Institutional Effectiveness
2021-2022

Program: Chemistry, MS

College and Department: College of Arts & Sciences, Department of Chemistry

Contact: Jeff Boles

Mission: The mission of the graduate program in chemistry may be summarized as follows:

1. To provide an ongoing program of study that prepares graduates to successfully pursue scientific

SLO 3: prepare a hypothesis, design and execute experiments to test the hypothesis, keeping complete experimental records, (Assessment Item 14 on M.S. Survey of Graduates, M. S. Survey of Faculty). Surveyed annually and compiled every 5 years.

SLO 4: apply appropriate statistical analysis to collected research data, (Assessment Item 15 on M.S. Survey of Graduates, M. S. Survey of Faculty). Surveyed every 5 years.

SLO 5: apply critical thinking skills to further refine the hypothesis based on experimental evidence (Assessment Item 12 on M.S. Survey of Graduates, M.S. Survey of Faculty). Surveyed annually and compiled every 5 years.

SLO 6: effectively communicate scientific knowledge and ideas through both oral and written communication skills.

A departmentally developed curriculum map can be found in Appendix 1 that shows the connections between courses and student learning outcomes.

Assessment Methods:

PG 1: Engage students in research

1. SciFinder Scholar:

   In order to assess our goal of increasing research productivity, SciFinder Scholar is used to determine the number of peer-reviewed publications in each two-year period. The chemistry department annual report is generated each year and contains tabulated data such as external funding dollars raised and numbers of manuscripts published via SciFinder Scholar to show progress in research productivity, in part, as a funding outcome.

2. Chemistry Department Annual Report:

   Information in the Chemistry Department Annual Report provides annual tabulation of the results of each program goal (Indirect, but containing information from Direct Measure Assessment). The Chemistry Department Annual Report is used to not only track such data, but is also disseminated to the faculty and discussed at faculty meetings and retreats, as are the other assessment tools. The graduate program is assessed by external review every 5 years.

3. Delaware Study

   Information in the Delaware Study will be utilized to determine and tabulate the total amount of external funds activated each year by the department. The University must file certain reports each year that indicate levels of funding support acquired from outside sources. The Delaware Report is thus very useful for acquiring this data.

PG 2: Decrease teaching load

1. Delaware Study

   Information in the Delaware Study will be utilized to determine actual teaching load assigned by the chair and the number of degrees awarded.

PG 3: Maintain a satisfactory graduation rate.

1. Graduation Rate

SLOs 1-6:

1. Seminar Evaluation Form

   Both faculty and students attending student seminars fill out an evaluation form on the student speaker. This is helpful to both the student giving the seminar as well as the student grading the seminar. These are kept by the Seminar Program Coordinator, who also provides feedback to students, and to the M.S. Program Coordinator.

2. Chemistry M.S. Survey of Graduates

   Specific items on this survey along with the students Graduate Advisory Committee will assess students' progress on each of the student outcomes. The survey of graduates will be administered every year beginning this year.

3. Chemistry M.S. Survey of Faculty

   Specific items on this survey will assess students' progress on student outcomes. This survey is administered every five years.

4. Graduate Advisory Committees

   Graduate Advisory Committees of the graduate students assess student progress at the time of the proposal presentation, the thesis seminar, and the oral defense of the written thesis.

   A student with an advanced degree in chemistry must have sufficient critical thinking and problem-solving skills in order to succeed. Graduate Advisory Committees of the graduate students at the time of proposal presentations, literature seminar, thesis seminar, and oral defense of the written thesis will make evaluations of student progress. Progress and novel ideas for improvement are discussed within these committees, at faculty retreats and occasionally at faculty meetings. The results of the Chemistry M.S. Survey of Graduates and the Chemistry M.S. Survey of Faculty are also discussed at faculty meetings and retreats since they contain valuable information as a direct measure of assessment.

5. External Program Reviews

   External program reviews (every 5 years) also contributes to improvements in the assessment tools utilized by the department. The results of these reviews are maintained in the Chemistry Chair s office.

Results:

PG 1: Engage students in research

SciFinder Scholar is used as the direct assessment tool. Two-year cycle is defined, for example, as papers published during calendar year 2018 and 2019 and reported as 2018-2019, the last full assessment cycle for results for this metric

Years Tabulated	# of Publications	Target (5% increase)
2001-2002	21	18
2003-2004	21	19
2005-2006	30	20
2007-2008	17	21
2009-2010	11	22
2011-2012	13	23
2013-2014	20	24
2015-2016	41	25
2017-2018	41	27
2018-2019	33	30
2020-2021	Available 12/21	Available 12/21
2001-2021	265	205 (exp)

Academic Year	Number of Graduates
2007-2008	4
2008-2009	6
2009-2010	6
2010-2011	6
2011-2012	5
2012-2013	6
2013-2014	4
2014-2015	6
2015-2016	7
2016-2017	10
2017-2018	5
2018-2019	4
2019-2020	11
2020-2021	4

SLO 1: Employ critical thinking skills to analyze a chemical problem

A rubric is used by the student s Graduate Advisory Committee to evaluate the oral thesis defens One of the subjects evaluated is Critical Thinking. The percentages below each box show the percent of students whose evaluations fell into each category. (Only students for whom at least 2 faculty members provided an evaluation are included in this data.) Each student advisory committee is composed of three members. Each committee is also different, and faculty are likely to assess students differently. This must be taken into consideration since there is not enough data to normalize the evaluation scores. Data for 2019 and 2020 are shown. Data for 2021 is incomplete at this time.

Rubric for Faculty Evaluation of Thesis & Defense: Critical Thinking

Year	Excellent	Good	Fair	Poor
2019	13%	75%	13%	0%
2020	29%	71%	0%	0%

SLO 2: Effective use of the scientific literature

The rubric mentioned in SLO1 contains an evaluation of the students use of the scientific literature along with their ability to gather and organize sources that support or contribute to the research being undertaken. The percentages below each box show the percent of students whose evaluations fell intoal.3 (t)-3.5 0 Td ( )Tj EMC /P2 Tc 00 (al.6 (t)78 0 T51.315 (t)-3 (o)-6.6 ( )10.6 (t)-2.9 (h)2

Rubric for Faculty Evaluation of Thesis & Defense Information Seeking

Year	Excellent	Good	Fair	Poor
2019	63%	37%	0%	0%
2020	43%	57%	0%	0%

SLO 3: SLO3: design and execute experiments

The rubric mentioned in SLO1 contains an evaluation of the student participation in the thesis problem/question

SLO 5: Effectively documenting sources

The rubric mentioned in SLO1 contains an evaluation of the student's documentation of all utilized sources that were referred to in the process of carrying out the planned research. The percentages below each box show the percent of students whose evaluations fell into each category. (Only students for whom at least 2 faculty members provided an evaluation are included in this data.) Each student advisory committee is composed of three members. Each committee is also different, and faculty are likely to assess students differently. This must be taken into consideration sinc

Modifications for Improvement:

SLO6: *Effectively communicate scientific knowledge*

Beginning in Spring 2021 the second literature seminar course

Appendix 2: Seminar Evaluation Form

(Evaluator ***Please*** make comments in the space to the right of each category as part of your grade. If you take this form with you to fill out at your leisure, please return it to *Kathy Rust* by the following Monday)

Planning and preparation: *Abstract clear, succinct, adequate detail in abstract and outline. Did the speaker adhere to the outline?, etc*	
	Award 1-20 points
Presentation to audience: *Voice level and clarity, enthusiasm, eye contact, absence of annoying actions, proper use of notes, entertaining style, correct grammar, timing, well-organized, professional demeanor*	
	Award 1-20 points
Visual Aids: ***Relevance:*** *effective use, quality, correct grammar, correct spelling, proper use of equipment, proper citations*	
	Award 1-20 points
Subject matter: *Knowledge about subject, presentation of scientific merit, use of literature, thorough understanding of material, etc*	
	Award 1-20 points
Discussion: *Interest aroused, ability to answer questions, adequate time allowed for questions*	
	Award 1-20 points
General Comments:	
Total points:	

Appendix 3: MS Survey of Graduates

CHEMISTRY M.S. SURVEY OF GRADUATES (COMPLETED ONLINE WITH GOOGLE DOCS)

Field of specialization: _____

Research Advisor: _____

Semesters in the M.S. program (counting summers): _____

Graduation Date (mm/yy): _____

Please rate your satisfaction or estimate the quality of the following items. Results will be kept anonymous

		Poor	Fair	Good	Excellent	Not Applicable
Quality of courses in preparing me for my future		1	2	3	4	5
Quality of instruction in:	Organic Chemistry	1	2	3	4	5
	Analytical Chemistry	1	2	3	4	5
	Inorganic Chemistry	1	2	3	4	5
	Physical Chemistry	1	2	3	4	5
	Biochemistry	1	2	3	4	5
Fairness in grading my courses		1	2	3	4	5
Availability of required courses		1	2	3	4	5
Opportunity for formal student evaluation of your instructors in chem courses		1	2	3	4	5

Assistance given by departmental secretaries	1	2	3	45
Quality of my initial contact with the department	1	2	3	45
Opportunity for student participation in departmental decisions	1	2	3	45
Overall quality of the department	1	2	3	45
Overall satisfaction with M.S. degree program	1	2	3	45

Please take time to share your thoughts and perceptions of the Chemistry Department in order to foster the improvement of its M.S. program and faculty.

List or discuss the strengths of the department, faculty, and degree program.

Appendix 4: MS Survey of Faculty

Chemistry M. S. Survey of Faculty

Please rate your satisfaction or estimate the quality of the following items. Your responses will be kept anonymous.

If you rate the program fair or poor on any of the items below, please use the text boxes at the end of the survey to elaborate on your rating.

	Poor	Fair	Good	Excellent	Unknown	Not Applicable
Perceived quality of instruction in graduate courses:						
Organic Chemistry	1	2	3	4	5	
Analytical Chemistry	1	2	3	4	5	
Inorganic Chemistry	1	2	3	4	5	
Physical Chemistry	1	2	3	4	5	
Biochemistry	1	2	3	4	5	
Organization and clarity of M.S. degree requirements	1	2	3	4	5	
Progress students make in learning to effectively use the scientific method	1	2	3	4	5	
Progress students make in learning to effectively communicate scientific info	1	2	3	4	5	
Progress students make in learning to think critically & analyze chem. probl (2)Tj 0.506 j 0.506 4 mbl (2na)2.6.3 (he. .6.54)2	1	2	3	4	5	

Quality of recruitment of M.S. students	1	2	3	4 5
Quality of curricular advising of M.S. chemistry students	1	2	3	4 5
Quality of career advising of M.S. chemistry students	1	2	3	4 5
Quality of research advising of M.S. chemistry students	1	2	3	4 5
Intellectual quality of entering students	1	2	3	4 5
Academic preparedness of entering students	1	2	3	4 5
Quality of efforts to prepare TA s for effective lab teaching	1	2	3	4 5
Appropriateness of number of T.A. stipends afforded to the program	1	2	3	4 5
Appropriateness of dollar amount of T.A. stipends	1	2	3	4 5
Level of operating budget afforded to the department	1	2	3	4 5
Quality of classroom facilities	1	2	3	4 5
Quality of laboratory facilities	1	2	3	4 5
Quality of TTU library chemistry holdings	1	2	3	4 5
Quality of computer support	1	2	3	4 5

Availability of a stimulating intellectual atmosphere conducive to learning	1	2	3	4 5
Availability of faculty development opportunities, sabbaticals, etc.	1	2	3	4 5
Assistance given by departmental secretaries	1	2	3	4 5
Opportunity for faculty participation in program decisions	1	2	3	4 5
Overall satisfaction with M.S. degree program	1	2	3	4 5

What are the major concerns that you have about the M.S. program that you wish to see addressed in this program review?

List or discuss the strengths of the department and faculty as they pertain to the M.S. degree program.

List or discuss the weaknesses of the department and faculty as they pertain to the M.S. degree program.

Any suggestions you may have to improve the M.S. program.

Appendix 5: Graduate Advisory Committee Thesis Assessment

Thesis/Research Defense Assessment Student Name_____ Points_____

* Point Value	Thesis/ Problem/ Question	Information Seeking/Selecting and Evaluating	Analysis	Written Synthesis	Documentation	Oral Synthesis	Critical Thinking
4	Student contributed to thoughtful, creative hypotheses that engaged them in challenging or provocative research. The research breaks new ground or contributes to knowledge in a focused, specific area.	Student gathered information from a variety of quality electronic and print sources, including appropriate databases. Sources are relevant, balanced and include critical information relating to the thesis or problem. Primary sources were included.	Student carefully analyzed the information collected and drew appropriate and inventive conclusions supported by data.	Student developed appropriate structure for communicating data and conclusions, incorporating a variety of quality sources. Information is logically and creatively organized with smooth transitions. Little faculty assistance was required (mostly general editing).	Student documented all sources. Sources were properly cited in both written thesis and presentation slides. Documentation is error-free.	Student	