0%	3	6
13	Opportunities to develop research skills	0.0%	0	0.0%	0	0.0%	0	33.3%	2	66.7%	4	6
14	Office of Financial Aid	16.7%	1	33.3%	2	33.3%	2	16.7%	1	0.0%	0	6
15	Enrollment	0.0%	0	16.7%	1	33.3%	2	33.3%	2	16.7%	1	6
16	Office of Admissions	0.0%	0	0.0%	0	50.0%	3	16.7%	1	33.3%	2	6
17	Registrar	0.0%	0	0.0%	0	50.0%	3	16.7%	1	33.3%	2	6
18	Office of Graduate Studies	0.0%	0	16.7%	1	33.3%	2	16.7%	1	33.3%	2	6
19	College of Science and Engineering Technology	0.0%	0	16.7%	1	33.3%	2	16.7%	1	33.3%	2	6
20	Availability of Housing	0.0%	0	20.0%	1	40.0%	2	40.0%	2	0.0%	0	5
21	Availability of Parking	0.0%	0	0.0%	0	66.7%	4	33.3%	2	0.0%	0	6
22	Opportunities to interact with students from outside the department	0.0%	0	0.0%	0	83.3%	5	16.7%	1	0.0%	0	6

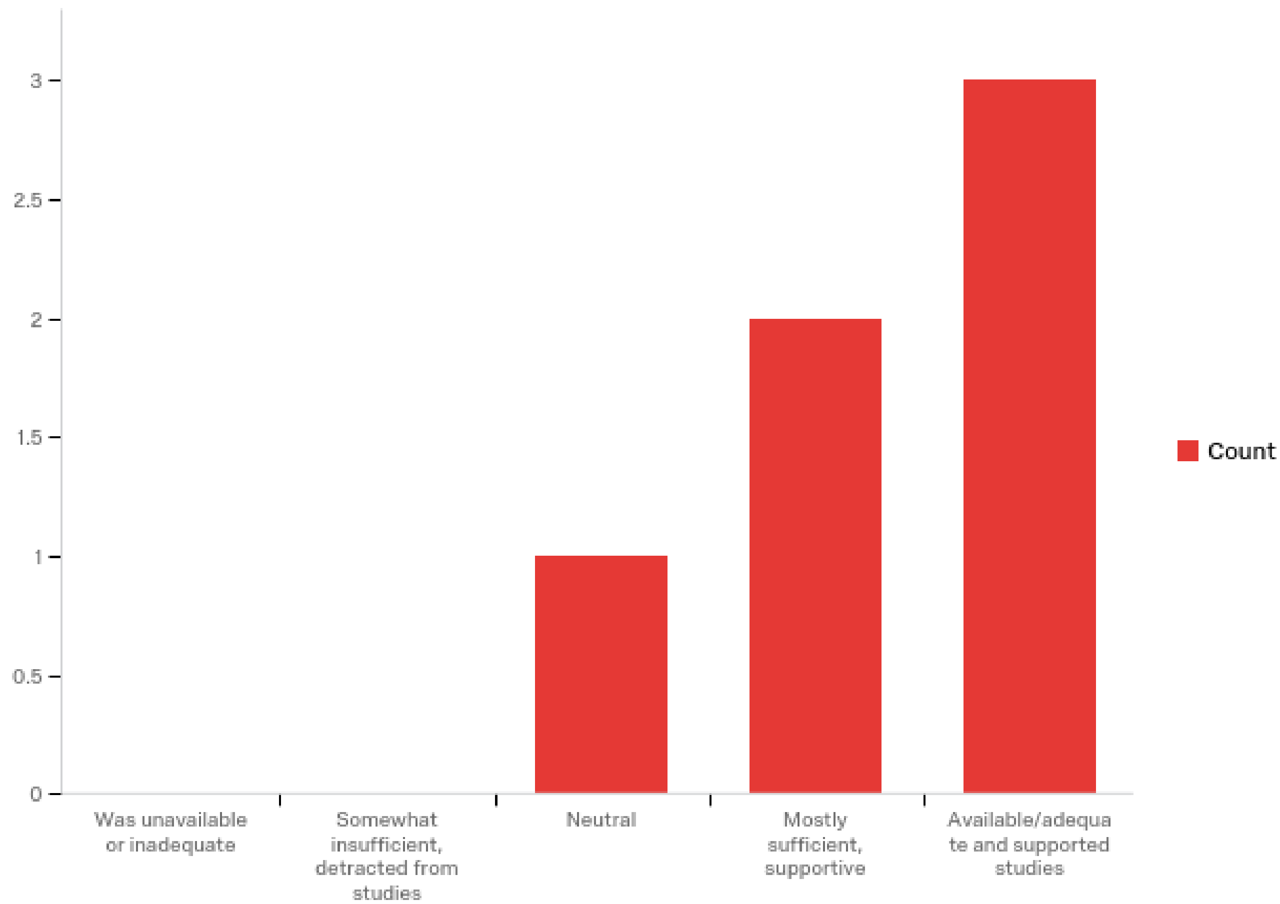
23	Service/Volunteer opportunities	0.0%	0	0.0%	0	100.0%	5	0.0%	0	0.0%	0	5



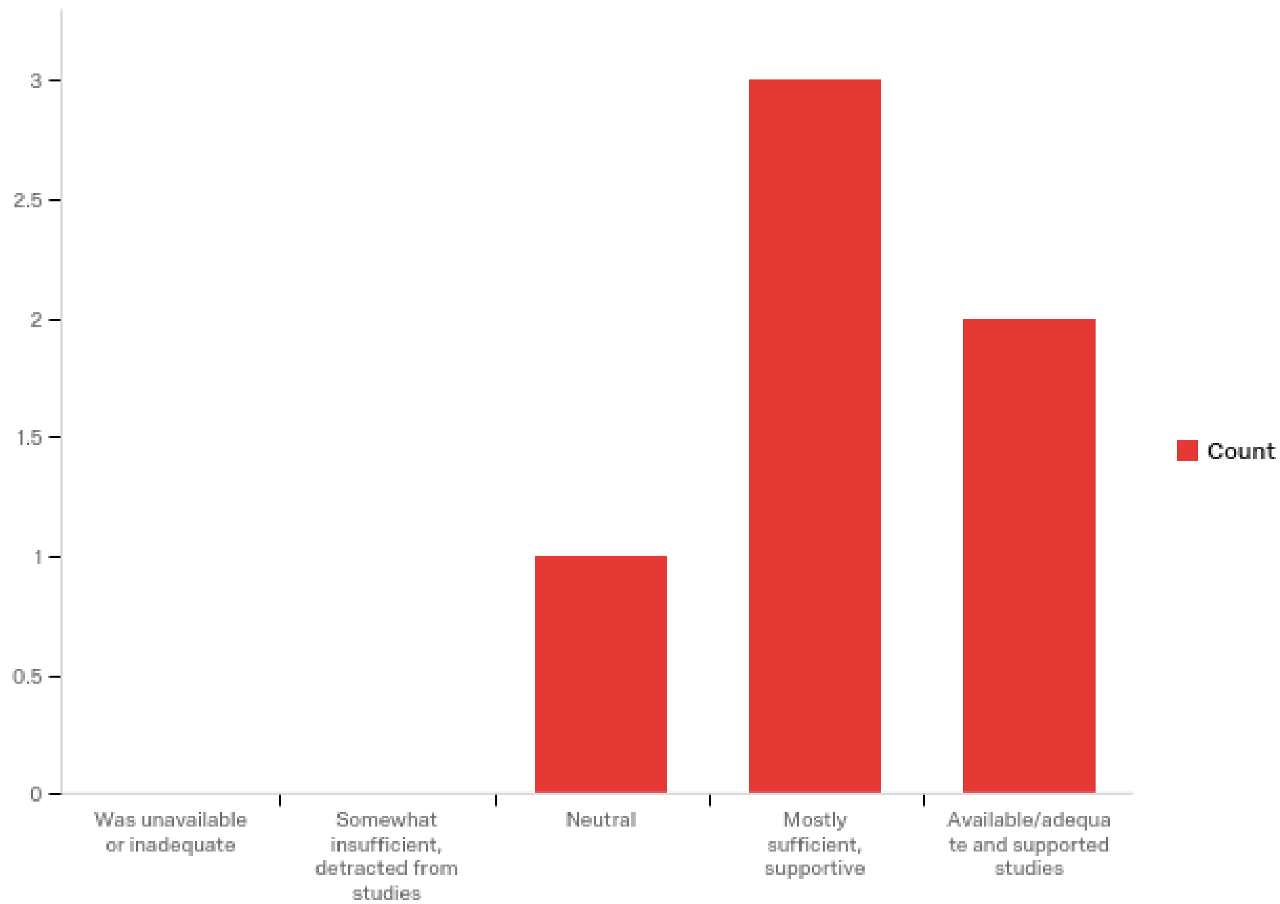
Q2_2 - Course Availability



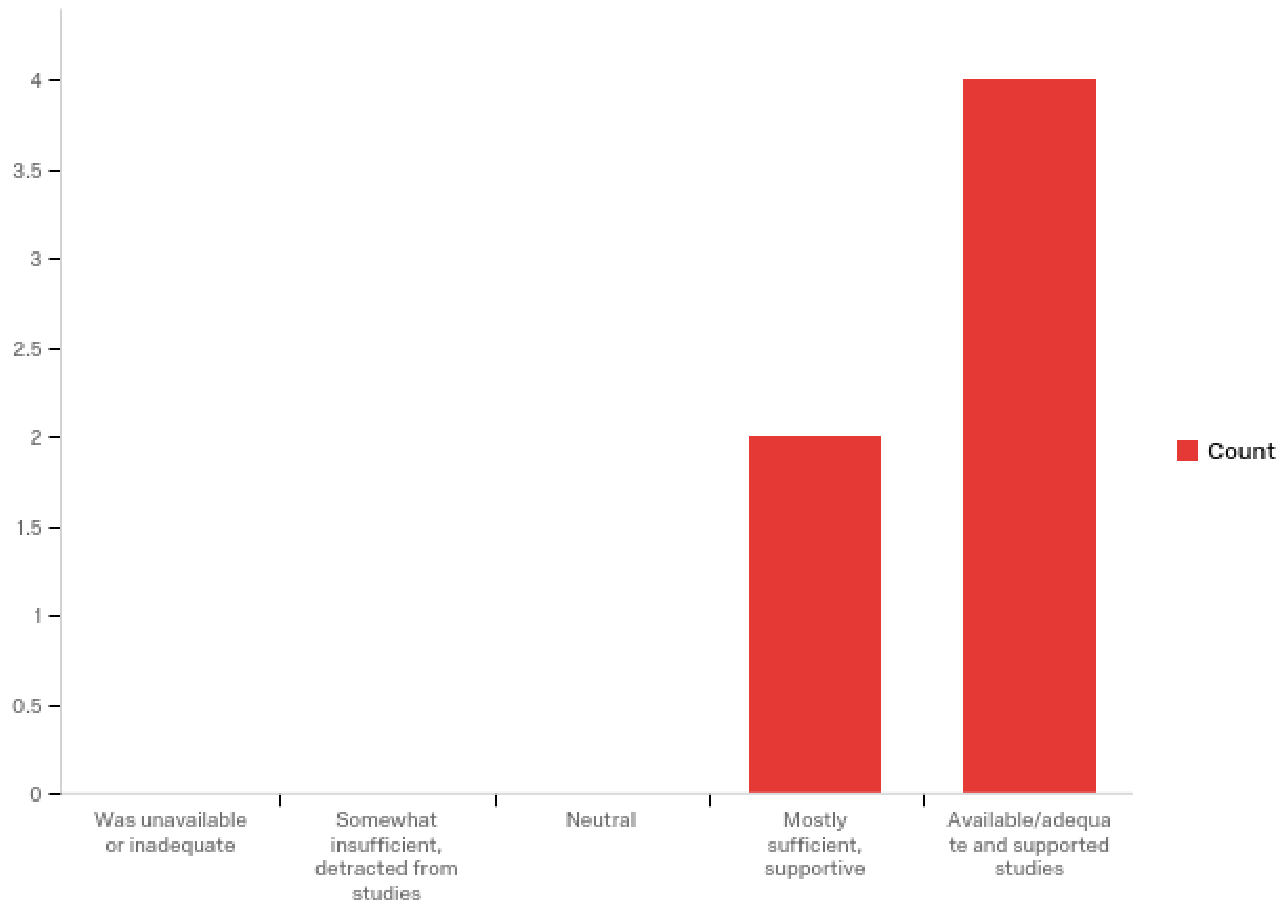
Q2_3 - Administrative Support



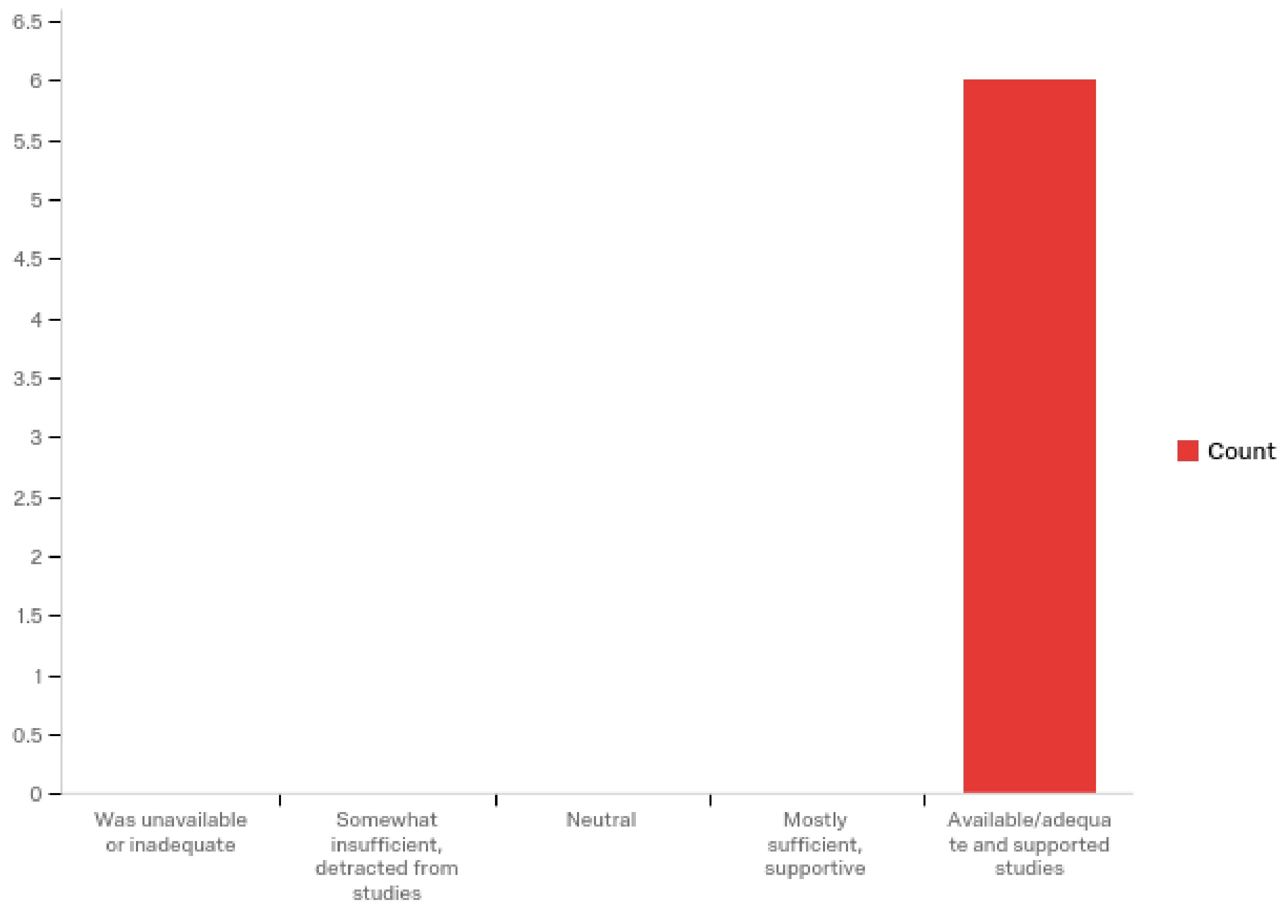
Q2_4 - Degree Planning



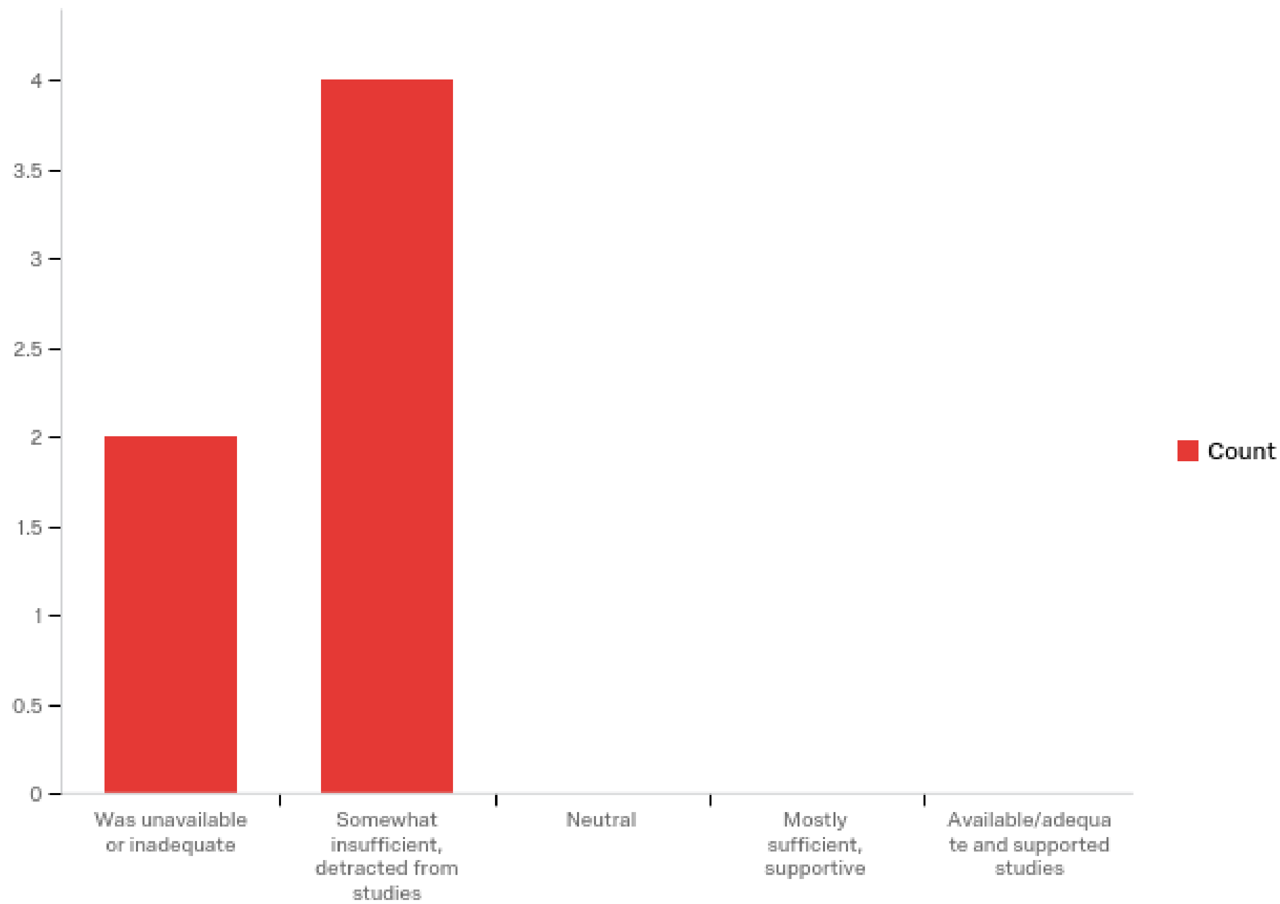
Q2_5 - Graduate Program Advising

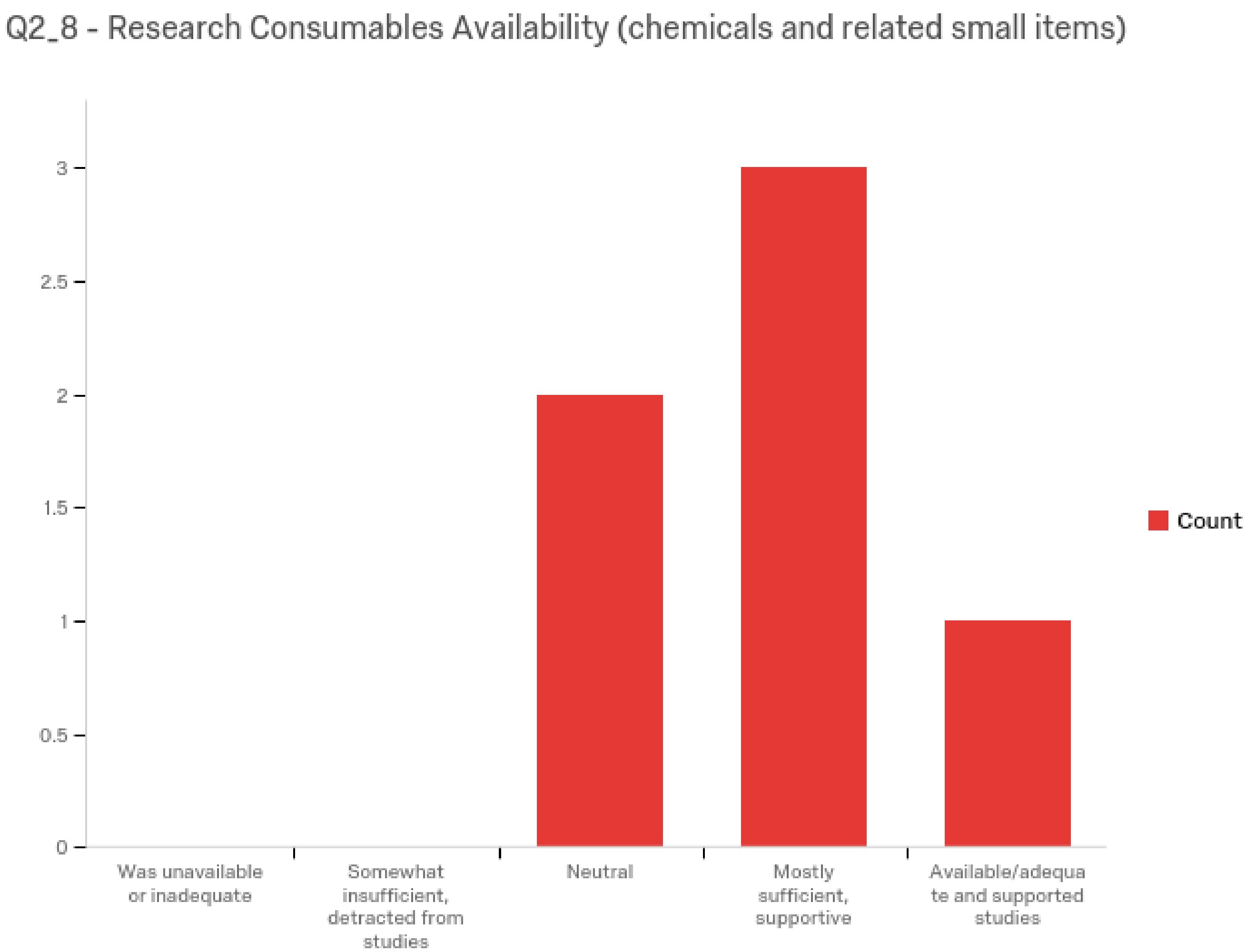


Q2_6 - Research Advising & Mentorship

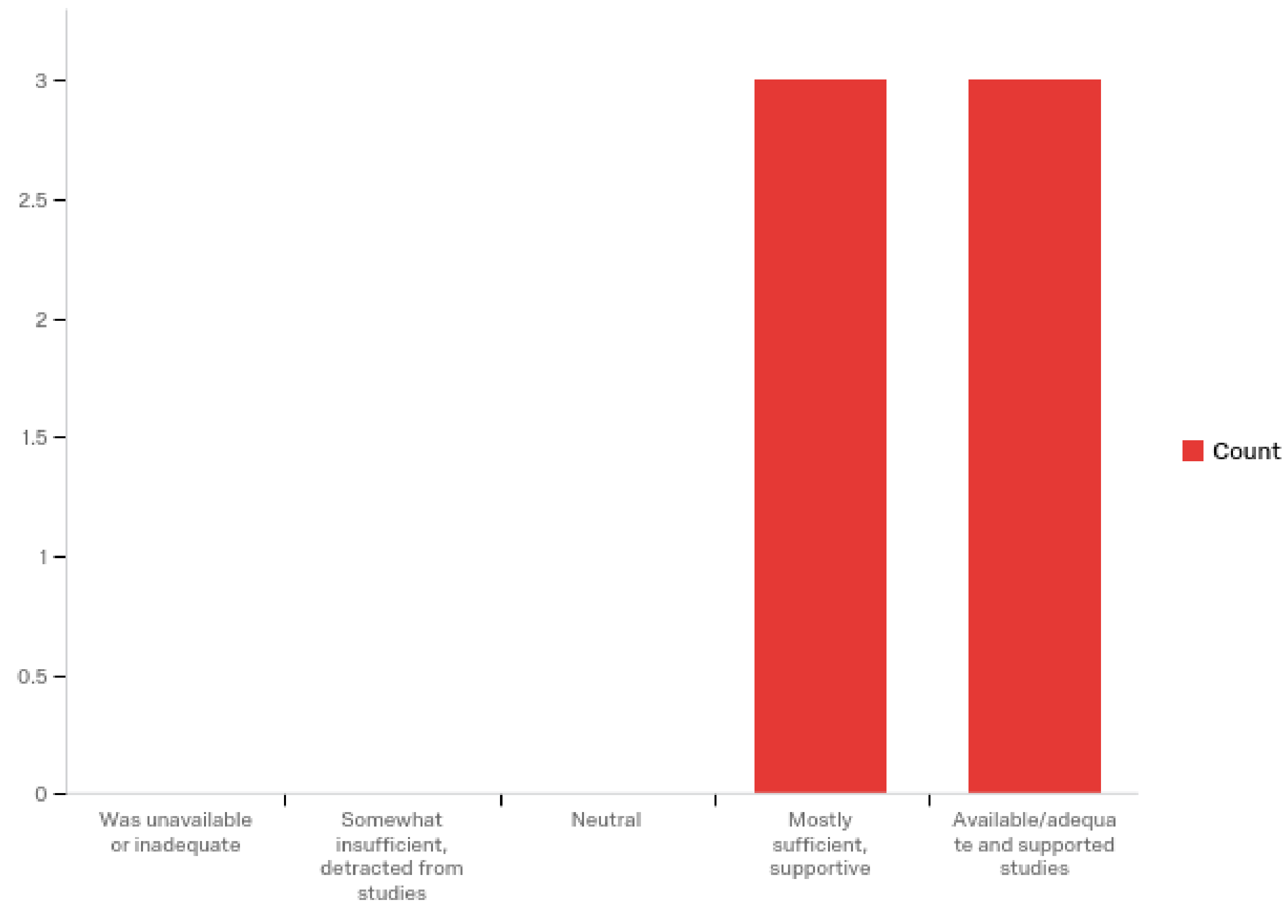


Q2_7 - Financial Support Availability (Financial Aid, Stipends, etc.)

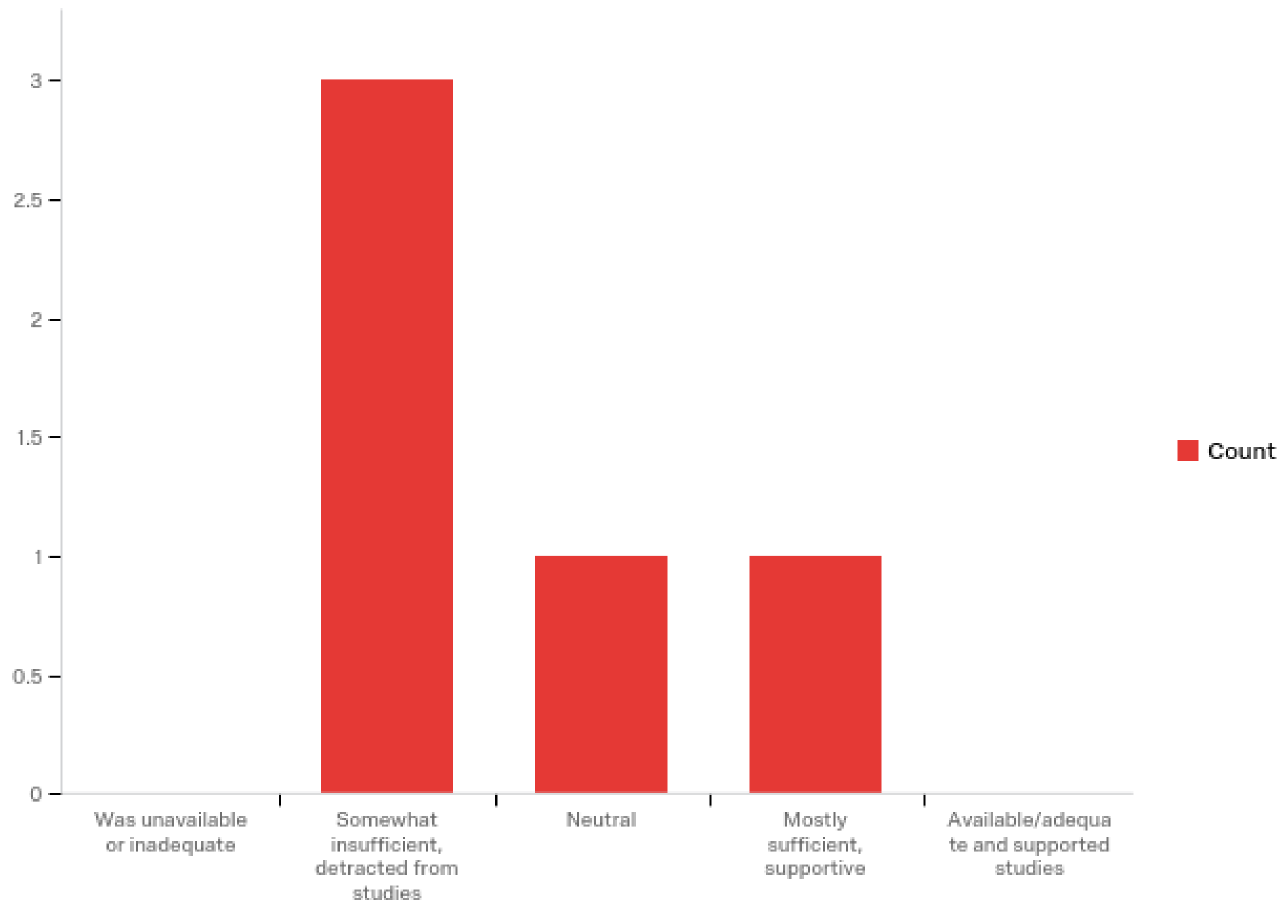



Q2_8 - Research Consumables Availability (chemicals and related small items)
3
2.5
2
1.5
1
0.5
0
Was unavailable or inadequate
Somewhat insufficient, detracted from studies
Neutral
Mostly sufficient, supportive
Available/adequate and supported studies
Count

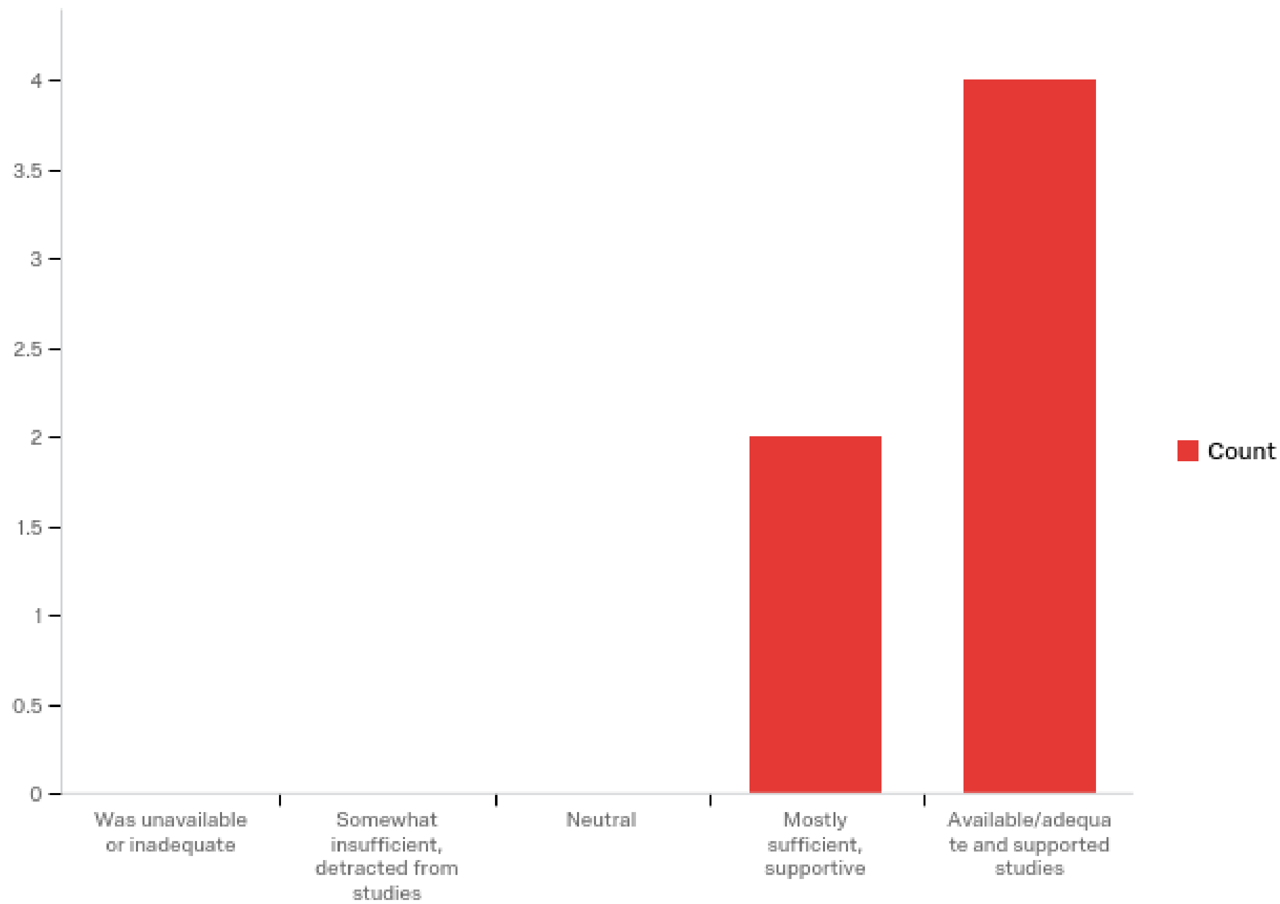
Q2_9 - Research Equipment Availability



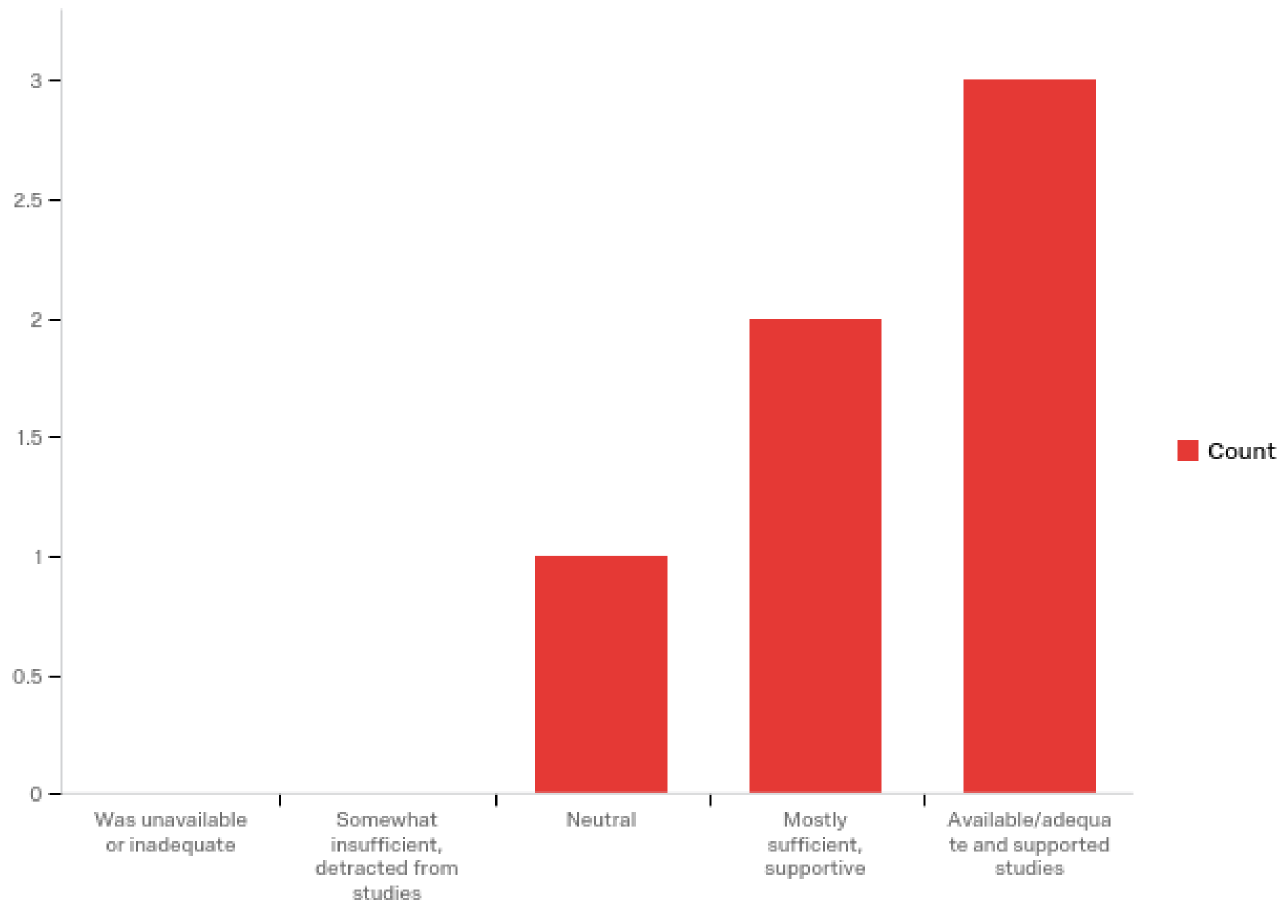
Q2_10 - Availability of Travel Funds



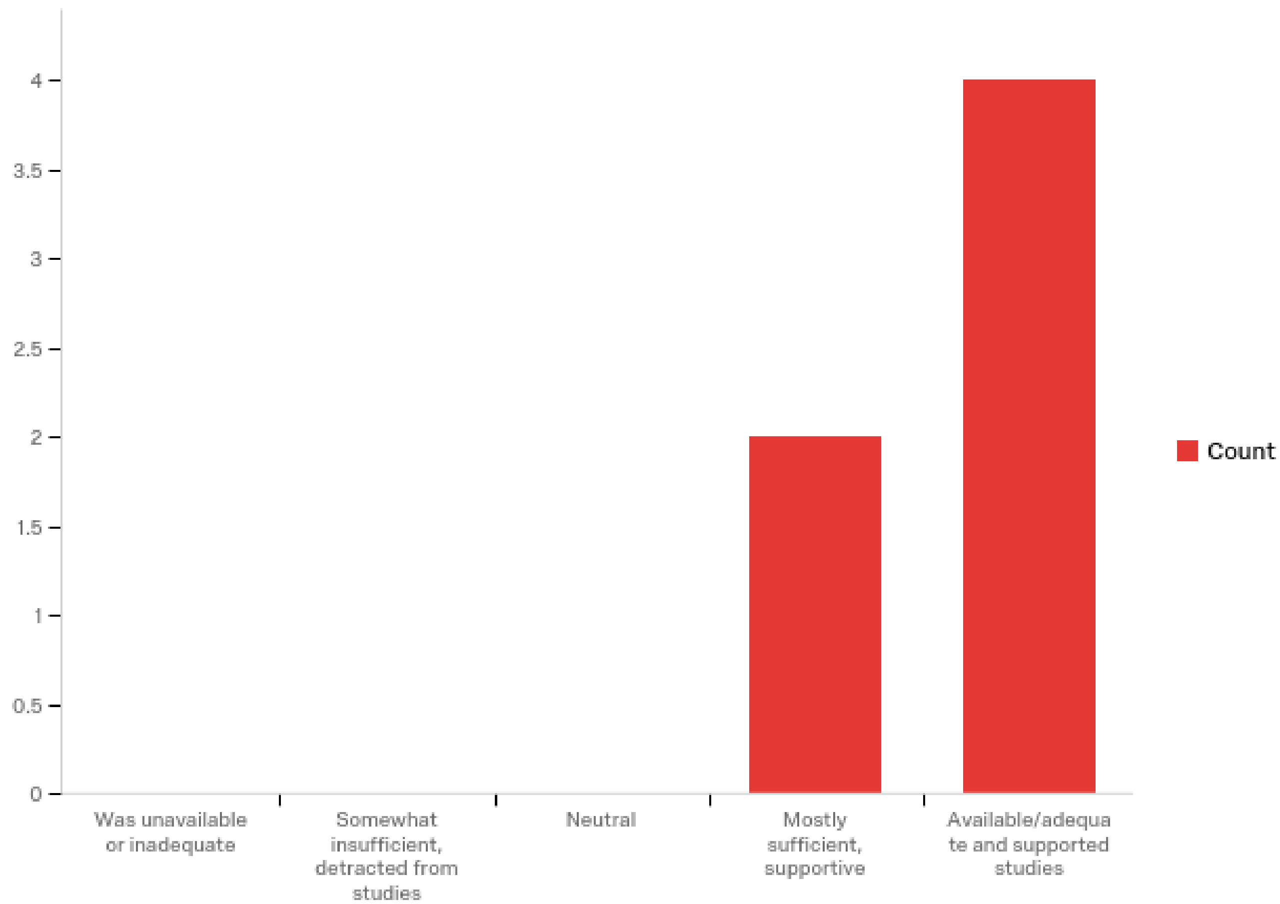
Q2_11 - Access to Faculty



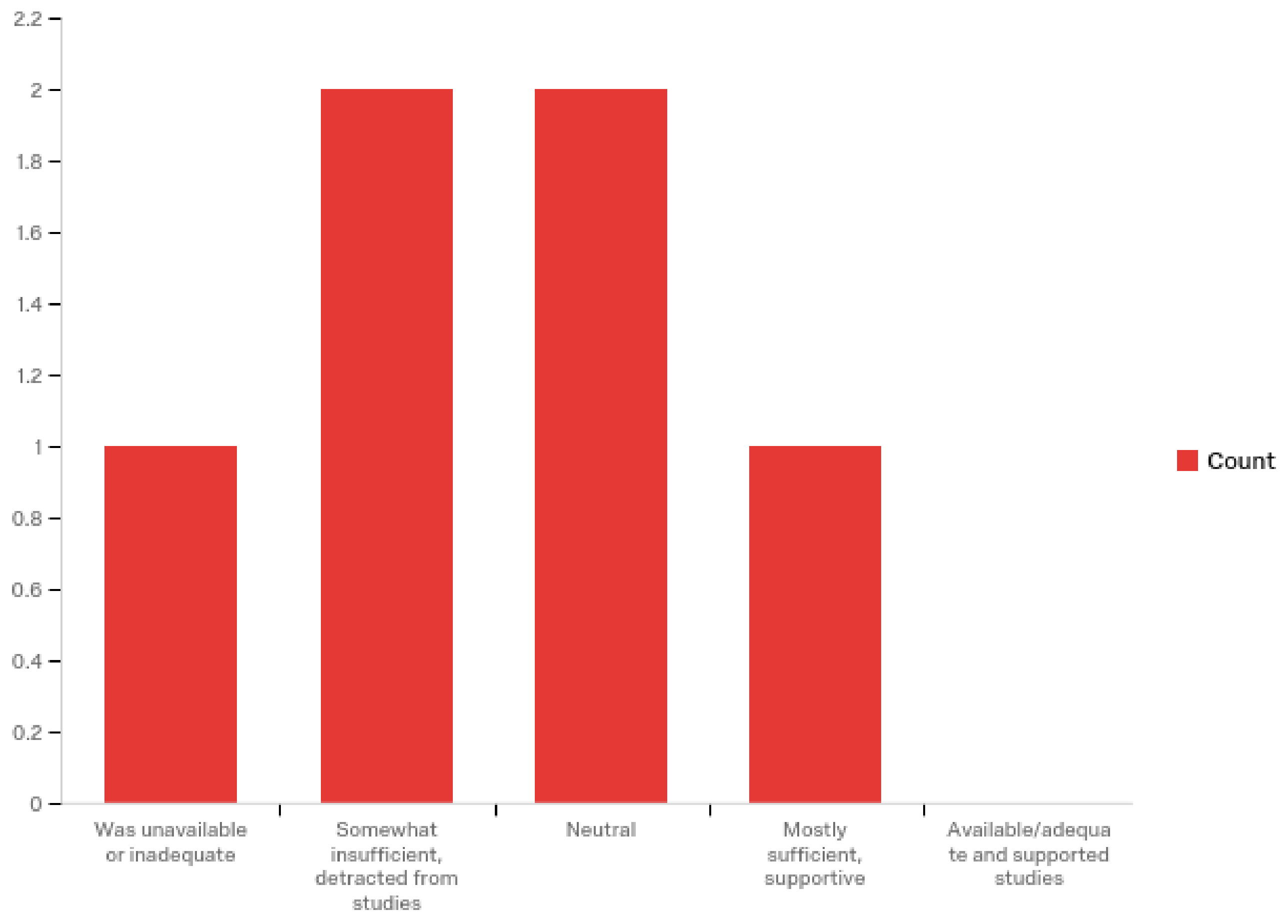
Q2_12 - Opportunities to develop communication skills



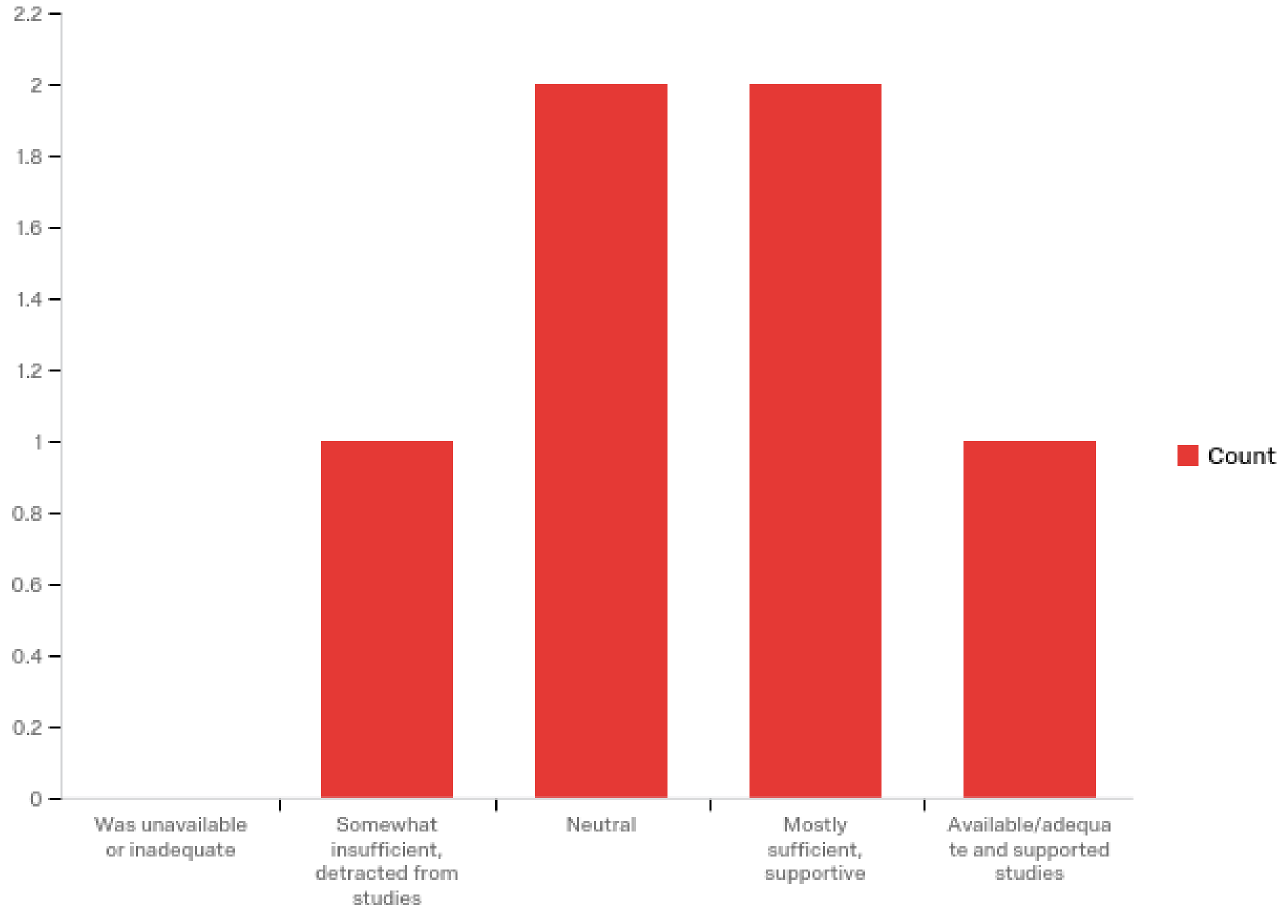
Q2_13 - Opportunities to develop research skills



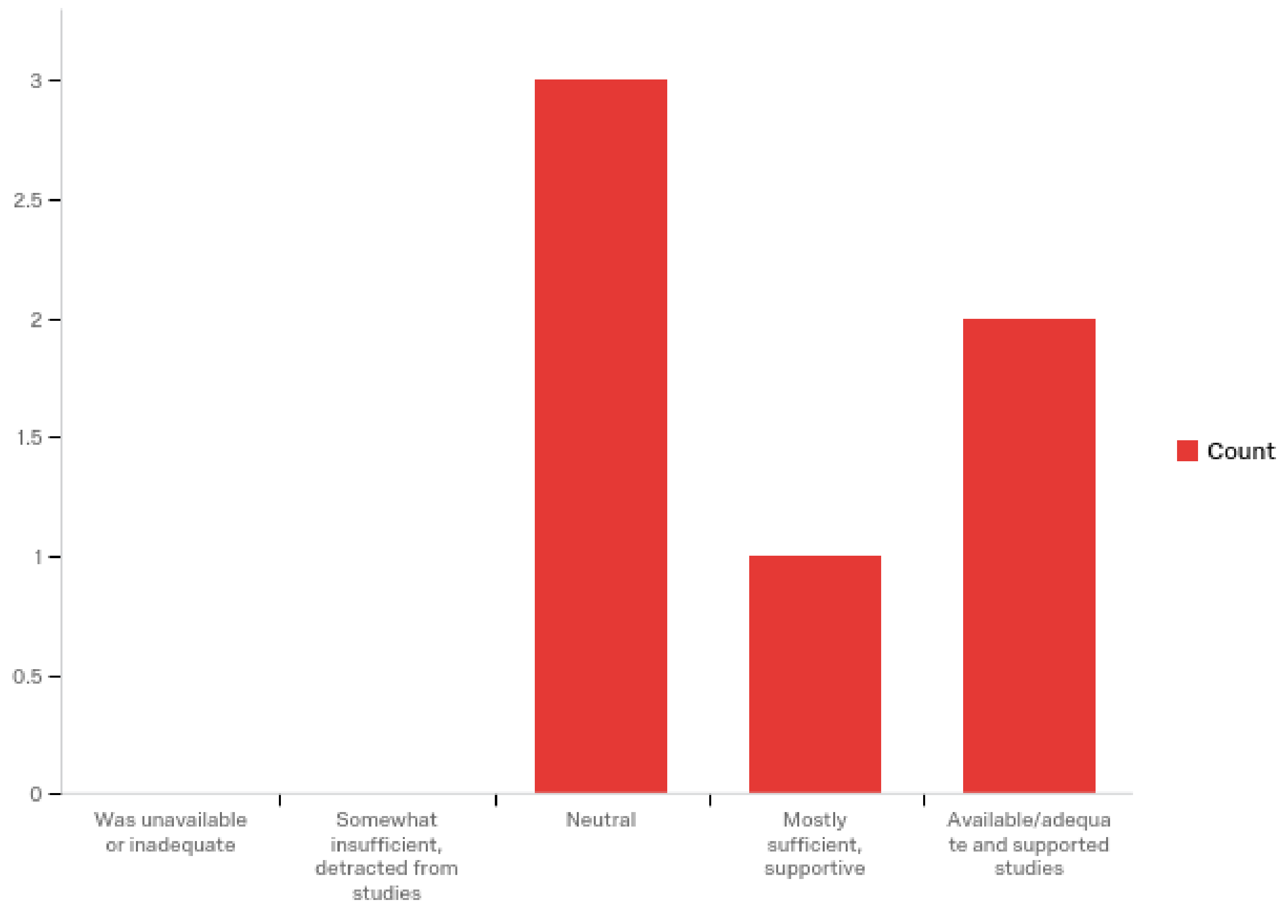
Q2_14 - Office of Financial Aid



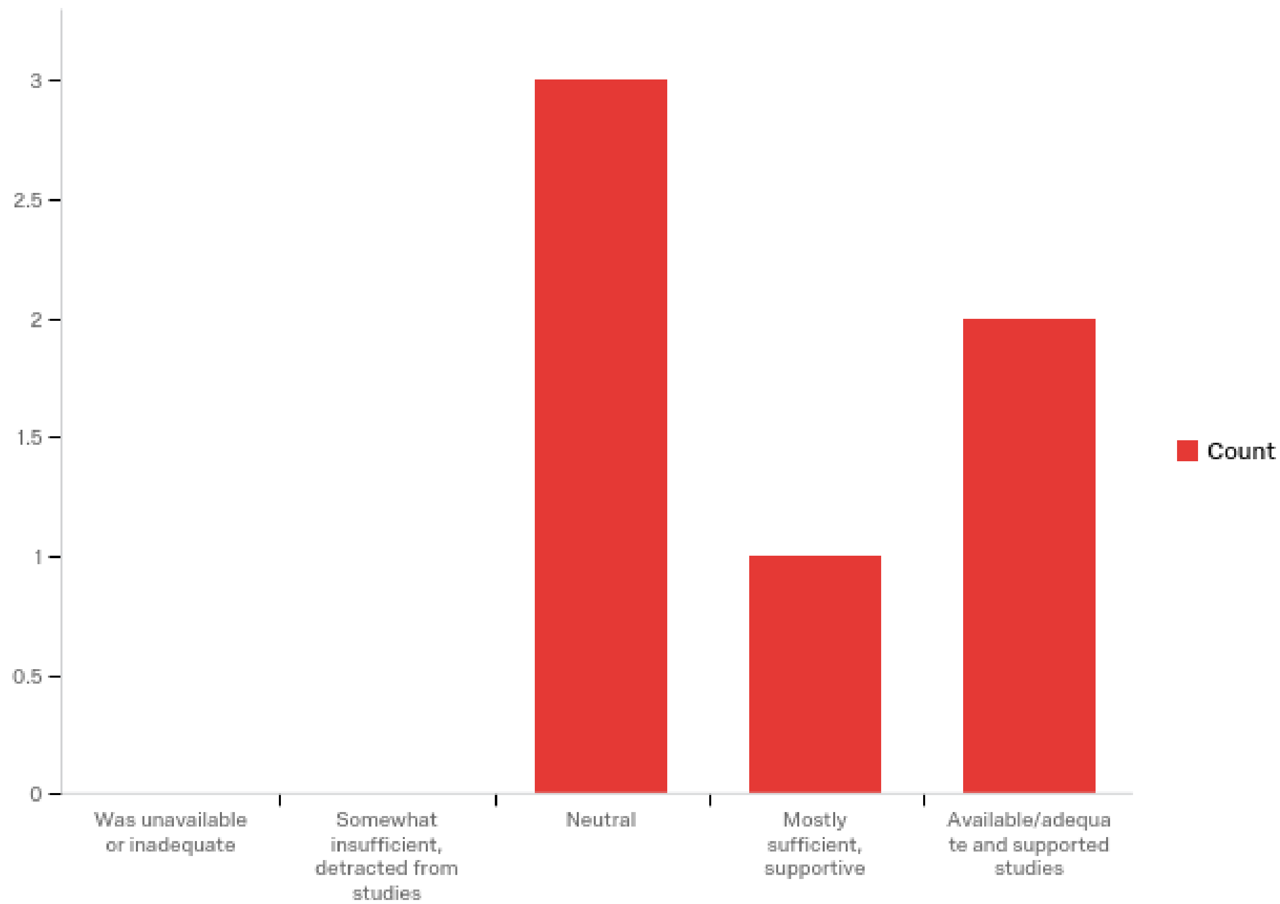
Q2_15 - Enrollment



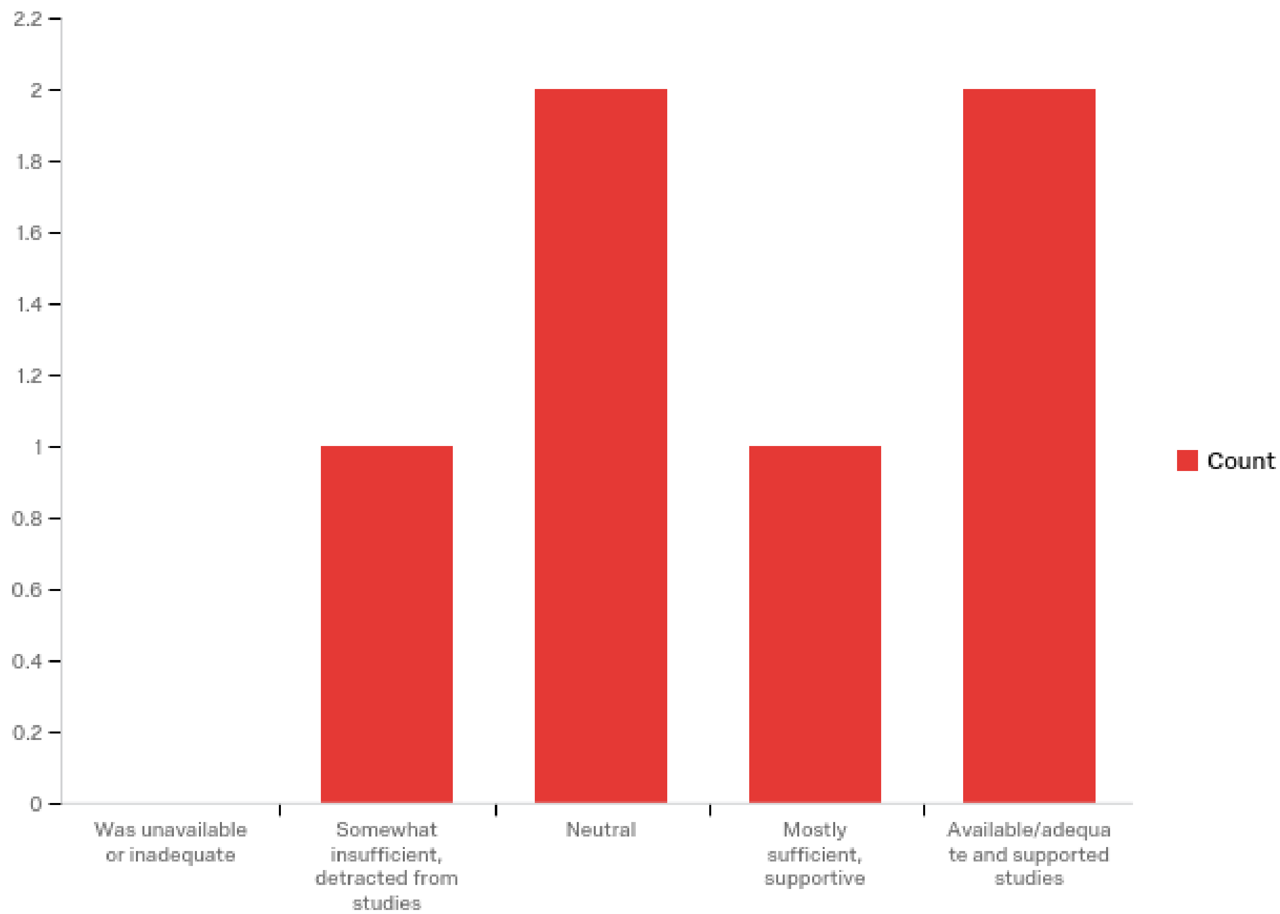
Q2_16 - Office of Admissions



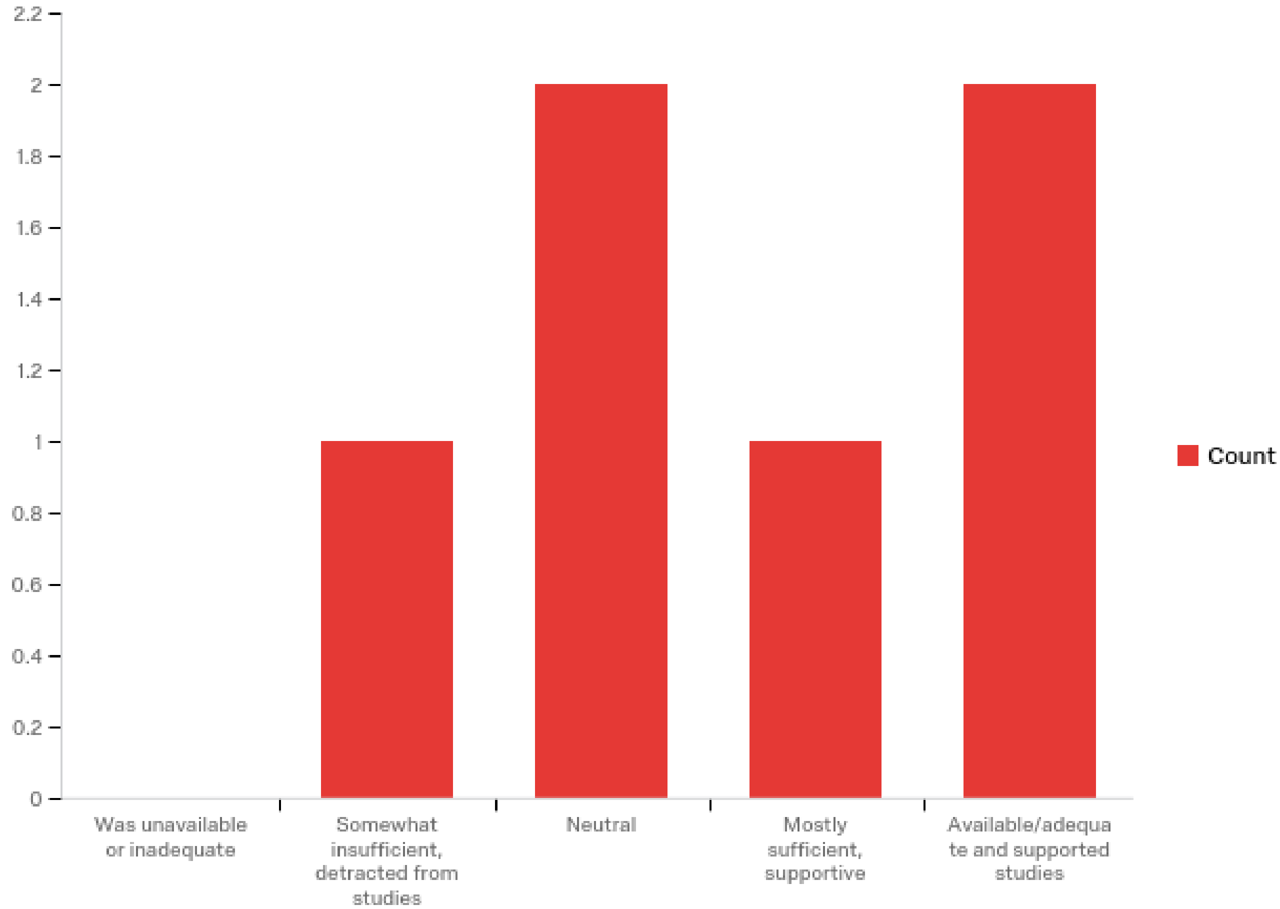
Q2_17 - Registrar



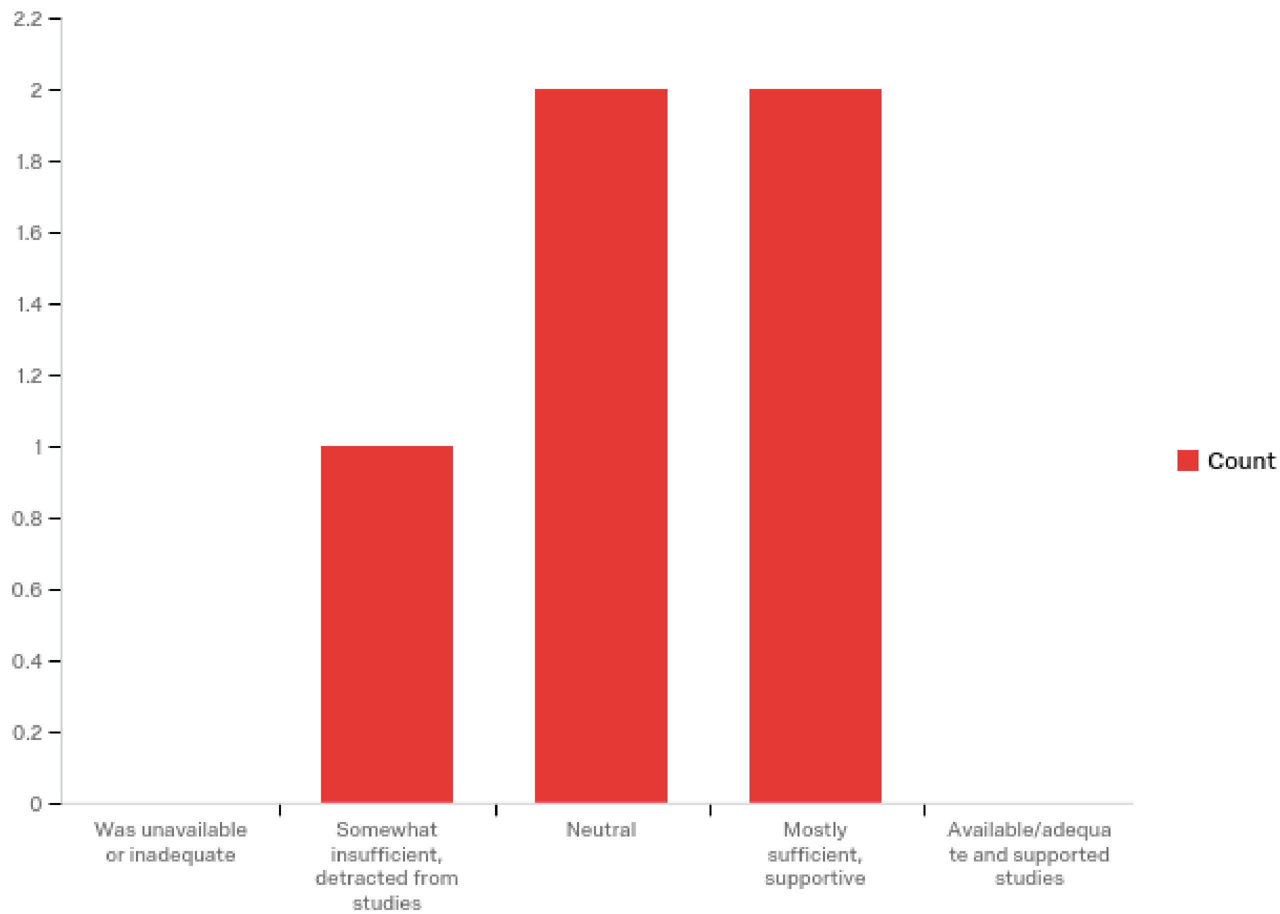
Q2_18 - Office of Graduate Studies



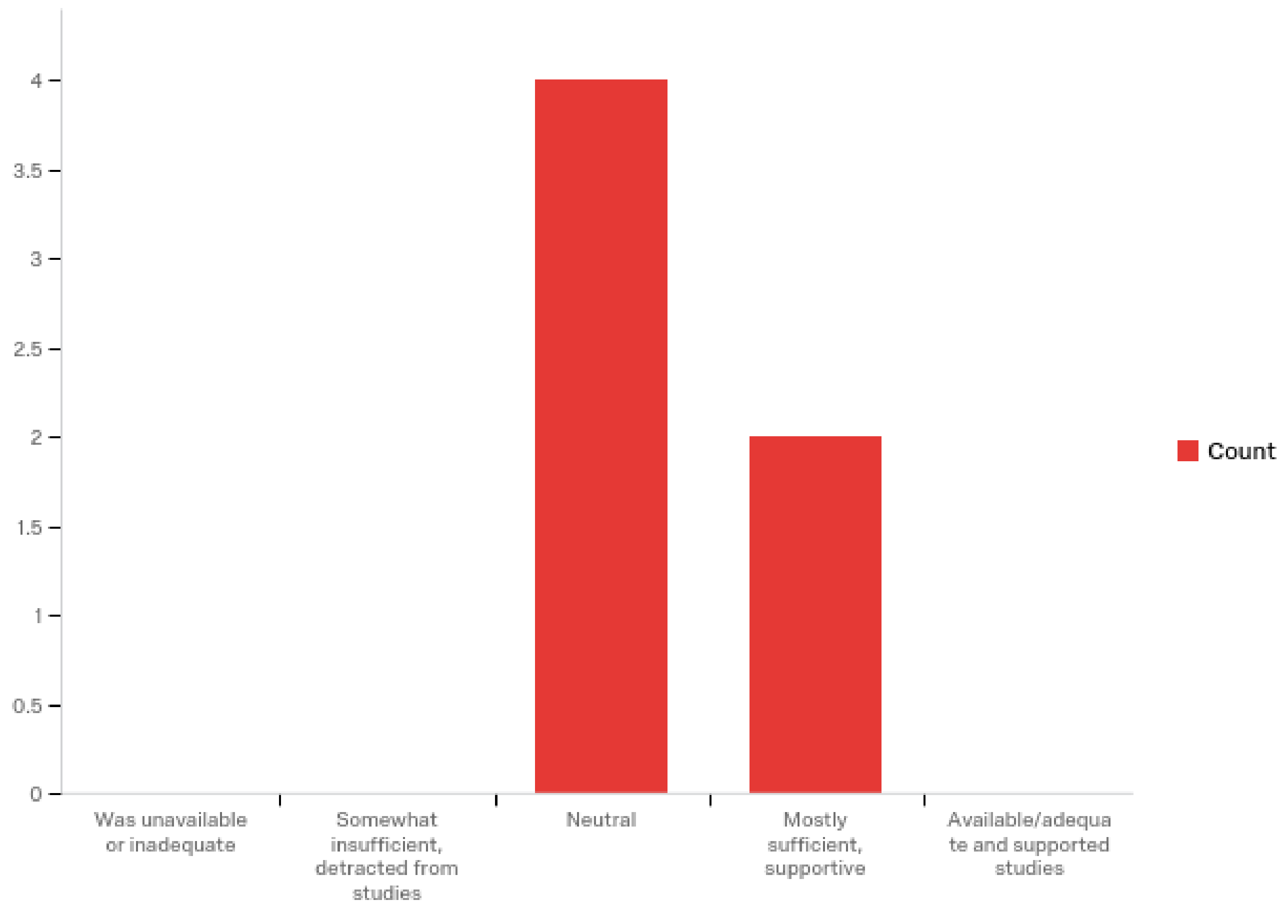
Q2_19 - College of Science and Engineering Technology



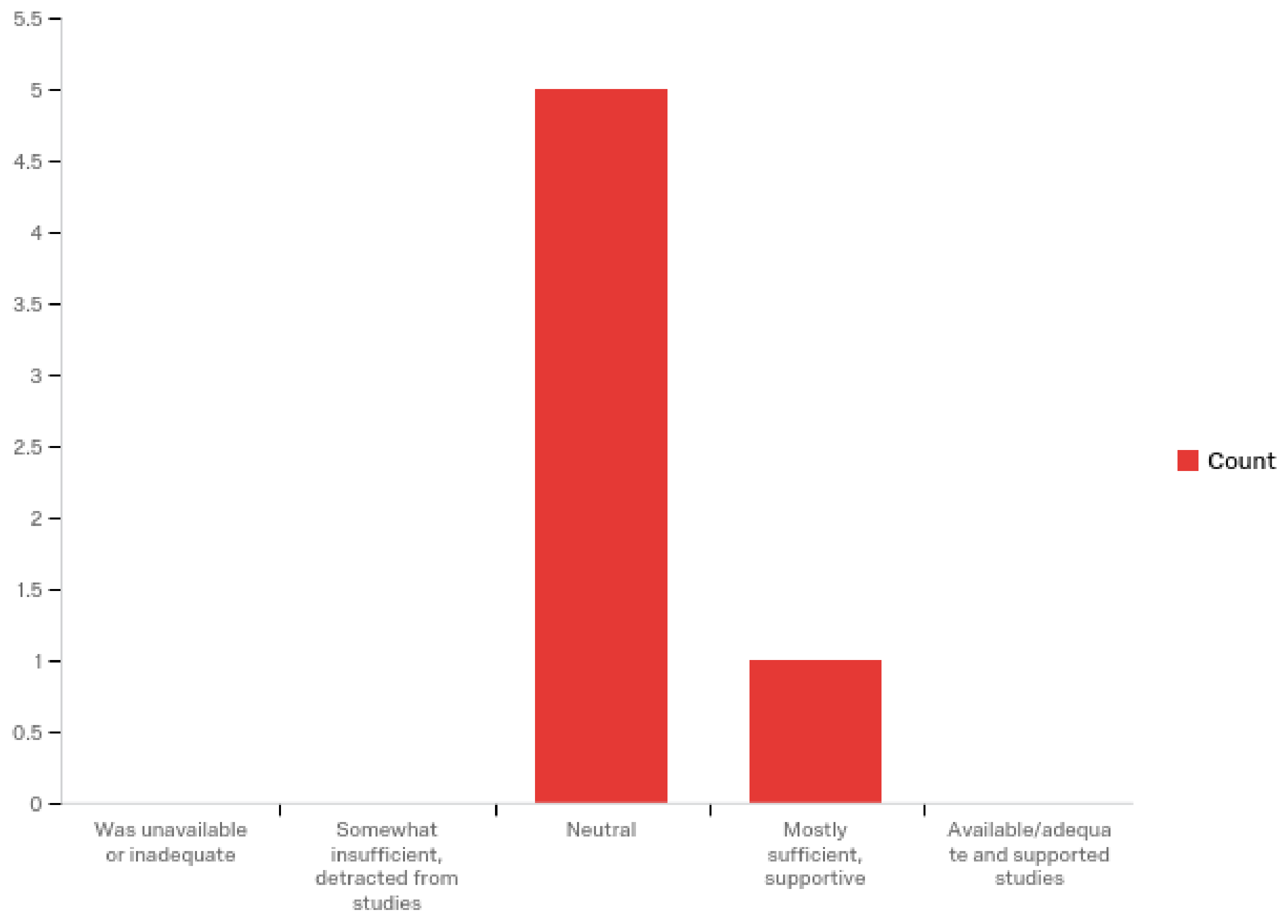
Q2_20 - Availability of Housing



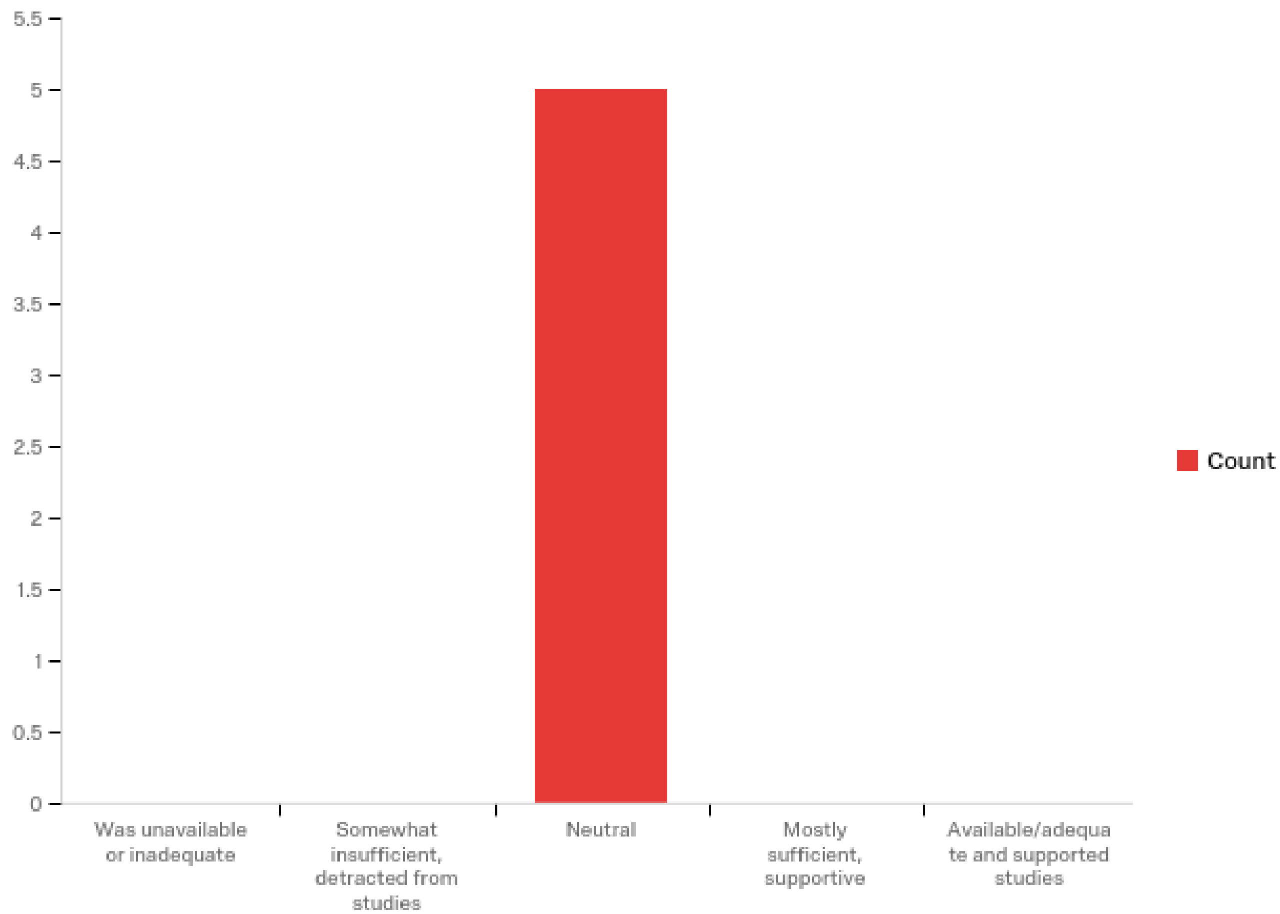
Q2_21 - Availability of Parking



Q2_22 - Opportunities to interact with students from outside the department



Q2_23 - Service/Volunteer opportunities



Q6 - Please provide any additional feedback you may have for the department.

Please provide any additional feedback you may have for the department.
Overall the Chemistry Graduate Program is good enough for our future studies but I would be interested if we had any courses on professional aspects, how to apply for the various Grad schools, ways to improve our CVs, how to write an attractive SOP when applying for PhD programs, advising on which schools to apply for, guide us with the applications, etc. Being prospective PhD students, I think these information and support is very much needed and it will be very helpful if the department can provide a guidance in this regard!
I really appreciate the support form the faculty of department of chemistry. They really do a great job to give good knowledge on subjects and research skills to their students.

Date: 15 April 2018

To: Dr. Ken Hendrickson, Dean of the Graduate College; Dr. Rick Norman, Chemistry Department Chair; Dr. Donovan Haines, Chemistry Graduate Coordinator; Dr. John Pascarella, Dean of the College of Science & Engineering Technology; Dr. Richard Eglsaer, Provost & Vice President for Academic Affairs

Re: Review of the MS Chemistry Program in the SHSU Department of Chemistry

From: External Reviewer: Dr. Bryan Breyfogle, Department Head, Chemistry, Missouri State University

Summary

Program Strengths

The department is, in general, in good shape. It has a strong curriculum, dedicated, collegial, and productive faculty from all ranks. The faculty provides a good mix of expertise in all of the core areas of chemistry along with some assorted expertise in other more niche areas of research and teaching. The department is housed in a modern building with sufficient teaching and research lab space presently, although it will likely be constrained by the space for any significant enrollment increases in its programs or at SHSU in general. The chemistry department has some support staff, including an administrative assistant and stockroom manager. The department has a wide range of instrumentation, and a small but strong group of graduate students. It is apparent from my site visit and from the alumni survey done by the department that MS students are overall very satisfied with the academic quality of the MS program and the mentoring received by the faculty.

The department has access to additional instrumentation via TRIES (Texas Research Institute for Environmental Studies) where students are also able to gain valuable and marketable experience. Additionally, the department has access to a very unique resource through STAFS (Southeast Texas Applied Forensic Science Facility), one of the nation's few body farms at which departmental faculty are able to carry out collaborative/applied forensic chemistry research.

Program Challenges/Weaknesses

- Over reliance on International graduate students from one region—Sri Lanka, which leaves the program exposed to fluctuations due to Sri Lankan, U.S., and Global politics
- Currently a low number of graduate students in the programs, and almost no domestic students
- Faculty diversity: it appeared that 9 out of 12 faculty are white males and only 1 female faculty member, whereas most of the MS candidates were female
- Student dissatisfaction with the graduate stipend
- Net amount of money going to graduate students (stipend – tuition) is way too low to be competitive for recruiting a sufficient number of quality MS candidates
- Instrument maintenance: Some of the instruments are old (NMR and some others) or seemed to be in disrepair (gel electrophoresis)

Further information, including suggestions to address these challenges, are given in the report that follows which will follow the format of the MS Chemistry Graduate Program Review Self-Study Report to aid in clarity as to the areas to which the recommendations apply.

I. Program Profile

The self-study report did a fine job outlining the mission of the program, its alignment with the SHSU strategic plan, and the history of the program. I don't have a lot to add/comment on those aspects of the report.

Regarding program demographics, it was my impression that the department currently has an over-reliance on International MS candidates, especially from Sri Lanka. This may be due to the net stipend (stipend – tuition) being too low to attract students from many other places. This also leaves the program vulnerable to fluctuations in enrollment outside of their control such as the zero new graduate students they experienced this past academic year. In light of a significant drop in international student applications to all U.S. graduate programs due to political reasons, this result isn't completely unexpected but is troubling nonetheless. It can be seen that in past years, when the net stipend was better due to lower tuition that the department fared better in recruiting quality graduate students to the program. This does provide an excellent faculty:student ratio, but obviously the program needs 12-15 graduate students enrolled at any given time to remain fully viable.

II. Program Administration

The self-study clearly outlines the administrative processes and policies. My only recommendation would be for the department to consider having a graduate committee if one doesn't already exist—it's not obvious in the report if such a committee exists. This committee could be chaired by the graduate coordinator and assist him and the department head in reviewing graduate applications and policies, curriculum issues, and course offerings. The graduate coordinator and chair would be ex officio members along with at least 2 faculty from different ranks/disciplines within chemistry.

There was concern in the self-study regarding the faculty instructional workload policy, especially as it applies to MS vs PhD level courses and multi-section laboratories taught by faculty. I agree with their concerns and suggest the following:

- MS level FTE should be calculated in between that of BS and PhD. That is, if a 3-hr BS level course is 0.25 FTE and a PhD course is 0.50 FTE, then a MS-level course should be 0.375 FTE.
- Instead of concerning themselves with multi-section labs (mainly general and organic) for faculty, I recommend the department hire a full-time lab coordinator with an MS degree to handle this instructional load.

In meeting with the graduate students, it was my perception that they were being asked to teach a fairly heavy teaching load with 8-9 hours of actual lab instruction towards their 20-hr work expectation. This does not include, preparation for lab, grading of lab reports, office hours, tutoring, and any potential stockroom-associated duties they might have. I'm not sure if this is a result of a small number of graduate students or if it is usual policy. The main concern here is that assigning too much workload to graduate students typically results in delayed completion of the MS thesis and degree. Overall however, it appears the department is graduating the MS candidates within a reasonable timeframe and at a very high rate of successful completion. The department should be commended for this performance indicator. This also indicates that policies on thesis committee formation, research expectations, thesis writing, etc. are working reasonably well. If not, the success rate for MS candidates would likely be considerably lower than what it is.

III. Curriculum

Description of Curriculum and Curriculum Changes

The curriculum was well described in the self-study and by the faculty during my visit. The amount of course offerings and the required variety within the 5 core areas of chemistry is appropriate for a program of its size.

Changes to the graduate curriculum are primarily a result in changes of the expertise in graduate faculty during retirements and subsequent hires. This is also quite typical and necessary for MS Chemistry programs similar in size.

Appropriateness of Curriculum

The curriculum is mainly traditional in the 5 core areas of chemistry (analytical, biochemistry, inorganic, organic, and physical) with a decent variety within that mix. I have two constructive criticisms in this area:

1. With there only being one course in analytical chemistry, I do not see where chromatography/separations is being covered. Possibly this is just an oversight in the course description, but I would suggest adding another analytical course that covers separations/chromatography if it's not covered extensively elsewhere. This would seem especially appropriate given the extent to which it is used in forensic chemistry.
2. Although it is listed as a potential special topics area, there is no regularly scheduled course in environmental chemistry. Since this will likely continue to be a growth area in chemistry, much like biochemistry, I'd suggest considering making one environmental chemistry course (possibly interdisciplinary within analytical chemistry to the curriculum).

Description of Comprehensive Exams and Thesis Process

This appears to be consistent with what most graduate programs in chemistry do regarding a comprehensive exam and thesis defense. The prospectus requirement for the thesis is likely good to get the committee on board with the student's project and to get the student thinking about the writing process of their thesis research, something that often gets put off until too late in the process. Although faculty commented that this early deadline of one semester before defense is often difficult to achieve, I would recommend keeping this requirement in place.

Accreditation, Quality of Instruction, and Online Course Offerings

SHSU is accredited by SACS and the undergraduate in Chemistry is ACS-approved (ACS doesn't approve graduate programs). The teacher ratings provided under Quality of Instruction are very high. At first glance I found these a bit questionable, wondering if content rigor is what it should be. Based on my visit with the department's graduate students and its faculty, I think teaching likely is a strength of this department. While I have no direct evidence of that, the graduate students spoke very highly of the faculty, and I was impressed with the faculty's level of knowledge and apparent dedication to teaching and research mentoring. Lastly, the department doesn't offer any online courses—not surprising at the graduate level, but I am somewhat surprised there isn't a general education undergrad class online.

IV. Faculty

Credentials

In terms of faculty expertise, the department currently has a good balance of inorganic, organic, analytical, physical, biochemical, and chemical education capabilities with some interdisciplinary (physical organic, bio-organic, organometallic, analytical-environmental) expertise as well. In the future, it looks as if they may need further analytical/environmental expertise judging by the expertise areas listed in this section, so they should be considered in a near future hire. It is difficult for me to predict the other needs as they may be affected by upcoming retirements, of which I have little knowledge.

Faculty Productivity and Teaching Loads

In terms of faculty productivity, teaching loads, service, and research outputs are, on average, similar to or better than those of other master's level only institutions. However, it is not clear to me in the self-study how many of the publications and funded grants are recent, like in the past 5 years when funding has been more difficult to obtain. This would've been useful for me to see to give a better assessment of faculty productivity in those arena.

With regards to teaching loads, faculty do have fairly high teaching loads which is not atypical of MS-only departments, but it does have a direct impact on faculty productivity in the aforementioned areas of research and external funding for research/teaching endeavors.

It might be worth having an internal college-wide workshop where those who have had success in grantsmanship share tricks of the trade with those new to the process. Many of these tricks work across disciplines so that the workshop leaders do not need to be explicitly matched with others submitting to the same disciplinary program. This could be accomplished with a new faculty mentoring program which I would encourage for pre-tenured faculty within the department and college. Sometimes those individuals are hesitant to reach out for such assistance, fearing it may be viewed as a sign of weakness or unpreparedness. I think it is especially important that some sort of mentoring be offered to the new chemistry educator in the department as those within this sub-discipline can often be overlooked and hence feel isolated. Upon talking with that individual, I didn't get the feeling that was necessarily the case, but I do believe he would benefit from some formal mentoring by another science educator.

Diversity

The faculty in the SHSU Chemistry Department do not display a great deal of diversity—racially, gender-wise, or internationally. There are 8 white men and 10 men out of 11 faculty. The department indicated they are attempting to address this in future hires and indeed the 2 most recent hires had diverse backgrounds if I'm understanding the data I was supplied correctly and based upon my own observations during my visit. Since the majority of the department's graduate students are International and a number I observed were female, I would encourage the department to do their best to attempt to make gains in the diversity of its faculty. This is not easily accomplished in the short term so it should be more of a long term goal.

Faculty Program Responsibilities

For the most part, the graduate faculty share the workload equitably with regards to MS thesis advising, with the normal exceptions due to student preference, interest area, natural variations within a small sample size, etc. Faculty nearer to retirement in some cases appear to do less thesis advising but serve on a fairly large number of thesis committees. Newer faculty members don't yet have any/many graduate students, which is also to be expected. I encourage the department to ensure that incoming graduate students are steered towards the newer faculty. This low number for new faculty is also a result of the overall very low number of graduate students (6) currently in the program.

V. Students

Admission Criteria

The admissions criteria are typical of public MS-only institutions in terms of GPA, transcript evaluation of international students, TOEFL/IELTS scores, etc. I don't have any additional recommendations here aside from possibly considering requiring letters of recommendation if that is not already being done. Sometimes such letters raise red flags where other items may not. I assume SHSU requires criminal background checks of GAs who will be teaching at the University.

Number of Applicants per Year

The average number of applicants per year of 19 (high 29, low 10) is about what I'd expect for the program. It is not surprising to see the number of applicants drop significantly in 2016 and 2017 considering that numbers of international student applications around the US dropped at that time due to political circumstances surrounding immigration, visas, etc. Due to what I'd consider an over-reliance on International Students and mainly from one country, the low numbers in 2016-17 for SHSU chemistry reveal the flaw in that recruitment strategy. It is recommended that the department develop new strategies to more effectively recruit domestic students, their own undergraduate students, and international students from other countries. This should help to broaden the pool of applicants and leave it less vulnerable to singular issues.

Profile of Admitted Students

As noted in the previous section, the department relies a bit too heavily on international students (over 50% of its students). Aside from that the age and gender demographics are fairly typical.

Student Funding

The stipend for the program is sufficient IF there was a fee/tuition waiver. Due to the fact that I was told the State of Texas does not allow fee waivers for graduate students, I highly recommend a substantial increase in the stipend or the establishment of a monetary fellowship to incoming GAs, such that the net dollars to students (All forms of remuneration – tuition/fees) equals at least $10,000 per year. MS-only Programs I'm familiar with have a net to the students of $10-15K per year and the lower end of that scale is often a source of issues with students. These issues (outside jobs, debt problems, inconsistent housing, etc.) often contribute to lower completion rates and/or student dissatisfaction with the program.

Program Performance Statistics

During the self-study review period of 2011 – 2015, the overall completion rate for the MS program is exceptionally good and the department should be commended for this. A minor criticism is that the 2-year rate is significantly lower than the 3-yr rate and MS programs are nominally 2 year programs. However, the largest percentage of students in the cohorts did complete after 6 semesters (including summers), so this is truly a very minor criticism as it is normal in all graduate programs to have these variations.

The student retention rates are excellent. The post-graduation outcomes for the students are quite good with the vast majority being either employed or in PhD and postdoctoral positions.

The number of publications and presentations is reasonably good with 29 publications and 103 presentations for the total of 38 students. Ideally this number would be one publication per student, but the department's 0.76 publications/student is reasonable while the 2.7 presentations per student is quite good. Based on these numbers, it appears departmental faculty are holding students accountable to produce publishable and presentable results to a reasonable degree.

External Reviewer Interactions with Students During My Campus Visit

I had a chance to meet with 4 of the 6 current graduate students as group for about an hour during my site visit. Overall, the students were satisfied with the program, and especially satisfied with the faculty guidance in both research and coursework. They also spoke favorably of the department's facilities and its support for research, travel to meetings, and just general personal supportiveness of the individual. The main sources of concern to the students were the small program size, the stipend amount in consideration of having to pay tuition, and concern about finishing in a timely manner. All of the students spoke about financial difficulties due to the small net amount the stipend yields upon paying tuition, although they were thankful for being allowed to pay in-state tuition rates.

VI. Departmental Resources and Finances

The department appears to have sufficient budgetary resources for chemicals, consumables, supplies, travel to professional conferences, etc. It was my impression the department is a very good steward of its limited resources. It was also my impression that the department benefits from a decent amount of outside support (Welch Foundation, Friends of Chemistry Account, Scholarship Account, etc.)

The department has 21 assistantships available to it currently at $13,005 per year. This is more assistantships than it needs based on number of MS applicants and amount is considerably too little considering tuition costs approaching $10K. Hence, I very much agree with what I understand will be a substantial increase in the amount of each assistantship while at the same time lowering the overall number of assistantships. This essentially budget neutral solution appears to be several years overdue based upon the information provided to me in the self-study. However, I applaud the administration's recruitment efforts. While I don't recall the number of assistantships the total pool will be divided into, I I would recommend it be somewhere around 12-15 to allow for a net $ amount (remuneration – tuition) of at least $10K/year to each graduate assistant.

Looking at the $8 per student lab fee, I would also recommend that amount be increased substantially. While this depends to some extent on what other sources are available for things like computers, probeware, small instrumentation, etc., $8 is not sufficient to cover consumables for even the general chemistry laboratories, let alone the more expensive advanced courses like biochemistry.

VII. Departmental (and shared) Facilities and Equipment

NOTE: ***There was a mistake in the Self-Study indicating that each full-time tenure-track faculty member had an assigned lab of approximately 1350 ft^2. It was determined during the site visit that this was more like 550 ft^2, so that is the assumption I will make in my comments here.***

The department has sufficient research lab space for its current needs. The department has sufficient teaching lab space for its current enrollment of students. That being said, with even modest levels of growth the department will become space-limited very quickly.

The research labs that I visited are quite modern, housed in an approximately 12-year old building from what I recall. It is nice that there is graduate student seating (desks) within the research labs. It was not apparent to me if this was being done or not relative to research space, but I strongly recommend that research lab space be partly tied to faculty productivity and numbers of students mentored. Minimally, a faculty member who has more than 2 graduate students should get some of the desk space in another research lab with fewer than 2 graduate students. I wouldn't stop with that however; I would also recommend additional hood/bench space for the most productive faculty at the expensive of the least productive faculty. I will leave the more complete definitions of productivity up to the department/college/university as this can vary a bit from institution to institution.

The current teaching lab spaces appears minimally sufficient to meet the current needs of SHSU enrollment, being the most efficiently used facilities on campus according to the self-study. With the projected growth in STEM-related fields and healthcare, both of which require chemistry courses, I urge the department/college/university to find ways to expand or more efficiently use the existing teaching lab space. I don't recall if evening labs were being offered as one means to expand enrollment, but this is one possibility, although it does come with some associated staffing and safety concerns.

Regarding modern instrumentation, it appeared to me that the department either owned (centrally and in individual research labs) or had access to (via other "centers") a very good variety of capable instrumentation. Some of it is aging, such as the NMR, and will need a plan in place for replacement. The one area that was somewhat lacking in this regard was access to research grade computational resources. A good "cluster"/server in this arena can be had for under $100K depending on the number of users. If this is an interest area to some faculty in the program/college, I would urge the college/department to consider purchasing a centralized computational resource.

What I saw of the remaining departmental facilities, it appears the appropriate infrastructure was in place for an MS/BS department with a large number of undergraduates and small number of MS students. I didn't see all of that infrastructure so I really don't have any recommendations there. The self-study describes the facilities and infrastructure relatively well.

Somewhat concerning on the short term is how the department plans to keep its instrumentation capacity up to date and functional. What is current practice? Are selected faculty to provide the upkeep and maintenance for larger departmental instruments and given a teaching release for this work? Also, as some of the department instruments are older, and parts are difficult to obtain, the upkeep can be a considerable drain on a faculty member's time. The graduate students mentioned instrument "down time" as a challenge in performing their research in a timely fashion. Such downtime can significantly decrease a faculty member's group productivity, in terms of papers and preliminary data for proposals. The department might wish to search for a Ph.D. level instructor/instrument maintainer, though this person might command a larger salary than available in the department budget. Another option would be to develop a capable and interested master's student as an instrument technician, in an internship program that would lead to a job helping to maintain the instruments and, perhaps, to relieve some of the pressure on teaching lab preparation, especially at the upper levels.

In addition to improved plans for maintenance, there should be a plan in place over longer time periods for replacement/upgrading of key instrumentation. Chemistry equipment is generally "obsoleted" by its manufacturer after approximately 8 years, after which the manufacturer no longer provides spare parts or service. After-market businesses do often provide support for a few years after obsolescence but this time frame is limited.

While the department should be commended for its instrumentation capabilities, which are critical for teaching and research, a plan between department and dean to address these issues should be developed soon if such a plan doesn't already exist.

VIII. Assessment Efforts

The current assessment scheme appears well-designed with reasonable and appropriate student learning outcomes for all courses. While the comprehensive exam process is not described in any great detail, the expected outcome is appropriate. SLOs are being tracked within courses to inform the curriculum. As seems to be the case with SLOs at all institutions (possibly my own SNARKiness here), it's not obvious how the data will be used.

The thesis review process is laudable with early efforts in forming a committee and the writing of a prospectus. The department/college/university is commended for this; even though it is likely met with some resistance, it likely improves the quality of the average thesis. J

The Alumni Survey included in the self-study was well-designed and administered. It yielded meaningful data back to the department. I applaud this effort as it is a bit of an undertaking. From the survey it can be seen that MS-completers were highly satisfied with most aspects of the program except for the financial support they received in their assistantships. It also shows most have been reasonably successful following graduation.

IX. Recruitment and Marketing Efforts

The department is doing most of the traditional things to recruit students and market itself. I offer up a few potential suggestions to be considered:

a. Expand international recruiting efforts to regions outside of Sri Lanka and India.
b. Grow-your-own domestic students by considering an Accelerated MS degree where high performing undergraduates can take up to 12 hours of "mixed credit" courses that count for both BS and MS degrees with some additional expectation (typically needed for accrediting bodies) in the MS level course.
c. Consider forming an Advisory Board of successful graduates, emeritus faculty, and from the Friends of Chemistry group. This could lead to additional outside support, company contacts for employment of graduates, potential outside seminar speakers, internships, etc.

X. Outreach

The Outreach efforts described in the self-study are consistent with what's to be expected of a program of this size in a public university the size of SHSU within the service area it resides. No recommendations beyond looking for ways to promote the good chemistry does for society and continue supporting K-12 communities. I guess I would say this could possibly be expanded upon a bit if that is an interest area of the newly hired chemistry education faculty member.

XI. N/A

XII. Summary

I concur with the executive summary that the program is mainly in good shape with respected faculty, and successful students in terms of professional outcomes in employment and PhD programs. This was supported well by a nicely designed Alumni Survey where the MS Chemistry program was given high marks in nearly every category (rigor, preparedness, faculty mentoring) with the obvious exception of dissatisfaction with the GA stipend. As I've mentioned previously in this report, it's good the college/dept/university has a plan in place to fix this and that it was overdue.

There was also some concern amongst the graduates about industrial preparedness. This is typical of these types of surveys as students are often not prepared well for statistical and computational (programming/coding) applications in some industrial settings or the people management issues.

Aside from those key items and what I'll include in my summary that follows, I believe I've commented on most parts of the Self-Study summary previously in this report.

XIII. Conclusions of the External Reviewer

My impression from both the department's self-study document and my visit to SHSU in March 2018 is that the department appears strong overall, delivering a good and economical program for master's students. Both faculty and students, in general, regard their department and colleagues warmly and are justifiably proud of their accomplishments. That said, there are several areas that could be improved or are likely to be challenges over the next 5 to 10 years. It is possible to mitigate these challenges, and some suggestions have been given here previously with sort of an executive recommendations summary below. The department is likely to have further good suggestions, as they are more familiar with their day-to-day challenges and are in good hands from the department head, all ranks, staff, and students. I was highly impressed by the cohesiveness and collegiality I witnessed during my site visit.

Recommendations:

1. Increase the net stipend (compensation – tuition) to graduate assistants.
2. Consider an Accelerated MS program to "grow-your-own" MS students.
3. Consider forming a Chemistry Department Advisory Board of alumni, emeritus faculty, discipline-related donors, industrial partners, government agencies, high school teacher, etc. 8-12 members is a decent starting point.
4. Bring in outside speakers to your Seminars (for career/industrial advice especially).
5. Institute some career advising for students. This was their 2nd biggest concern beyond i above.
6. Increase collaborations with forensics, since this is a large program with additional resources.
7. Establish a formal mentoring program for new faculty members if one doesn't already exist.
8. Perform a space vs. productivity audit for research-active faculty within the department and consider ways to more equitably assign research space.
9. Continue and expand upon the well-designed Alumni Survey as this could inform future decisions.

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Sam Houston State University
MS Chemistry Graduate Program

Self-Study

Action Plan

Spring 2018

This Action Plan was created in Spring 2018 by the MS Chemistry Self-Study Review Committee as part of the graduate program performance review mandated by Title 19, Part 1, Chapter 5, Subchapter C, Rule 5.25 of the Texas Administrative Code. The committee generated a self-study report and an external reviewer then reviewed the report, performed a site visit, and submitted an external review report. This Action Plan results from the insights gained from that process.

Submitted to:

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Dr. Ken Hendrickson, Dean of the SHSU Graduate College

Dr. John Pascarella, Dean of the SHSU College of Science & Engineering Technology

External Reviewer:

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Introduction

The Department of Chemistry appreciates the level of professional engagement its external reviewer Bryan Breyfogle demonstrated. In this document we report our plan of action resulting from our own self-study and the feedback from Dr. Breyfogle in his external review report, which provided detailed and frank advice.

Note: A summary of actions to be taken appears on the final page of this document.

External Reviewer's Nine Major Recommendations

The external reviewer provided nine specific recommendations at the end of his report (p. 10), summarizing his findings. This will be individually addressed here.

1. *Increase the net stipend (compensation – tuition) to graduate assistants.*

At the time the self-study report was generated in Fall 2017, the graduate assistantship stipend was $13,005 for the nine month academic year and students typically received an additional $2,250 stipend for summer research. There were additional scholarships at the college and university levels that students could compete for, but success was highly variable historically. As the reviewer pointed out, "MS-only Programs I'm familiar with have a net to the students of $10-15K per year and the lower end of that scale is often a source of issues with students." Based on our self-study analysis of student aid and costs, MS Chemistry students paid $8,333 in tuition and fees during the normal academic year, leaving only $4,672 after paying these costs and this had been getting steadily worse each year.

Alumni and current students provided significant feedback identifying this as a problem in the surveys done as part of the self-study, with a question to current students about financial aid including stipends and scholarships demonstrating that 100% find them "inadequate or insufficient" or "somewhat insufficient/detracted from studies". Responses to the alumni survey revealed that the number of alumni who disagree at some level with the statement that "The level of financial aid, considering stipends and scholarships, available during my studies at SHSU was sufficient." increased from 25% (1 of 4) for those graduating before 2006, to 33% (2 of 6) for those graduating between 2006 and 2011, to 46% (16 of 35) for those graduating between 2011 and 2017 consistent with the trend in net stipend minus tuition. Several alumni provided very blunt and sometimes detailed assessments (for example, "I would strongly recommend the program to other students, if the stipend is sufficient. But the stipend is not sufficient to do the MS at SHSU.")

ACTION: Increase stipends without increasing costs to the university, and monitor to the extent possible how this impacts graduate recruiting.

Although the department had been pointing out this growing problem to the university administration for years, it became clear during Fall 2018 when 100% of the six accepted applicants turned down the program's offers, when the alumni and current student survey scores and comments were collected, and when the financial analysis was done, that this problem was now extremely urgent. We did not wait for the self-study process to complete; we showed the data to Graduate Dean Hendrickson and COSET Dean Pascarella and came up with a plan to increase stipends in the absence of increased overall funds for stipends. We greatly appreciate their willingness to work to find a solution for the current problem.

The result was a compromise to increase stipends to just over $18,000 (approximately $10,000 over tuition and fees) by reducing the number of assistantships available from 21 to 15. Although the final approvals to do this came late in the recruiting cycle for Fall 2018 limiting its effects, there are already some signs that it is helping recruiting. As of the writing of this document (late April 2018) 100% of offers have been accepted (three offers), and four additional SHSU undergraduates that are qualified have indicated they plan to apply in the very near future (it is anticipated that all four would be made offers based on their known credentials and would accept). At least one of those students has indicated that the increased stipend caused them to change their plans and choose to apply to our program.

The program will work diligently to advertise the new stipend along with the extremely favorable evaluation of our program by alumni and current students for the next year's recruiting cycle, and will monitor application rates and offer acceptance rates for evidence that it is having the intended effect. The impact of capping the number of assistantships at 15 will also be monitored and re-evaluated as that limit is reached.

2. *Consider an Accelerated MS program to "grow-your-own" MS students.*

The external reviewer suggested this recruiting tool based on discussions and brainstorming that occurred while he was on-site. The general idea is that the accelerated BS+MS program would be attractive to students. More broadly, there may be a number of related degree constructs that could be promoted or created that would attract a broader population of students.

ACTION: Explore the different mechanisms by which something similar to this might be done, and the feasibility of such a program.

The original concept proposed was to allow students to 'double dip' some courses at the undergraduate to graduate transition, counting those courses for both the BS degree and the MS degree. The committee has had some initial discussions about this possibility, and there is concern that rules of the university, the accrediting body, and/or the State of Texas very likely do not allow it. However, there may be creative solutions that still allow us to meet our responsibilities and offer an accelerated program. The graduate faculty will first need to obtain more information about what exact rules apply, then brainstorm how alterations in course offerings might allow an accelerated route to the combined BS and MS degrees. It is not certain that a solution exists, but this will be further elaborated over the next year. Examples of related alternatives that would provide unique degree experiences that students might find attractive to be discussed would be the addition of graduate certificates in education or business to graduate chemistry coursework, or potentially increasing the use of the graduate minor (though this caused significant concern about reduced chemistry courses in preliminary discussions). Some options may require the hiring of additional faculty member(s).

3. *Consider forming a Chemistry Department Advisory Board of alumni, emeritus faculty, discipline-related donors, industrial partners, government agencies, high school teacher, etc. 8-12 members is a decent starting point.*

ACTION: Consider the benefits of such a board and its likely composition, then formally decide whether to form the board.

The external reviewer's department has such a board, and he discussed the benefits of it with us during his visit. His board has some unique alumni that provide an unusual level of support (esp. financial) for his department and its students that likely would not reproduce at SHSU. That said, there may still be benefits of such a board in our program and the faculty recognize that it might be useful for alumni engagement and as part of a broader plan to increase the level of interaction (virtual or in-person) of students with program alumni. We will consider the merits of such a board as well as the best composition and format for its interactions with the department and make a decision as to whether to create the board.

4. *Bring in outside speakers to your Seminars (for career/industrial advice especially).*

ACTION: Start incorporating external speakers into seminar.

In initial discussions, the faculty of the department agree that there would be numerous benefits to increasing the number of external speakers that visit the department. In recent years this has been an occasional occurrence when a unique opportunity presented itself. We will make a more specific plan to bring in speakers, initially one or two a semester and growing from there later on. The most likely place for the seminars initially is in the undergraduate seminar course CHEM 4100, near the beginning of each semester, with graduate students expected to attend. Other options will also be explored, however.

5. *Institute some career advising for students. This was their 2nd biggest concern beyond i above.*

The alumni responded very positively about the department's role preparing them for their careers. Of those that held a position in industry, 87% agreed that they were better prepared than their coworkers, 100% agreed that the department taught them the subject of chemistry very well, and 74% agreed that they got good career advice at SHSU that was accurate and served them well. The fact that all 6 current students gave "Research Advising & Mentorship" the highest rating is a strong indication that individual research advisors in the department are doing a good job mentoring students in general, though we didn't ask a question specifically polling them on career advising. The department strongly agrees, though, that we should always strive to do more to prepare students for careers as professional chemists.

ACTION: Develop a multi-faceted approach to increasing the exposure of the MS students to career advice and to opportunities to experience industrial chemistry in context.

Based on the preliminary discussion, the department thinks a multi-faceted approach is most appropriate and that additional discussion over the next year will be important (though implementation of some aspects can occur while discussion is ongoing). Our alumni, primarily though the survey, have clearly indicated a general willingness to provide advice to the department and its students. We can capitalize on that through having alumni from industry visit to give seminar presentations and answer questions and through potential videoconferencing and related opportunities for direct advising of students by alumni. Being more intentional in surveying the students about their plans and career goals in order to give them better advice is also being discussed, as well as increasing participation of graduate students in visits to industrial chemistry facilities and related activities that are arranged by the J.C. Stallings Chemistry Club, our student chemistry club that is an official Student Affiliate of the American Chemical Society and a student chapter of the Society for the Advancement of Material and Process Engineering.

6. *Increase collaborations with forensics, since this is a large program with additional resources.*

ACTION: Discuss enhancing collaboration with Forensic Science and other departments at the university.

Currently, faculty in the department do have numerous collaborations in place with Forensic Science and other departments. These include research collaborations and more formally having Chemistry faculty serve as co-chairs on dissertation committees. In addition, Forensic Science graduate students are not uncommon in the Chemistry graduate courses. The department will discuss how to better enable such collaborations, and more generally collaborations with a number of other departments at the university. For example, there have been many collaborations with Biological Sciences over the years, and the rapidly growing Agriculture and Engineering Technology programs provide new opportunities. Encouraging collaboration across department lines is always a challenge at any university, but we have had success and will look at ways to enhance those successes.

7. *Establish a formal mentoring program for new faculty members if one doesn't already exist.*

ACTION: Discuss further whether this would be useful.

Preliminary discussion after review of the external reviewer's report, a discussion that included all pre-tenure tenure-track graduate faculty, suggested that due to the small size of our faculty and the collegial environment that is an integral part of the department's culture at this time, that informal mentoring occurs frequently and meets the current needs of faculty. This will be discussed in more detail with an eye to the future, however, to be re-evaluated.

We did discover as part of that conversation that there is significant confusion right now about a relatively new program on campus that provides new faculty with mentors from outside their departments. This is a potentially useful avenue by which faculty can get advice that is difficult for them to seek from the department colleagues, and gain context for how things are handled differently in other parts of campus. Some new faculty suggested that they weren't clear whether they had a mentor for the first part of the year, or how it worked, and that communication of how this program works should be increased. We will pass that on to the administration.

8. *Perform a space vs. productivity audit for research-active faculty within the department and consider ways to more equitably assign research space.*

ACTION: Discuss further whether this would be useful and how this would work.

Preliminary discussions for the production of this Action Plan suggested that this is not necessary, would carry significant risk of damaging the collegial environment that in no small part enables the department's high level of productivity, and in fact would be considered by many faculty to be less fair treatment of the faculty as a whole than the current system. This may be due in part to recent (prior to receiving the reviewer's report) improvement in communication about making underutilized space available to those in need. A significant problem is the lack of chemical ventilation fume hoods for researchers who need more than the one hood present in the typical research lab, with a secondary problem being student desk space. It is also true that in the past few years senior faculty have been good about making the sacrifice of giving up their more prime lab space to take reduced space allowing the department to meet the needs of other faculty (especially our newer faculty). There appears to be no way in the near future to give significant additional lab space to highly productive faculty members, with or without the kind of audit and assignment system the reviewer calls for.

The department will have follow-up discussion in Fall 2018 about whether such a system should be implemented. That allows faculty to consider the merits and drawbacks more carefully before making a final decision.

9. *Continue and expand upon the well-designed Alumni Survey as this could inform future decisions.*

ACTION: Make a plan for future surveys, and to increase alumni feedback in other ways.

The alumni survey provided fantastic feedback and had an extraordinary response rate, as noted by the reviewer (in fact, there were additional responses after the self-study report was produced so the response rate is even higher than that reported there). The department certainly plans to use some of the results from those surveys, which was extremely favorable about essentially all non-financial aspects of the program, in future recruiting communications as well. Based on initial discussion, we are definitely interested in following up with periodic surveys that are expanded to provide additional feedback (in a format that allows sections of questions to be skipped so alumni are not overwhelmed with the time and effort required). We are concerned, though, that if we are not careful and carry out surveys too frequently our response rate will drop precipitously. Therefore, we will likely not perform the survey every year. We will discuss in more detail the appropriate frequency, how to reach out to alumni that graduated longer ago than this survey did, and what additional feedback would be more useful.

More broadly, the surveys revealed to us that our alumni are highly interested in providing feedback and advice. Separately from the survey itself, we will make a plan for increasing direct interactions with alumni and our current students. Note that this also is part of the response to Recommendation #5, provide more career mentoring, as having alumni from industry interact with students directly would provide them practical career advice that is difficult for academic faculty to provide.

We will also discuss whether it is feasible to run an employer survey, to assist career advising and curriculum development. As our students work for a wide variety of employers, and some of the positions require security clearances, there are some issues to address before rolling such a survey out.

Other Recommendations in the Report

Other than the nine listed recommendations, there were a number of other items addressed in the main text of the report.

Program Challenges/Weaknesses: Over reliance on International graduate students from one region—Sri Lanka, which leaves the program exposed to fluctuations due to Sri Lankan, U.S., and Global politics. Currently a low number of graduate students in the programs, and almost no domestic students (p.1 of the external reviewer's report).

The demographic information on page 205 MS Chemistry of the Self-Study Report shows that over the period reviewed, there were 23 graduate students from Sri Lanka, 22 from the US (19 from Texas, 3 from other states), and 10 from other countries. Clearly the department does admit a large number of students from Sri Lanka, mirroring a large number of applicants. At the international level, recruiting can be difficult and expensive. One reason for the large number of Sri Lankan applicants is that the department and the university have a number of faculty and staff from Sri Lanka, and they recruit students when they go back to visit and/or by email. After having had a number of Sri Lanka students that became highly satisfied alumni, they would often refer other students to SHSU (for example, both Sri Lankan graduate students who have accepted offers for Fall 2018 applied after interaction with alumni who recommended the program to them). In contrast, we have also had students from India, Bangladesh, China and Iran that completed the program. Presumably these individuals were also highly satisfied alumni (since the survey of alumni indicates a high level of satisfaction), but for the most part, this has not led to additional applications by students from those countries.

The Sri Lankan students have been very valuable and productive members of the program over the years. Clearly, it would not behoove the department to decrease these recruiting efforts. The challenge, then, is to be more effective recruiting students from other places, especially U.S. domestic students. As the pool of applicants increases, the department can be more selective in its admissions while increasing student quality.

ACTION: Increase efforts to recruit qualified students both domestically and internationally and make a specific recruiting plan for the department.

The increase in stipend to ~$18,000 appears to already be improving recruiting and will play a major role here, though as noted previously this change happened too late to have a full impact on recruiting for Fall 2018 (see pages 2 & 3 of this Action Plan). We will devise a recruiting strategy to communicate the improved financial package and the newly documented high alumni satisfaction level. Further, the Graduate coordinator will increase communications to universities across Texas advertising the program and its benefits. The department will continue to recruit at the Southwest Regional American Chemical Society meetings each fall, and will evaluate whether it would be cost-effective to recruit at the national meetings that take place twice each year. As noted on page 3 of this Action Plan, we will also be exploring additional program options like an accelerated route to the MS degree that might attract more SHSU undergraduates to the graduate program.

In addition, the department has already started actively seeking to increase recruiting from other countries around the world. One of our faculty members from Hungary, Dr. Petrikovics, and the Dean of COSET, Dr. Pascarella, recently had to cancel a recruiting trip to Hungary due to a medical emergency but plan to reschedule. The department has also started to discuss how to better recruit students from countries like Saudi Arabia, with the benefit that some of these students are financially sponsored by their host country and wouldn't be dependent on assistantships.

Program Challenges/Weaknesses: Faculty diversity (p.1 of the external reviewer's report).

The department has long been interested in hiring diverse, qualified candidates. In recent years, multiple offers have been made to female faculty candidates, but none of these offers have been accepted. Of course, there are only two possible ways to increase the diversity of the faculty: replace current faculty with more diverse candidates, or hire additional faculty who are more diverse. As positions come available, we will continue to seek diverse, qualified candidates.

Program Challenges/Weaknesses: Instrument maintenance: Some of the instruments are old (NMR and some others) or seemed to be in disrepair (gel electrophoresis) (p.1 of the external reviewer's report).

The department thinks the reviewer misunderstood the state of some of the instrumentation (for example the NMR has been refurbished in the past few years; it is true that the spinner does not currently function properly, though this hasn't seemed to impact the quality of spectra in general). That said, it is certainly true that instrument maintenance and replacement is a major issue for a department like ours. Although we have requested the college hire a full time technician to maintain and repair instrumentation in the past, that request has never been approved.

ACTION: Develop a plan for instrument maintenance and repair.

We will meet as faculty and interact with the Dean's office to develop a plan for instrument upkeep and replacement. As part of this plan, we will also discuss coordination of efforts to write grant proposals to fund acquisition of new or replacement equipment and identification of a strategy to improve computational infrastructure.

Consider having a graduate committee (p.2 of the external reviewer's report).

The department discussed this in generating this Action Plan, but decided that at this time it is not beneficial to do this by a larger committee. A number of the tasks listed that the committee could address are already often discussed by the graduate faculty as a whole since we are a relatively small department. That will be re-evaluated if the program grows in the future.

MS level FTE should be calculated in between that of BS and PhD. That is, if a 3-hr BS level course is 0.25 FTE and a PhD course is 0.50 FTE, then a MS-level course should be 0.375 FTE. (p.2 of the external reviewer's report).

We certainly appreciate the reviewer proposing this change to correct a severe workload inequity and lack of application of best practices for graduate program workload on campus. Obviously, this is beyond the department's immediate control but we will continue to raise the concern though channels and during workload policy revision that is ongoing on our campus.

Instead of concerning themselves with multi-section labs (mainly general and organic) for faculty, I recommend the department hire a full-time lab coordinator with an MS degree to handle this instructional load (p.2 of the external reviewer's report).

This is a direction the department has been moving in for some time now. Last year we hired a lab coordinator to take over some of these duties for laboratories for the non-science majors, and we are in the process of hiring a lab coordinator for the general chemistry laboratories.

In meeting with the graduate students, it was my perception that they were being asked to teach a fairly heavy teaching load with 8-9 hours of actual lab instruction towards their 20-hr work expectation (p.2 of the external reviewer's report).

The 20-hour per week requirement is fixed for all assistantships above the level of the department. As far as the hours credited for each lab taught, faculty are asked each year if the number of hours assigned to their assistants for these activities need to be adjusted, and adjustments made were reasonable. We will remind everyone to consider the reviewer's comments the next time these adjustments come up. The reviewer wondered if this was due to using a smaller number of graduate students, but the extra load was assigned to undergraduate teaching assistants and was not added to the load of current graduate students (although obviously we would rather use the more highly trained graduate students to direct labs).

I do not see where chromatography/separations is being covered (p.3 of the external reviewer's report).

Dr. Trad does cover chromatography methods as one of the topics in his graduate course.

There is no regularly scheduled course in environmental chemistry (p. 3 of the external reviewer's report) and

In the future, it looks as if they may need further analytical/environmental expertise (p. 4 of the external reviewer's report).

At the undergraduate level, every spring we offer courses in environmental chemistry: CHEM 3368 "Environmental Chemistry" (offered in the spring of even years) and CHEM 4442 "Air Quality" (offered in the spring of odd years). The individual who had taught these courses for many years (Tom Chasteen) retired at the end of last year. Tarek Trad was hired to replace him and is teaching CHEM 3368 this semester. At the graduate level, for at least the last decade, Tom Chasteen, an environmental/analytical chemist, did not teach a graduate course specifically in environmental chemistry. Instead he routinely taught CHEM 5368 "Analytical Spectroscopy" and a chromatography/separations course as a CHEM 5385 "Selected Topics in Adv Chem.". In the former course, the description mentions "application to environmental, atmospheric, forensic, and bioanalytical problems". So while Tom Chasteen didn't teach a graduate environmental chemistry course explicitly, he included relevant topics in his other courses. Presumably Tarek Trad will continue to do similar things. If one of the graduate faculty members in chemistry want to develop an environmental chemistry graduate course, they are welcome to do so. It would begin as a CHEM 5385, and if the faculty member decided that this was a successful course, ultimately it could be given its own course number through the curriculum process. It is worth noting that while environmental chemistry started being highlighted in the 1970's (for example, Dr. Norman's B.S. degree had "environmental emphasis"), the topic has not become as important and widespread as one might have expected.

Looking at the $8 per student lab fee, I would also recommend that amount be increased substantially. While this depends to some extent on what other sources are available for things like computers, probeware, small instrumentation, etc., $8 is not sufficient to cover consumables for even the general chemistry laboratories, let alone the more expensive advanced courses like biochemistry.

This general issue (the costs associated with teaching laboratories) has been addressed many times and at various levels at SHSU. Currently the College of Science and Engineering Technology is in the process of implementing a College fee that is expected to increase revenue that can be used to support laboratory expenditures.

Summary of Actions to be Taken

- Increase stipends without increasing costs to the university, and monitor to the extent possible how this impacts graduate recruiting.
- Explore the different mechanisms by which something similar to an accelerated MS degree might be done, and the feasibility of such a program.
- Consider the benefits of an advisory board and its likely composition, then formally decide whether to form the board.
- Start incorporating external speakers into seminar.
- Develop a multi-faceted approach to increasing the exposure of the MS students to career advice and to opportunities to experience industrial chemistry in context.
- Discuss enhancing collaboration with Forensic Science and other departments at the university.
- Discuss further whether a formal mentoring program for new faculty would be useful.
- Discuss further whether a space vs. productivity audit and reassignment of lab space would be useful and how this would work.
- Make a plan for future surveys, and to increase alumni feedback in other ways.
- Increase efforts to recruit qualified students both domestically and internationally and make a specific recruiting plan for the department.