

Chemistry Program
How We Meet the Criteria for Evaluating Academic Programs
Christina Miller, Chair

Introduction: The department of Chemistry, Computer Science and Math is a department that houses two official Programs: Chemistry and Math. In the Chemistry Program we have 5 full-time Tenured/Tenure-track faculty; 3 Full Professors, one Associate professor and one Assistant Professor. 3 that teach full loads, 2 that teach half-loads = 4 full load faculty. We have an adjunct that teaches on occasion. In this document we will address the 7 criteria posed for the assessment of academic Programs.

Criterion 1. Impact and Overall Essentiality of the Program; Connection to Mission/Vision/ASU 2020.

Below is how the Chemistry Program at ASU aligns with ASU 2020.

Goal 1. Academic Excellence.

This fits in directly with our Chemistry Program Goals:

1. Students will demonstrate a working knowledge of the main areas of chemistry that are relevant to their major.
2. Students will understand and create arguments supported by quantitative evidence and they can clearly communicate those arguments in a variety of formats (using words, tables, graphs, mathematical equations, etc.), as appropriate.
3. Students will describe, both in writing and orally, chemical processes and procedures.
4. Students will correctly and safely use relevant laboratory equipment and instruments and record data correctly in laboratory notebooks.
5. Students will design, evaluate and implement a strategy to answer open-ended questions or achieve desired goals.
6. Students will make simple connections among ideas and experiences to synthesize and transfer learning to new, complex situations within and beyond the campus.

Initiative 1.1. Ensure a quality education for our diverse populations by offering relevant, current and rigorous undergraduate and graduate course work. Interdisciplinary courses were created to support other Programs in the interest of the career goals of the student population. These include Introduction to Forensic Chemistry as a General Education course and General, Organic and Biological Chemistry (GOB) as a course for Pre-nursing majors.

Our Chemistry majors align well with the national expectations in the field and professional organization, the American Chemical Society (ACS) (see criteria 6 for details on this alignment). This sets the stage for students to pursue professional degrees and employment in chemistry or

related fields. The Program also uses benchmarks from the nationally normed ACS exams to ensure rigor and quality of the courses and the Program and the competitiveness of our graduates.

Initiative 1.2. Provide a responsive and professional education that fosters civic responsibility in a global culture. The Program requires students to participate in civic outreach promoting science education. This includes the annual Chemistry Magic Show, the SLV Regional Science Fair, the STEM Academy, the migrant education Program (MEP) STEM week, STEM Saturdays, internships and research projects.

The upper-divisional courses and the capstone course involve and engage students in projects that emphasize global perspective and scientific responsibility. These include green chemistry projects, water quality studies, and alternative energy sources. Many courses, including general education and lower division courses, engage in civic responsibility through environmental stewardship which includes the use and disposal of laboratory chemicals as well as the impact of chemical innovations.

Initiative 1.3. Strategically strengthen and expand the University's undergraduate and graduate degree Programs. The department annually evaluates its courses and Programs to ensure the quality of the courses and Programs as well as any recent changes in the educational/ business/ discipline landscape that may necessitate changes in Chemistry. Several recent things come to mind. The Program identified deficiencies in students' communication skills. To address this deficiency the Program has incorporated more assignments and bolstered assessment to improve students' communication skills, writing skills and presentation skills. This will better prepare students to succeed in their professional goals. Also the growth/interest in nursing and forensics came to light so the department worked to create the two aforementioned general education courses (Forensics and GOB) to address the interest and needs of these populations of students.

Initiative 1.4. Enhance efforts to recruit and retain a diverse faculty...(to) foster inclusion and equity...The department wholeheartedly embraces its role in fostering and supporting diversity within the department, across the discipline, and throughout the University. One faculty member is heavily involved in organizing Kindred spirits and is now in a half-time position encouraging diversity. Another faculty member in our Program was instrumental in obtaining the ADVANCE grant for ASU and 80% of the Chemistry faculty participated in the institutional study to identify barriers for success for female faculty in STEM. Furthermore, two of the five full time faculty in our Program are women, thereby inspiring our female students to continue to pursue a career in Chemistry.

Goal 2. Student Success.

Initiative 2.1. Provide flexible avenues and entry points from which to be engaged in and to progress toward their educational, personal, and career goals. The summer courses, evening classes and evening labs we regularly teach give students more flexibility and opportunity to enroll and succeed in our classes. The Program works hard to provide a wide array of entry points into Chemistry via Introductory Chemistry courses. This includes classes such as GOB, Intro to Forensics, Intro to Chemistry, and Introduction to Organic and Biological Chemistry,

OB. The Program provides alternate paths for students to meet chemistry requirements for their major when they are faced with scheduling constraints. An example of this is when Pre-nursing students cannot take GOB in the fall they may now take (or transfer) Intro to Chemistry in the fall and then take OB in the spring with the Wildlife Biology majors such that they are on track for applying to the Nursing Program.

Initiative 2.2. Recruit and support eligible transfer students. Our Program offers four GT pathways courses. The chair is open to evaluating and accepting transfer credits that meet our Program's standards including awarding elective credit that meets general education science requirements for quality courses that we do not offer at ASU.

Initiative 2.3. Enhance student advising to ensure it is accurate, timely, and supportive of the attainment of student goals. The faculty have made efforts to improve the quality and effectiveness of advising by attending available workshops focused on improving advising. These have focused on building stronger relationships with advisees through appreciative advising as well as receiving training on Degree Works to remove the focus of "checking the box" and on the attainment of student goals.

Initiative 2.4. Provide all students practical and hands-on experience supporting their learning and professional development. The Program makes an effort to get to know the students enrolled in our lectures and labs such that assignments and examples can be better tailored to their interests and aspirations. This is done informally by chatting with students in lab, requiring students to meet for at least one introductory conversation at the beginning of the semester and by providing assignments that allow the students to personalize their learning with respect to their own field of interest. The Program provides many opportunities to practice their expertise in the field through Supplemental Instruction (SI), TA, research, internships, and tutoring. The Program has created formal MOU with local businesses in the San Luis Valley. This includes Sangre De Cristo Labs, Cloud Co. farms, and will soon include US Bureau of Reclamation and the Square Peg Brewery for internship purposes.

Initiative 2.5. Promote and increase early student engagement as a means to graduate students with a strong sense of connection Adams State University. We have a STEM picnic in the fall to welcome all science majors and those interested in science to help form early connections and get a brief preview of the science clubs available. The Adams Atoms Chemistry club and the STEM center help build personal connections amongst students and with Adams State. By students participating in SI appointments, TAs, research, internships, and tutoring they develop a strong sense of community and affiliation with the department and institution. Indeed, Chemistry has always been good at building this strong sense of connection; the chair recently met 4 graduates of the Chemistry Program from '66 and '67 at Homecoming and invited their much-loved professor, Kay Watkins, to come meet with them at the Homecoming festivities.

Initiative 2.6. Identify and systematically remove obstacles to student success. Faculty engage in regular and often informal discussions pertaining to obstacles students are encountering that may hinder them reaching their full potential. Faculty speak openly and productively to find solutions around these obstacles. These can often be systemic or personal. Systemic issues are

often brought to the Program's attention and addressed. Personal conflicts or obstacles are often handled in a thoughtful, unbureaucratic manner often quickly resolves a students' conflict. An example; two students did not pass our senior Capstone course due solely to their final presentation in the course. In both cases, rather than forcing the students to wait another year to retake the course, we allowed the students to prepare a new talk to give in the following immediate semester as an example of a good talk for our younger students.

Goal 3. Personal and Professional Development.

Initiative 3.1. Increase campus programming for faculty and staff that fosters and promotes inclusive excellence. The Program has had substantial involvement in campus efforts to be involved in inclusive excellence programming like CIELO, Kindred Spirits, and the annual HILOS retreats. Two faculty participated in the Escala teaching workshop that promoted better instruction for underrepresented students.

Initiative 3.2. Provide opportunities for faculty and staff to earn degrees and/or certificates. Two faculty participated in the Escala teaching workshop that promoted better instruction for underrepresented students. Two faculty have participated in the TEED course. One faculty member took part in HERS.

Initiative 3.3. Increase opportunities for faculty and staff to grow and expand in their fields. The faculty attend and present at regional and national conferences. This often includes regional and national ACS meetings and the Biennial Conference on Chemical Education. We have hosted a local ACS meeting and have attended others. Faculty's attendance at these meetings was funded by University faculty development funds, department funds, and by the STEM grant. (The STEM grant was a title V grant that provided funds for faculty development, student research, tutoring, and construction over five years.) The faculty members attend and also present regular lunch-time talks, seminar presentations, and nightly talks for the public in the Faculty Lecture series. The Program provides opportunities for faculty to teach novel courses in their field, like a Brewing course.

Initiative 3.4. Develop institutional policies, practices, and provisions to support professional development endeavors. The department and department chair strongly support professional development endeavors. As part of the Annual Activity Summary and Professional Performance Plan faculty are evaluated on their efforts this area. The department provides funding for these endeavors, as mentioned above.

Goal 4. Access and Affordability

Initiative 4.1. Develop strategies and incentives to improve persistence and completion. As part of a strategy to improve persistence and completion, the faculty participated in the writing and the implementation of the STEM grant. This funded tutoring, STEM outreach, research, SI, and the construction of the STEM center which includes study rooms, meeting rooms, and social spaces.

We are also lucky enough to have the Porter Scholars Program available. This money, donated by William Porter, allows us to give scholarships to deserving students, award students funds to

attend professional conferences or be involved in research projects, and have a dinner together once a year and hear an inspirational graduate of Adams speak about their journey.

The department engages in many High Impact Practices in alignment with this initiative such as undergraduate research, internships, collaborative assignments and projects, providing teaching assistantships, requiring writing-intensive courses, and capstone courses. We also have 3 Chemistry scholarships available. These scholarships and awards help to defray the cost of the students' education, allowing them to come and remain and Adams. This is only possible because faculty work on the committees that award money.

In addition, we give our students access to instrumentation that the students would not expect to find at an institution of this size. Examples are HPLC, atomic absorption and Mass Spectrometry.

Initiative 4.2. Clearly communicate costs and resources. The faculty encourage students to access free resources available to them. This includes tutoring, library resources, and career services. We also encourage students to check-out calculators, iPads, and laptops from the STEM center.

Initiative 4.3. Better utilize financial aid resources. All of our laboratory manuals are written in-house and available to students online to print as a means to reduce costs. The faculty try to find cheaper options for textbooks when available. Extra copies of textbooks are put on reserve on the library and old editions of books are available to students in the computer lab on the third floor of Porter Hall.

Goal 5. Community Relations.

As a Program, we participate in many activities geared towards the STEM education of young people in the San Luis Valley. These activities include mentoring, judging, and serving on the board for the San Luis Valley Regional Science fair. We willingly give out some supplies and copious suggestions for Science Fair projects for folks who call or stop by. It also includes teaching STEM Academies and STEM Saturdays, performing in the annual Magic Show with our senior students, and providing hands-on experience for high school students in health related fields through AHEC (Alamosa Health Education Center). Students in our Program are actively involved in Adams Atoms Chemistry club along with many other campus clubs. Through these clubs they participate in ASU cares day, homecoming events, PALS, hands-on activities after magic show, and many fundraisers. The department creates an annual newsletter (The Adams Atom) highlighting the activities, research, and accomplishments of our faculty and students that is sent to our alumni each year.

Criterion 2. Quality of the Program Outcomes.

1. Results of annual assessment reports.

It is hard to compare the 5 years since the 2012-14 assessments were done by the VPAA with E, A and I, the 2014-15 assessment was done with a slightly different rubric and was graded by the

Assessment Coordinator and subsequent years were graded by the SLAC with yet another rubric. However, if we compare the corresponding questions from 2014-2017 we see that:

For question 1, Information/Evidence/Data Gathered to Inform Department of Student Learning, the numbers are 1.67, 1.62 and 1.86 on a 0-2 point scale. I believe the 1.86 was earned by redesigning our Program goals and Student Learning Outcomes. This work was done in conjunction with Beez Schell, the former Assessment Coordinator. Our new PG's and SLO's now give us better direction to gather and assess data. The reviewers clearly saw this with the comment from an evaluator: "This department did a commendable job of collecting data to support the achievement of SLO's and Program goals. There were two goals evaluated this year but they both seemed to focus on senior level student learning." Previous years gave E in this category.

For question 2, Planned Actions Based on Discoveries About Students and Their Learning, the grades are: I, A, 1.17, 1.37, 1.71. Again, note the dramatic rise in grade for 2016-17.

For question 3(a), Departmental Discussion of Information – Faculty Involvement, the grades are: 1.5, 2, 2. This is a very high average, indicating that the Program as a whole meets to discuss the information and are all involved each year. This is not a real surprise to us; Chemistry has always been an extremely collaborative Program and we learned from our mistakes of 2012 where received an "incomplete" in this category.

For question 3(b), Departmental Discussion of Information – Quality of Discussions, the numerical scores are: 1.5, 1.875, 2. This is nearly as high as above, indicating that we are working towards making sound decisions for the future and are working together to improve our Program. Again, we took the "incomplete" to heart in this category and greatly improved.

For question 4, Support/Resources, The numerical scores are: 1.17, 1.75, 1.857. We worked to better -align our Requested resources with evidence. A reviewer comment from 2014/15 was: "Stated resources needs are not line with discoveries. For instance, how does a strategy to reduce cheating relate to the assessment findings?"

Overall, the evaluators seemed pleased with our recent assessments, but there is room for improvement. The results of each assessment are shared with the faculty in preparation for better assessment in the future. We have shown how capable we are of doing this.

2. Scores of graduates on National Assessments.

In Chemistry the assessment that we use for our seniors is the DUCK. The Diagnostic of Undergraduate Chemical Knowledge is a National exam prepared by a committee of the American Chemical Society. This exam tests all areas of chemical knowledge and does so through a series of scenarios that include lecture and laboratory knowledge. Please see the percentile information in the table below:

Year	Number of Students	Average Percentile
2012/13	6	59.5
2013/14	2	51
2014/15	9	37
2015/16	4	21
2016/17	5	25.6
2017/18	5	47

The averages are somewhat low in some years and have a great deal of variation from year to year due to the low numbers of students in our senior seminar course. However, realize that the percentile rating means that this year, as a whole, our students did better on the exam than 47% of the students who took that exam that year across this country. We saw a dramatic increase this past year in scores as we attempted to motivate students to do well on the exam by giving them extra points in the seminar capstone course if they scored well.

3 and 4. Jobs Secured by graduates and Admission and admission rates to graduate or professional schools.

The table below was compiled by all members of our Program. It is what we know about our graduates. We have not been keeping records of the admission rates to graduate and professional schools, and so we do not have that data, but it appears that of the 65 graduates listed below, 16 are unaccounted for and 22 were admitted and attended graduate or professional school. Information gathered on jobs/graduate school/professional is shown below:

Graduation Year	Semester	Degree	post-graduation info
2007	Spring	B.S. Biochemistry	
2007	Spring	B.A. Chemistry Secondary Education	was teaching in Sargent
2007	Spring	B.A. Chemistry Allied Health	was teaching in the valley
2007	Spring	B.A. Chemistry Allied Health	
2007	Spring	B.A. Chemistry Allied Health	
2007	Spring	B.S. Biochemistry	
2007	Summer	B.S. Biochemistry	
2008	Spring	B.A. Chemistry Allied Health	
2008	Spring	B.S. Biochemistry	Medical School
2008	Spring	B.S. Biochemistry	MS in the Masters Plus Program at ASU, Teaching chemistry at Alamosa high school

2008	Spring	B.S. Chemistry	
2008	Spring	B.S. Chemistry	
2008	Spring	B.S. Chemistry, Secondary Licensure	
2008	Spring	B.S. Biochemistry	Pharmacy school, currently in Alamosa at City Market Pharmacy
2008	Summer	B.S. Chemistry	Masters Plus at ASU, was teaching in Bailey, CO
2008	Fall	B.S. Biochemistry	graduate school in chemistry
2008	Fall	B.S. Chemistry	Analytical Chemistry - Biomass Research Technician at National Renewable Energy Laboratory
2009	Spring	B.A. Chemistry	
2009	Spring	B.S. Chemical Physics	Living in Sioux City, Iowa, working at quality assurance, masters from University of Oregon
2009	Spring	B.S. Chemical Physics & B.S. Math-Physics	
2009	Spring	B.S. Chemistry	Was working on PhD in Denton, TX.
2009	Spring	B.S. Chemistry	Living in Logan, Utah, working as a radiology tech in a hospital
2009	Spring	B.S. Chemistry	PhD in chemistry as CSU 2014, worked in Fort Collins a senior scientist at Symbios Technology. Now in San Fran and Analytical Development Scientist for Memphis Meats
2009	Spring	B.S. Chemistry	
2010	Spring	B.S. Biochemistry	
2010	Spring	B.A. Chemistry Allied Health	MD from Dominica, Doctor at University of Massachusetts Memorial Medical Center
2010	Spring	B.A. Chemistry	was working at Alta Fuels.
2010	Spring	B.S. Chemistry	Graduate School - U. of Tenn. Knoxville, Research Assistant Professor at UT Institute for Nuclear Security
2010	Spring	B.S. Chemistry	Pharmacy school at East Tennessee State, was a Pharmacist for a few years, currently working on a PhD at University of Tennessee, Knoxville
2010	Spring	B.A. Chemistry Allied Health	Pharmacy school at Anshutz
2010	Fall	B.S. Biochemistry	was working in instrument sales out East
2010/11	Spring	B.S. Chemical Physcis	M.S. in Organic, now out east.
2010/11	Spring	B.S. Chemistry	was working at Pfizer in Northern Colorado
2010/11	Spring	B.S. Biochemistry	went to Pharmacy school
2010/11	Spring	B.S. Biochemistry	Zookeeper at Cheyenne Mountain Zoo in Colorado Springs
2011/12	Fall	B.A. Chemistry Allied Health	
2011/12	Spring	B.S. Biochemistry	M.S. from U. of Utah. Transitioned to tech career and is currently getting second M.S. from Georgia Tech in computer science and working full time.

2011/12	Spring	B.S. Chemistry	grad school in Analytical Chemistry at University of Denver
2011/12	Spring	B.S. Chemistry	Ppharmacy school at the University of Colorado Denver Skaggs School of Pharmacy and Pharmaceutical Sciences, currently a clinical pharmacist at SLV health in Alamosa
2012/13	Fall	B.S. Biochemistry	Paramedic Cert., EMS in Alamosa, now working on Masters cert in Medical Physiology at U of Florida, wants to apply for med. school this spring.
2012/13	Fall	B.S. Biochemistry	Went to Pennsylvania college of optometry, going into practice in Monte Vista
2012/13	Spring	B.S. Biochemistry	Studied at Colorado Center for Medical Laboratory Science
2012/13	Spring	B.S. Chemistry	working at NREL
2012/13	Spring	B.S. Chemistry	was working for a forensic drug analysis company in Northern Colorado, now QC Analyst at Pfizer
2012/13	Spring	B.A. Chemistry	MS at NM Tech. Working at Alonza Company in Bend Oregon, a contractual pharmaceutical company
2013/14	Spring	B.A. Chemistry	lab technician Phillips 66 in Bartlesville, Oklahoma
2013/14	Fall	B.A. Chemistry Allied Health	works at Starbucks
2013/14	Spring	B.S. Biochemistry	was a lab tech at TSJC, currently studying Culinary Arts at CNM Central New Mexico Community College
2013/14	Spring	B.S. Biochemistry	Chemist - Fontem Ventures in North Carolina
2013/14	Fall	B.S. Biochemistry	CEO at Sharks with Lasers, LLC in Denver area
2014/15	Spring	B.S. Chemistry	PhD candidate at UC-Riverside, organometallic and surface chemistry
2014/15	Spring	B.S. Chemistry Secondary Licensure	Teaching middle School in Alamosa
2014/15	Spring	B.S. Biochemistry	
2015/16	Fall	B.A. Chemistry Allied Health	Applying to Grad school
2015/16	Spring	B.S. Chemistry	
2015/16	Spring	B.S. Biochemistry	
2015/16	Spring	B.A. Chemistry Allied Health	
2015/16	Spring	B.S. Biochemistry	
2015/16	Spring	B.S. Biochemistry	Taking classes at TSJC and planning on applying to Pharmacy School
2015/16	Spring	B.A. Chemistry	working at ASU as an admissions counselor
2015/16	Spring	B.S. Biochemistry	MS in biomedical science at Regis University
2016/17	Spring	B.S. Chemistry	detention deputy at Conejos County Sheriff's office
2016/17	Spring	B.A. Chemistry Secondary Education	

2016/17	Spring	B.S. Biochemistry	Accepted to Pharmacy School, U of Utah
2017/2018	Fall	B.S. Biochemistry	taking classes to apply to PA school this spring

Criterion 3. Demand for the Program. In Chemistry, as in most areas, the number of student credit hours that we teach has declined over the years. In 2012/13 it was 2230, in 2013/14 it was 2142, in 2014/15 it was 2205, in 2015/16 it was 2027 and in 2016/17 it was 1912.

1. Internal Demand: Induced Course Load Matrix.

Service to Other Areas. Chemistry offers a number of courses that were designed solely to serve other disciplines. Examples are Introduction to General, Organic and Biological Chemistry (for Pre-Nursing, 48 students/fall), Introduction to Chemistry (Wildlife Biology, Geography and Pre-nursing, ~30 students/fall/spring) and Introduction to Organic and Biological Chemistry (Wildlife Biology majors and Pre-nursing, 9 students/this spring). We have other courses that serve our students as well as students from other disciplines. Our General Chemistry Course is designed for Chemistry students, but is enjoyed by Biology, Geology, HPPE and other STEM students (110/this fall, 62 this spring). Our Organic Chemistry course (~25/fall, ~18/spring) is also enjoyed by Chemistry, Biology and HPPE students. Biochemistry is populated by Chemistry and Biology Students (~12/fall, ~9/spring). Physical Chemistry is about equally populated by Chemistry and Math/Physics students (~4/fall/spring). Thus, if one studies the Induced Course Load Matrix, they see that the students taking the most Chemistry hours, are not Chemistry students, but instead, in order are: BIOL, HPPE, CHEM, NURS, and MATH.

Service to General Education. Chemistry offers a number of courses that are guaranteed transfer General Education courses. Introduction to Forensic Chemistry is a popular offering that is only suitable for General Education (48 students whenever our schedule allows us to offer it), but we also offer Introduction to Chemistry and General Chemistry for this purpose. In addition, if a student changes their major from Pre-Nursing to another area, the chair will substitute Introduction to Chemistry for the Introduction to General, Organic and Biological Chemistry they took as a General Education science course.

2. Employment Opportunities: National and State Statistics.

State and National Trends for Employment of Chemistry (Bachelor's degree only)

	2016 Employment	2026 Projected Employment	% Employment Change	2016 Median Income
National*	88,300	94,000	+8.6%	\$73,740
Colorado**	1,935	2,341	+20.98%	

* <https://data.bls.gov/projections/occupationProj>

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<https://www.colmigateway.com/vosnet/analyzer/results.aspx?session=occproj&pu=1&plang=E>

This indicates that the need for chemists is high and looks to increase both on the State and National level.

3. 10-year trend of graduates at ASU. The information for Chemistry graduates is shown in the table below:

	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Chemistry (BS)	1	6	2		3	2		1	2	1
Chemistry/ Allied Health	1	1	2		1		1		1	1
Chemistry/ Science Education	1							1		1
Chemistry (BA)	1	1	1			1	1		1	
Chemistry: Biochemistry	3	2	2	5	1	3	3	2	3	2
Chemistry: Chemical Physics BS		1		1						1
Total	7	11	7	6	5	6	5	4	7	6

It appears that if we ignore 08/09 that the number of graduates in Chemistry is fairly unchanged over the years. In fact, if we drop the high of 11 and the low of 4 we have an average of 6.1 +/- 0.7. B.S. Chemistry: Biochemistry has the highest number of graduates over the 10-year period with a total of 26, followed by B.S. Chemistry with 18, followed by B.A. Chemistry, Allied Health with 8, B.A. Chemistry with 6, and tied for last are Chemistry/Science Education and Chemistry: Chemical Physics each with 3. **The grand total of graduates for 10 years is 64.**

4. National, State and local enrollment trends. The information below is from the CDHE concerning the number of Bachelor's degrees awarded. We see that the numbers here are fairly flat at an average of 210 +/- 17, mirroring what we see.

	2011	2012	2013	2014	2015	2016	2017	
Chemistry	175	220	211	229	204	198	234	Trend is mixed, fairly flat

Criterion 4. Size, Scope, and Productivity of the Program.

1. Number of degrees awarded. See the table below for the total number of Chemistry degrees awarded each year:

Year	12/13	13/14	14/15	15/16	16/17
Number of Degrees	6	5	4	7	5

2. **Degrees per full time faculty member.** See the table below for the calculation. 3.75 faculty refers to the years when Chemistry had four full-time faculty, but one person was serving as Program Coordinator and was given a quarter-time release for this activity. The 4.5 listed is when an administrator returned to Chemistry as a full-time faculty member, but simultaneously, a Chemist became the chair of the Department of Chemistry, Computer Science and Math with a half-time release for this activity.

Year	12/13	13/14	14/15	15/16	16/17
Calculation	6/3.75	5/3.75	4/3.75	7/3.75	5/4.5
Quotient	1.6	1.3	1.1	1.9	1.1

3. **Student credit hours.** See the table below for the total number of SCH generated by the Chemistry Program.

Year	12/13	13/14	14/15	15/16	16/17
SCH	2230	2142	2205	2027	1912

4. **SCH generated by Program per full time faculty member**

Year	12/13	13/14	14/15	15/16	16/17
Calculation	2230/3.75	2142/3.75	2205/3.75	2017/3.75	1912/4.5
Quotient	595	571	588	541	425

5. **Service to Campus.** The folks in Chemistry are very active in Campus Service activities, as is evidenced by the table shown below. Chair is bold to indicate it. Designation of ‘Professor #’ is random, but consistent throughout the table.

	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Academic Master Plan				Professor 3 Professor 2		Professor 1, focus area 3 (Chair)
CIELO	Professor 1	Professor 1	Professor 1	Professor 1	Professor 1	Professor 1
Curriculum Innovation Team					Professor 4	
Curriculum Review Committee						Professor 2
EARTH Group	Professor 2 Professor 3	Professor 2, Chair of Recycling	Professor 2, Chair of Recycling Professor 2, President’s	Professor 2, Chair of Recycling Professor 1, Treasurer	Professor 2, Chair of Recycling	Professor 2, Chair of Recycling

			Climate Commitment Professor 1, Treasurer			
Essential Learning Task Force					Professor 2	Professor 2
Evening and Weekend College						Professor 3
Extended Studies Migration						Professor 3
Faculty Development				Professor 1	Professor 1	Professor 1
Faculty Senate		Professor 3 (President)	Professor 3 (President)	Professor 3 (President)		
Faculty to Faculty State Conference				Professor 2		
General Education Coordinating		Professor 2	Professor 2, Chair	Professor 2, Chair		
Graduation		Professor 3	Professor 3	Professor 3		
Health Professions Advisory	Professor 3		Professor 3	Professor 3	Professor 3	Professor 3
High Impact Practices					Professor 4	Professor 4
Institutional Appeals				Professor 3		
Institutional Review Board				Professor 4	Professor 4	Professor 4
Maker Space			Professor 2, Chair and Co-founder	Professor 2, Chair and Co-founder	Professor 2, Chair and Co-founder	Professor 2, Chair and Co-founder
Pre- baccalaureate						Professor 3
President's Cabinet		Professor 3	Professor 3	Professor 3		
Porter Scholars	Professor 3	Professor 3	Professor 1	Professor 1	Professor 3	Professor 3
President's Advisory Group						
Promotion to Professor			Professor 3, (dept Rep)			
Promotion and Tenure	Professor 3 (dept Rep)		Professor 1, Chair	Professor 1, Chair	Professor 1, Chair	Professor 2
Retention and Recruitment				Professor 1	Professor 1	Professor 1
Strategic Planning				Professor 1 (Goal 3)		

Stipend						Professor 3
STEM Grant Steering	Professor 1	Professor 1	Professor 1	Professor 1		
Student Scholar Days			Professor 2	Professor 2		Professor 2
Outside search	Professor 3, HPPE and Nursing			Professor 1, Psychology	Professor 1, Psychology Professor 3 (STEM Coordinator, Admin Asst, Lab coordinator)	Professor 2, Nursing Chair
Total	3/4 of current Professors were on committees	3/4 of current Professors were on committees	3/4 of current Professors were on committees	4/4 of Current Professors were on committees	4/4 of current Professors were on committees	4/5 of current Professors were on committees
Fraction that are Chair of one or more committee	0% Served as Chairs	50% Served as Chairs	75% Served as Chairs	75% served as Chairs	50% served as Chair	50% served as Chair

One might notice that we do not see “Professor 4” taking part in committee work until 2016/17. This is because this professor was not hired until that time. This Professor’s predecessors may have been involved in committee work, but we do not know what that was.

6. Service to the Community and Community Engagement. The designation for “Professor #” is the same as in the table above.

Professor	12/13	13/14	14/15	15/16	16/17	17/18
Professor 1	Magic Show PALS workshop AHEC Workshop Summer STEM Academy Science Fair Board Science Fair Judge	Magic Show Science Fair Board	Magic Show AHEC Workshop Science Fair Board Science Fair Judge STEM Saturday	Magic Show State Science Fair Judge STEM Saturday	Magic Show STEM Saturday	Magic Show State Science Fair ASU Scholarship Judge
Professor 4				Magic Show	STEM Saturday SLV Area Health Education Center (2 sessions) Magic Show Science Fair Judge	STEM Saturday Magic Show Science Fair Judge

Professor 3	Science Fair Judge Team Leader Magic Show	Science Fair Judge Team Leader Magic Show	Science Fair Judge Team Leader State Science Fair ASU Scholarship Judge Magic Show	Science Fair Judge Team Leader Magic Show State Science Fair ASU Scholarship Judge	Science Fair Judge Team Leader Judge at AHS Speech and Debate Meet Magic Show	Science Fair Judge Team Leader Judge at AHS Speech and Debate Meet Magic Show
Professor 5					Science Fair Board Pearl Lake Trout Club	Science Fair Board/Judge Magic Show
Professor 2			Maker Space Science Fair Judge Magic Show	Maker Space Science Fair Judge Magic Show	Maker Space Science Fair Judge Magic Show	Maker Space Science Fair Judge Magic show

Criterion 5. Cost and Benefit of the Program.

1. Salaries and Program Delivery Costs (Including Administrative Costs and specialized Course Support Costs.)

The table below illustrates the costs to deliver our Program:

Description	Cost
Faculty Compensation	\$338,141
Faculty Benefits	\$123,690
Student Hourly Compensation	\$2,221
Operating Expenses	\$9124
Lab Support Position (with benefits). Shared between Chemistry and Biology Programs	$\$34,944/2 = \$17,472$
Administrative Position for Porter Hall (with benefits). Shared between 4 Programs	$\$53,311/4 = \$13,328$
Porter Hall Budget, shared between 4 Programs	$\$10,236/4 = \2559
Course-Specific Fees for Chemistry	\$6,544
Allocation from Chemistry Gift Fund to pay for seminar snacks, our annual Magic Show and our annual Departmental Newsletter	\$1,000
Total	\$514,079

One thing of note: This data is for 2016/17. It was during this time that another faculty member joined our department from Administration. Thus, while this data (total cost) is completely

indicative of 2016/17, it may not be completely indicative of years 2014/15 and 2015/16 below, even though it is used in the calculations.

2. Cost/ Full time Faculty Member for the past 3 years.

See the table below:

Year	2014/15	2015/16	2016/17
Calculation	\$514,079/3.75	\$514,079/3.75	\$514,079/4.5
Quotient	\$137,088	\$137,088	\$114,240

3. Cost per Graduate for the past 3 years.

See the table below:

Year	2014/15	2015/16	2016/17
Calculation	\$514,079/4	\$514,079/7	\$514,079/5
Quotient	\$128,520	\$73,440	\$102,816

4. Cost per SCH for the past 3 years.

See the table below:

Year	2014/15	2015/16	2016/17
Calculation	\$514,079/2205	\$514,079/2027	\$514,079/1912
Quotient	\$233	\$254	\$269

5. Revenue Generated by the Program, Not Tuition and Fees.

- a) **Grants.** The outside funded grants that professors in Chemistry have received are shown below. The title of "Professor #" is random and does not correlate to that seen previously.

Professor 1. 8/16. NSF ADVANCE Grant. **\$249,571 total funding, \$45,847 indirect cost.**

Professor 2. Fall/16. Travel grant from the International Activities Committee, Division of Chemistry Education, ACS, **\$1500.** Fall 17/Spring and Summer/18. Travel grant for a pre-conference workshop for Gordon Research Conference on Visualization in Science Education, **\$500.** Travel grant from cCWCS Chemistry Community, Collaborations, Workshops, and scholars) NSF funded project, Georgia State University, 2017, **\$842.**

Professor 3. The CoWyAMP grant (Colorado/Wyoming Alliance for Minority Participation) is an NSF grant. CSU is the lead institution and Rick Miranda is the CSU PI. PI for the sub-recipient institution of ASU with a yearly budget of \$32,000. **Over the course of the five years of grant, we were awarded \$160,000.**

Total for the last 5 years is \$412, 413.

b) **Donations.** The donations over the last three years to Chemistry-related areas has been quite generous. Here we will just add the three years of donations together for each area:

Chemistry Gift Fund: \$6,825

ASU Emeritus Faculty Scholarship: \$450

Kay Watkins Scholarship: \$24,265

Tim and Peggy Walter Chemistry Scholarship: \$1,500

Total: \$33,040

6. Formal and Documented Recruiting Efforts by Program Personnel. All five professors in the Chemistry Program have served as San Luis Valley Regional Science Fair Team Leads for judging at the Science Fair every year that they have worked for the department. (Our Adjunct has also.) Two have served as Judges for ASU Scholarships at the State Science fair. Two have mentored high school students doing Science Fair. All have assisted with and performed in our Annual Magic Show for the community. Three have taught labs for High School Students through the Alamosa Health Education Center. Three have been involved in STEM Academies and four have taught STEM Saturdays. Two have been involved in New Student Orientation, and one is very involved with the STEAM shop (Maker Space). While we have no documentation that any of these important activities has resulted in success of recruiting students to ASU, we have little doubt that our efforts have resulted in the enrichment of lives and in more Valley children showing interest in STEM activities, and this is rewarding, indeed.

Criterion 6. Faculty and Program Strengths and Accomplishments

In the Chemistry Program we have 5 full-time faculty; 3 that teach full loads, 2 that teach half-loads = 4 full load faculty. We have an adjunct that teaches on occasion.

All Tenured/Tenure Track professors have a Ph.D. in their discipline or in a related discipline. Our adjunct has a Master's in Organic Chemistry. All are at or above the minimum required by HLC.

1. Faculty credentials, skills, flexibility, breadth and depth.

In Chemistry we are very specialized. While we can all teach some lower divisional courses, we do not have a great deal of overlap at the upper levels and even at some lower divisionals. The Professor designation is random. Courses one could teach, but have not is shown in parentheses.

Professor	Degrees	Rank	Area of Specialty	Courses taught/(could teach)
1	Ph.D. Chemical Education. Master's Organic Chemistry	Assistant Professor	Organic and GOB/Intro to OB	Intro to Forensics, GOB, Intro to Chem, Intro to OB, (General Chemistry I and II)

				Organic, (Science Education Methods)
2	Ph.D. Biochemistry	Professor	Biochemistry and GOB/ Intro to OB	(Intro to Forensics), GOB, Intro to Chem, Intro to OB, General Chemistry I and II, Biochemistry, (General Biology)
3	Ph.D. Chemical Physics	Associate Professor	Physical Chemistry, Physics and Instrumentation	Intro to Forensics, Intro to Chem, General Chemistry I and II, Instrumentation, Inorganic, Thermodynamics, Quantum Mechanics, General Physics I and II, (other Physics courses)
4.	Ph.D. Chemical Education Master's Analytical Chemistry	Professor	Analytical Chemistry and Inorganic Chemistry	Intro to Forensics, GOB, Intro to Chem, General Chemistry I and II, Instrumentation, Inorganic, (Science Education Methods.)
5	Ph.D. Analytical Chemistry	Professor	Analytical Chemistry and Instrumentation	Intro to Forensics, Intro to Chem, General Chemistry I and II, Analytical, Instrumentation, (Inorganic)

2. Quality of the curriculum

The American Chemistry Society has a set of requirements for accreditation of chemistry programs. The chemistry program at Adams State meets and exceeds many of the criteria that relate to the quality of educational experiences (including laboratory instruction and capstone classes), number of graduates, curriculum requirements, and frequency of course offerings. However, due to limited funding and heavy service obligations, the chemistry program does not meet the requirements that specify the number of contact hours, instrumentation support, hygiene officer, and library subscriptions. Thus we are not able to offer an ACS accredited degree.

3. Quality of physical, online, or other resources (equipment, software, facilities, etc.) required to deliver the program.

We have a great deal of high quality equipment/instrumentation available for students to use. Most has been purchased using grant funding. I will break down our holdings into three categories:

Shared facilities: We have 3 stockrooms which are well stocked with chemicals and maintained by our Lab Manager, 3 teaching laboratory spaces, an independent study laboratory space and an instrumentation room (detailed below). We share the interdisciplinary research lab with the rest of the building. Porter Hall features a water deionizer, house vacuum and compressed air for our use.

Shared instrumentation/ equipment in labs: We have 3 refrigerators, 5 melting point apparatuses, many balances, 6 Vernier boxes (and probes that work with them), several Geiger Counters, 3 Ocean Optics UV/Vis spectrometers, 6 laptops, 6 pH meters, two drying ovens, 1 ice maker, standard and specialty glassware, a printer, and 2 roto-evaporators.

Shared instrumentation in the Instrument Lab: Here we have research-grade instrumentation. We have High Performance Liquid Chromatography (HPLC), Atomic Absorption (AA), Gas Chromatography (GC), 2 muffle furnaces, Fourier Transform Infrared Radiation Spectrometer (FTIR), Scanning Fluorometer, UV/Vis Spectrometer, Refrigerated Centrifuge, GC-Mass Spectrometry, cyclic voltammeter, Nuclear Magnetic Resonance (NMR), and some lasers. The FTIR was purchased using University funds, the rest were purchased by grant funds.

There are other specialty instrumentation/equipment in laboratories that are specific to the course, like bomb calorimeters for Physical Chemistry or protein purification columns and fraction collectors for Biochemistry.

What is required to deliver the program? This is hard to say. We know that the students will complain in their student evaluations of our courses if they find the equipment old or instrumentation hard to use. We also know that many of our instruments are old and break down regularly, specifically the HPLC, AA, GC, and NMR. There are times when these are unavailable for student-use, but we eventually get them all up and running again, hopefully in time for each cohort of students to use.

We strive to insure that our Chemistry majors have the opportunity to learn to use every instrument we own. Our graduates tell us that this opportunity helps them to get jobs and to do their future jobs well.

Criterion 7. Future Potential of the Program.

1. Opportunities to strengthen the Program to benefit the University. We have many high-grade instruments and much analysis expertise. We could analyze chemical samples for companies or individuals in the community. This would allow us to bring in money to the department and help our neighbors with their analyses. We could also use this as a training opportunity for students and have students do the actual analysis, giving them an ASU Internship opportunity.

The department has been establishing MOU's with local Business and Government agencies (hopefully soon) the past year and a half to further expand internship opportunities locally with the intent of expanding this through alumnus to have internship positions across the country. Not

only are internships a HIP, they also serve to attract HS and transfer students into the Program. In order to be successful, the internship opportunities will need to be marketed via a user friendly website and social media outlets.

2. Potential for Program growth/adaptation with trends in the discipline, student needs, national trends, etc. One possibility would be to offer an associates degree level chemical technician Program. (CIP 41.0301). Many small businesses and governmental agencies (hemp farms, Bureau of Rec, etc) need qualified analysts but they don't necessarily need a BS trained chemist. A search of CCHE website did not yield any Programs under this CIP number. A significant majority of the curriculum could be offered at a distance with the hands-on lab based portions being offered in the evening, on weekends, or in short summer intensives.

We currently do not offer an ACS degree in chemistry to our students as was outlined earlier in the document. We could strive to do this, but this probably isn't cost effective as the ACS guidelines are very strict concerning the number of contact hours that a faculty member can have per week, the type and quantity of courses being offered, library resources, research opportunities, etc.

3. Potential for development of appropriate online presence. Chemistry currently does not offer online courses but we are more than willing to develop a course if it is believed that there would be a demand for it and that it would be of high quality. We could design a course that you can do lab in your kitchen (for example a course in Food Chemistry), a General Education Course that has no lab (only one general education science course is required by the State to have a lab so there might be demand for this), or a course that has the "lab in a box". Two faculty have taken the TEED course necessary for this endeavor, but because of our heavy loads (see above), and the time required to address the concern about the quality of labs no one has begun this activity.

4. Potential for growth of interdisciplinary Programs. This falls into two categories; new Programs of study and new courses to add to current Programs of study. In terms of new Programs, we thought that maybe students might be interested in a Fermentation Studies Program. We offer chemistry courses and a brewing class, but we figure that students would also need to take courses in Biology, Business and Sociology for this. We also thought that students might be interested in a Forensics Program. We currently plan for our General Education Introduction to Forensic Science course to be included in a Pathway, but we could imagine an interdisciplinary study that would include other Forensic Courses, as well as Criminology. We are less familiar with the Hemp initiatives currently underway, but we are interested in helping with this endeavor. In terms of offering courses of interest to other areas, our Intro to Forensic Science is already enjoyed by Criminology majors, but we could think about courses in "the chemistry of art" or "the science of art materials." Teacher Education is interested in one of our two Chemical Education Ph.D. professors to begin teaching the Science Methods course for them. We would be happy to do this if our load allows. If the associates degree Program chemical technician were expanded to Scientific technician or Laboratory technician it could be an interdisciplinary Program and this might increase the appeal.