

Assessment Report Template (2015-2016)

College: Arts and Sciences

Unit: Chemistry

Degree: B.S. and B.A. in Chemistry

The UNO Assessment Committee is responsible for guiding the process of campus-wide academic assessment of student learning, and to that end it conducts regular reviews of student learning outcome (SLO) assessment in each degree granted. This template is intended as a guideline to help reporting units organize the relevant information.

Assessment reports should answer a few basic questions: 1) How are students different after completing this degree, and what evidence of *student learning outcomes* demonstrates this? 2) How is evidence about student learning outcomes used to inform the unit's decision-making?

Units are asked to indicate whether their SLO assessment practice falls into the domain of Examination, Product, or Performance. Each unit should identify an assessment activity in *at least one of the three domains*, and may opt to report results of assessment activity in more than one domain. Reports should offer detailed results - including an explanation of what counts as a successful outcome, along with evidence of whether that level of proficiency was achieved - and should state how the unit responded to the findings.

- *Examination: includes standardized tests or qualifying exams, content exams, pre- and post-test comparisons, oral defenses, comprehensive exams, exit exams, etc.*
- *Product: includes refereed student portfolios, theses, publications, capstone projects, original creative works, software, apps or programs, etc.*
- *Performance: includes presentations, recitals, exhibits, speeches, demonstrations, field experiences, internships, etc.*

I. Student Learning Outcomes for this Degree

Please define the unit's major goals in preparing students in this degree. The focus should be on learning outcomes that students should know or be able to do upon graduation. Please identify as many objectives as deemed appropriate and state the outcomes to be measured accordingly.

- 1.** Baccalaureate graduates in chemistry will display understanding of the fundamental operations and concepts of chemistry.

2. Baccalaureate graduates in chemistry will be able to gather information from the various sources of chemical literature.

3. Baccalaureate graduates in chemistry will be able to evaluate chemical data and information.

4. Baccalaureate graduates in chemistry will be able to apply their knowledge, experiences and skills to deal with unfamiliar situations related to chemistry.

II. Methods of Assessment

*For each student learning outcome identified in Section I, please explain the element or artifact that is measured to assess it, and state the method of assessment employed. If desired, a table like the samples below may be used as an aid in compiling information. Under "Assessment domain", please identify whether the assessment activity best fits into the area of **Examination, Product, or Performance**.*

SLO addressed (from Section I)	Baccalaureate graduates in chemistry will display understanding of the fundamental operations and concepts of chemistry.
Element or artifact measured	Depth and breadth of chemistry knowledge
Assessment method	Exams graded according to a scale.
Assessment domain	Examination
Students assessed	Graduating Chemistry majors, Fall/Summer/Spring 2015-2016; 6* *6 graduates, 5 assessed. The one B.A. graduate was a student who completed requirements many years ago and just filed for graduation. This person was not on campus during this academic year.
When and by whom administered	Major Field Exam in Chemistry; Testing Center
Proficiency target	On average, students will do as well or better than students nationwide on standardized exams.

SLO addressed (from Section I)	Baccalaureate graduates in chemistry will be able to gather information from the various sources of chemical literature.
Element or artifact measured	Produce passing reports or poster presentations including references from the chemical literature.
Assessment method	Faculty grade the reports/poster presentations. Posters may also be graded by professionals outside of UNO
Assessment domain	Product
Students assessed	Graduating Chemistry majors, Fall/Summer/Spring 2015-2016; 5* see note in first block
When and by whom administered	These activities took place at various stages throughout their UNO career; primarily Physical Chemistry I & II, Biochemistry I, Medicinal Chemistry, and independent research projects.
Proficiency target	100% complete and judged satisfactory by reviewers.

SLO addressed (from Section I)	Baccalaureate graduates in chemistry will be able to evaluate chemical data and information.
Element or artifact measured	Chemistry majors will satisfactorily present results from research or critique a primary journal article in a forum attended by chemistry faculty, as judged by clarity of speech, logical order of presentation, satisfactory understanding of the science, ability to explain the science and the ability to answer questions.
Assessment method	Presentations/written reports at UNO are graded either by a team of faculty/chemistry professionals according to a rubric; the research advisor for research projects; or the faculty member in charge of the course.
Assessment domain	Performance

Students assessed	Graduating Chemistry majors, Fall/Summer/Spring 2015-2016; 5* see note in first block
When and by whom administered	These activities took place at various stages throughout their UNO career; primarily undergraduate research at UNO or at a professional scientific meeting (2 of the graduates presented at the American Chemical Society Midwest Regional Meeting in Oct. 2015); or Physical Chemistry I & II and Biochemistry I & II.
Proficiency target	100% passing; acceptable performance at scientific meetings but there is no single grading rubric for these presentations.

SLO addressed (from Section I)	Baccalaureate graduates in chemistry will be able to apply their knowledge, experiences and skills to deal with unfamiliar situations related to chemistry.
Element or artifact measured	Chemistry majors will gain exposure to chemistry outside of the classroom by attendance at local, regional or national professional meetings, participation in Chem Club or such student professional groups, internships or undergraduate research.
Assessment method	Presentations/written reports at UNO are graded either by a team of faculty/chemistry professionals according to a rubric; the research advisor for research projects; or the faculty member in charge of the course.
Assessment domain	Performance
Students assessed	Graduating Chemistry majors, Fall/Summer/Spring 2015-2016; 5* see note in first block
When and by whom administered	These activities took place at various stages throughout their UNO career, including 3 who did research for course credit and/or FUSE, 2 ACS MWRM presentations as previously mentioned, 1 student worked for UNO Environmental Health Services collecting used

	chemicals for disposal, 2 were UNO Chemistry stockroom employees.
Proficiency target	80% participation activities outside the classroom; 100% acceptable performance in internships and research.

III. Results

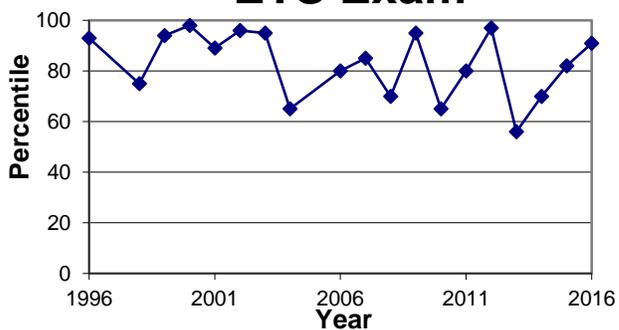
- I. Baccalaureate graduates in chemistry will display understanding of the fundamental operations and concepts of chemistry.

Included below are individual (table) and group (graphs) results for the graduating Chemistry Majors on the Major Field Exam (MFE) in Chemistry. Group results for the most recent class are included as the last data point of the history of student results. Individual scores for Critical Thinking and Biochemistry are not reported by the MFE. The overall goal was met, with this student group scoring in the 91st percentile overall, which is slightly above our group median of the 85th percentile over the past 20 years.

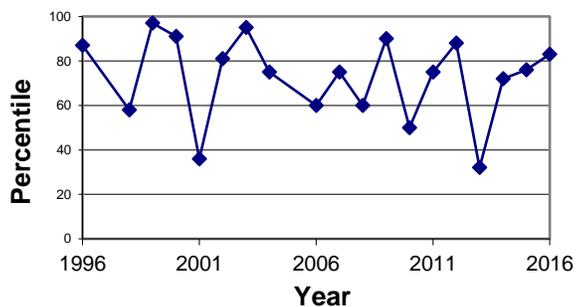
Individual Results					
(Percentiles shown for individual students overall in 4 subdisciplines)					
Year	Overall %	Physical	Organic	Inorganic	Analytical
2015-2016	96	92	98	83	97
	93	57	94	95	84
	89	75	92	91	80
	81	85	65	78	88
	64	75	71	52	33
	64	34	80	66	63
	34	49	19	29	41

Note: Exams are taken as a group and those students expected to graduate, but who did not are included. This is why they may not match exactly to our graduating class.

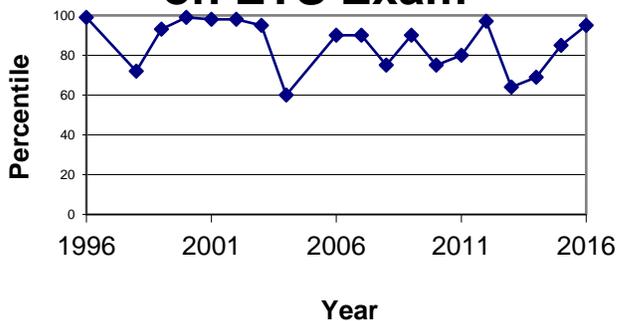
Overall Group Score on ETS Exam



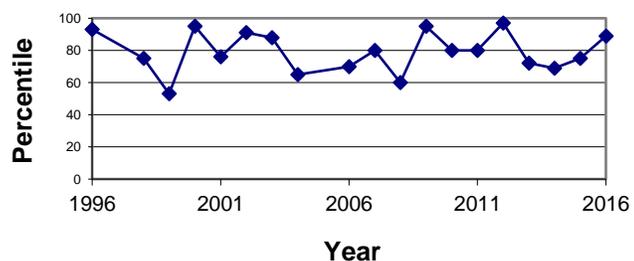
Group Physical Score on ETS Exam



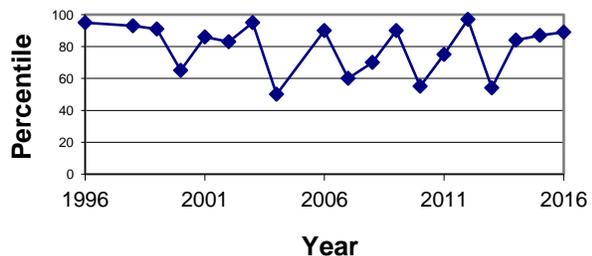
Group Organic Score on ETS Exam



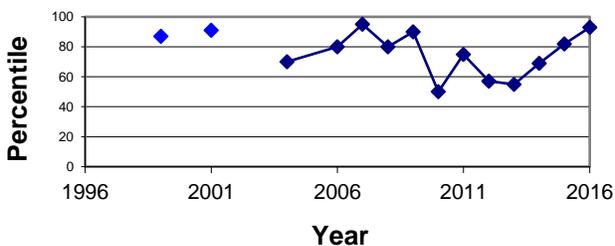
Group Inorganic Score on ETS Exam



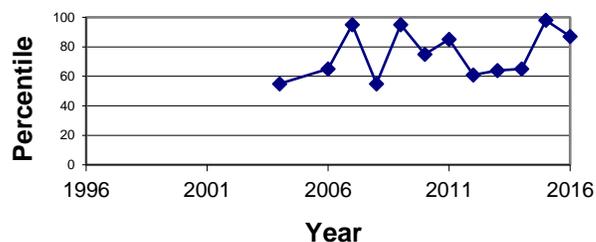
Group Analytical Score on ETS Exam



Group Critical Thinking Score on ETS Exam



Group Biochemistry Score on ETS Exam



- II. Baccalaureate graduates in chemistry will be able to evaluate chemical data and information.

5/5 chemistry majors graduating during the 2015/2016 academic year were documented to have written acceptable papers. *The overall goal was met.*

- III. Baccalaureate graduates in chemistry will be able to evaluate chemical data and information.

5/5 chemistry majors graduating during the 2015/2016 academic year were documented to have satisfactorily presented results from their research or from a primary journal article. *The overall goal was met.*

- IV. Baccalaureate graduates in chemistry will be able to apply their knowledge, experiences and skills to deal with unfamiliar situations related to chemistry.

4/5 chemistry majors graduating during the 2015/2016 academic year were documented to have participated in chemistry activities outside the classroom including 3 who engaged in research for course credit or FUSE. *The overall goal was met.*

IV. Analysis and Response

The standardized test scores demonstrate a very good knowledge of subject material by chemistry majors. Chemistry majors consistently score above the national average standardized exams, on many occasions well above the national average. Aggregate scores on the Major Field Exam in Chemistry reveal differences from year to year, but this variation is to be expected with the small number of majors who take the exams each year. The overall trends demonstrate consistent excellence over 20 years.

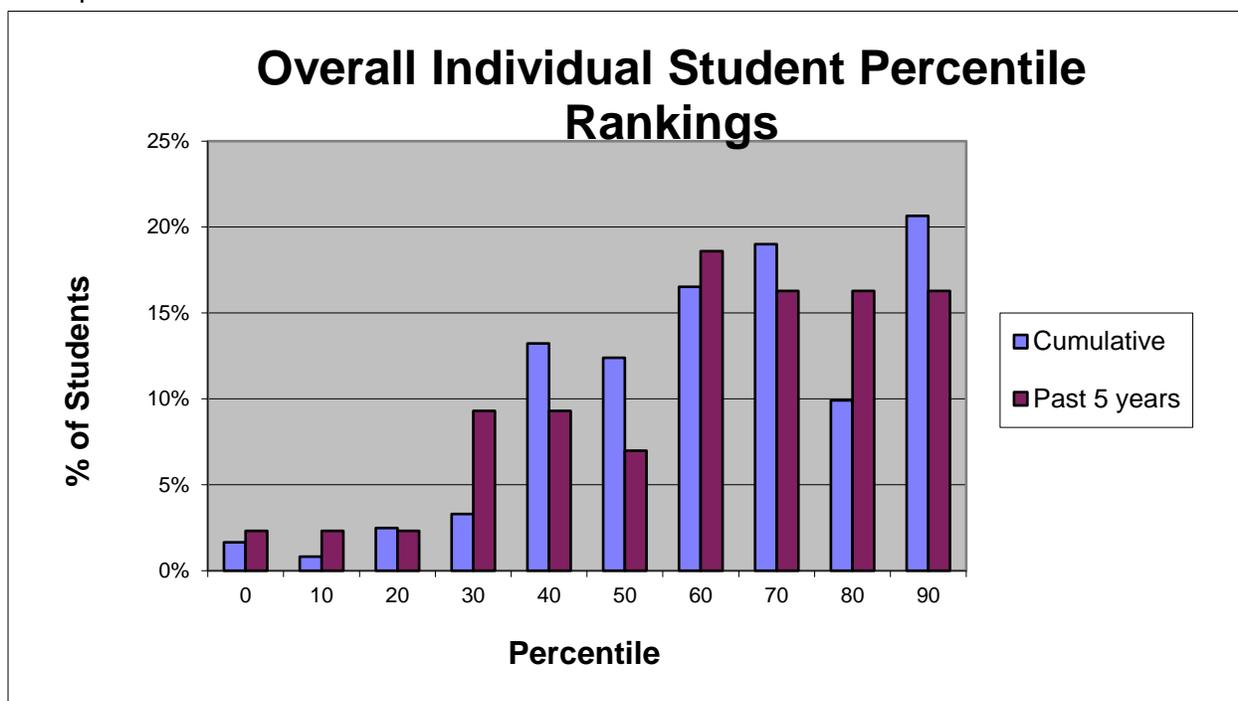
Chemistry majors are gaining valuable experience outside the classroom, being engaged in research, presenting research results (both in writing and orally), becoming involved in internships, attending scientific meetings, being active in the UNO Chem Club. These activities provide insight to the applications of chemistry they might not otherwise learn and improve their ability to critically evaluate information. We will continue to encourage students to be active in these areas and plan to provide more opportunities to be engaged in chemistry outside of our department. The student responses indicate they are confident in their knowledge of chemistry and their ability to apply chemistry in their next endeavor.

From the data we have, our majors are doing well finding employment or acceptance into professional and graduate programs. We have begun to better track our recent graduates to learn more about how well prepared they were for the challenges of the workforce or their postgraduate education.

We are pleased that the rigor of the chemistry program has allowed students to learn chemistry and leave UNO confident in their abilities. We need to be vigilant to collect student interview data each year and start collecting information from our graduates to improve our assessment procedures.

V. Reflection and Future SLO Assessment

In addition to the assessment outcomes listed above, the Department of Chemistry has additional assessment measures which include additional standardized test scores, student assessment of their abilities and success post-graduation. With the small numbers of graduates in our department, we look at trends in student responses and performance over time. One example of the way we look at the data is to examine the performance of recent graduates (within the past 5 years) with the performance of all students over the past 20 years. One example is shown below.



This figure and other similar figures demonstrate student performance on the MFE has not changed dramatically in recent years. We have also looked at the students in the Medicinal Chemistry track compared to the “traditional” track and seen no significant difference (data not shown, last analysis ~ 2yrs ago).

Overall trends demonstrate the students have learned chemistry, have applied their knowledge in research and internship experiences, can synthesize and present what they have learned in the lab and literature, and feel confident in their abilities when they graduate.

We will continue to monitor the data and review our assessment tools to see how they can be improved.

Student success in chemistry as defined by the assessment measures used by the Department of Chemistry lines up well with the three goals of the UNO strategic plan. Goal 1 – Student

Centered. Students are central the mission of the department and their academic success is a tribute to the willingness of students to work hard and be willing to stretch their limits by engaging in research and upper level classes. To achieve these goals, the faculty have demonstrated the high priority they place on educating students both in and outside the classroom. Goal 2 – Academic Excellence. Student success on nationally normed standardized chemistry exams provides clear evidence of their academic excellence. In addition, the requirements for presentation of chemical information in multiple venues further strengthens their academic training. Goal 3 – Community Engagement. Although not clearly demonstrated in this assessment report, our expanding internship program allows students to engage with employers in the area. Also majors aid in promoting STEM activities through their volunteer work with Chemistry Field Day for area high school students and chemistry workshops with the Girl Scouts and Girls, Inc. Also we have initiated a program to work with high school chemistry teachers in rural Nebraska to help improve their chemistry education.

There are currently 5 campus priority areas: Doctoral/Graduate Research; Early Childhood/Child Welfare; Global Engagement; Science, Technology, Engineering and Mathematics (STEM) Initiatives, and Sustainability. Let me address each of these.

--Doctoral/Graduate Research. The Department of Chemistry does not have a graduate program, but does have an active undergraduate research program which contributes to overall research at UNO and provides valuable research experience to better prepare students who do enter graduate research programs.

--Early Childhood/Child Welfare. The Department of Chemistry has limited contribution in this area, though two alumni worked on projects related to indoor air quality – a potential issue for day care centers – when they were students. No current projects relate to this topic.

--Global Engagement. The Department of Chemistry is not directly involved in the area of global engagement.

--Science, Technology, Engineering and Mathematics (STEM) Initiatives. Student success in chemistry obviously is a component of success in a field of science. Initiatives to improve student learning are not directly mentioned here, but impact the success of our students. To reiterate, the chemistry graduates are very successful as judged by their test scores and engagement in chemistry-related activities.

--Sustainability. The Department of Chemistry offers no formal training in sustainability to our students. However, by learning about lab safety, proper disposal of used chemical reagents and research in areas such as biofuels, students learn principles that offer a foundation for their understanding of sustainability.

In summary, graduation of well trained, competent and engaged chemists is the highest priority of the Department of Chemistry and also fits in well with the mission of the university and College of Arts & Sciences.

We sent an email survey to alumni who graduated with a chemistry degree from 2013 to 2015 (31 alumni, 27 with current email addresses, 18 replies) and asked them to agree or disagree with the following statement: "I feel my undergraduate experiences in chemistry have allowed

me to perform competently in my post baccalaureate studies or occupation.” 17 of 18 alumni strongly agreed or agreed with the statement. (11 strongly agreed.) Although this is qualitative information, the perception of alumni who have entered the workforce or professional programs is overwhelmingly positive. One alum who is in medical school commented: “...I struggled in anatomy the first 10 weeks, and it was really refreshing to turn it all around when I had 6 weeks of biochem. Even while I am studying for Step 1, I feel like my grasp on chemistry concepts are strong.” Another alum who is working in industry stated, “Overall I agree that my undergraduate experiences have allowed me to perform competently in my job as a QC Analyst. It was nice going into my job with a strong analytical background.”

It is nice to bask in the supportive comments, but not always most help. One theme among the alumni working in industry was they wish they had more “industrial” experience. We have an active internship program, but the comments indicate the importance of the internship for any student planning to start a career in chemistry upon graduation.