

## Department of Chemistry Assessment Plan

The Assessment Plan follows five Program Goals. For each Program Goal, there are one or more Outcome Measures. Bulleted text is used to show correspondence of subparts of Outcome Measures under different table headings.

**PROGRAM GOAL 1:** Students will understand the fundamental basis of the science of chemistry through mastering key concepts in the specific areas of physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and biochemistry following guidelines established by the American Chemical Society for a B.S. degree in chemistry.

Outcome Measures	Data Needed	Group	Assessment: Method	Reporting	Assessment Benchmarks
Understanding of key concepts in: <ul style="list-style-type: none"> <li>• Physical chemistry</li> <li>• Organic chemistry</li> <li>• Inorganic chemistry</li> <li>• Analytical chemistry</li> <li>• Biochemistry</li> </ul>	Demonstration of working knowledge	Students who completed: <ul style="list-style-type: none"> <li>• CHE 360</li> <li>• CHE 232</li> <li>• CHE 215</li> <li>• CHE 342</li> <li>• CHE 344</li> <li>• CHE 372</li> </ul>	1-Overall course GPA  2-Standardized tests: ACS final exam for 215, & 232  3-Exam question tracking* for 342, 344, 360, & 372	Course GPA; exam tracking results*; ACS exam results; reported to Chair at end of semester by course instructors;	1-No huge shifts from hist. GPA's  2- Course average to be within 1 standard deviation of national mean on ACS exams  3- No huge shifts from hist. exam tracking values

\* Exam question tracking (to be implemented): Instructors in CHE 342, 344, 360, & 372 will be asked to pick out five exam questions in key, fundamental concepts in their courses. They will put these questions on an exam or exams, perhaps with some variation in details but not substance, and they will keep track of the class average score on these questions each semester. The class average score will be reported to the Chair of the Department. These will be markers for comparison of student understanding from semester to semester.

**PROGRAM GOAL 2:** Students will develop information and communication skills (oral, written, and computer skills) needed to be a professional chemist.

Outcome Measures	Data Needed	Group	Assessment: Method	Reporting	Assessment Benchmarks
Ability to find and retrieve electronic data and information	Assignments that demonstrate work with electronic data and information	<i>Students in:</i> CHE 251	Attend library resources lecture and literature search assignment	Instructor reports to Chair the percent who succeed in assignment	Achieve 70% of enrolled students successfully completing assignment
Effective at communicating chemical ideas in writing	Assignments that demonstrate clarity and correctness in written expression of technical ideas	CHE 361 CHE 363	Written lab reports	Instructor reports cases of deficient writing	Less than 15% of enrolled students found deficient in any course
Ability to use computer based tools for data analysis, interpretation, and communication	Assignments that demonstrate student abilities with different kinds of computer based tools (e.g., Excel, chem. structure, graphs, simulations)	CHE 230 CHE 361 CHE 316	Homework and laboratory assignments needing specific software tools. ChemDraw-230, Excel-316, 361	Instructor reports cases of inability to use essential software tools	Less than 15% of enrolled students show a lack of ability
Effective at orally communicating their knowledge of chemistry	Participation in Research Symposium or Scientific Conference	CHE 290/299 HON 285/286	Oral/poster presentation	Instructor reports number of participating students	Achieve 50% of enrolled students successfully presenting

**PROGRAM GOAL 3:** Students will develop problem-formulating and problem-solving skills relevant to the field of chemistry

Outcome Measures	Data Needed	Group	Assessment: Method	Reporting	Assessment Benchmarks
Ability to formulate questions in problem areas in advanced courses and apply problem-solving skills to answer questions/problems	End-of-term assignments based on data or concept information calling for problem formulation and solution	<p><i>Students in:</i> CHE 233</p> <p>CHE 251 &amp; 316</p>	<p>Qualitative analysis laboratory</p> <p>Laboratory practical exam requiring students to formulate experimental plan, conduct experiment, and analyze results</p>	<p>Instructor reports to Chair percent of students who succeed in full</p> <p>Instructor reports to Chair percent of students who succeed in full</p>	<p>Achieve 70% successfully identifying unknown</p> <p>Achieve 70% successfully completing laboratory practical exam</p>

**PROGRAM GOAL 4:** Student will develop safe and effective laboratory skills, including those for chemical handling and use of chemical instrumentation.

Outcome Measures	Data Needed	Group	Assessment: Method	Reporting	Assessment Benchmarks
Laboratory activities that require basic chemical equipment and instrumentation	Laboratory work and related assignments that demonstrate equipment/instrumentation skills	<i>Students in:</i> CHE 216 CHE 233 CHE 361	Completed assignments from 10 randomly selected students	Instructor turns in copies of assignments to Chair with assessment	Achieve 75% pass rate for lab courses
Laboratory work that shows safe and effective practices in laboratory procedures, chemical handling and use of equipment	Percent of TAs completing seminar and on-site safety training  Number of lab courses with pre-lab safety talk	Teaching Assistants  CHE 216 CHE 231 CHE 233 CHE 316 CHE 351 CHE 361 CHE 363	Count of completions  Pre-lab safety talks	Reported by Safety Officer  Talks verified by Chair	100% of TAs attending  100% of courses to have pre-lab safety talks
	Lab ejections for unsafe practices	Students in all teaching labs	Count of lab ejections	Reported by instructor at the end of the semester	Less than 40 ejections per semester

**PROGRAM GOAL 5:** Students will learn how to translate their knowledge of chemistry into practice.

<b>Outcome Measures</b>	<b>Data Needed</b>	<b>Group</b>	<b>Assessment: Method</b>	<b>Reporting</b>	<b>Assessment Benchmarks</b>
Completion of supervised, independent work that demonstrates putting knowledge into practice	Number of students in graduating class who successfully complete at least one of the following: CHE 290/ 299 project HON 285/286 HON 395 project CHE 398A01 CHE 398A50 UTA assignment High school student teaching	Graduating seniors	Identify graduating seniors who have completed at least one from the list	By the Chair	Achieve 80% completion rate

## DATA SUMMARY

The table below adds certain details to the “Data Needed” items and indicates the frequency of collection.

Data Needed	Already Available?	Timeline
Overall course GPA: CHE 232, 215, 342, and 360	YES	Every semester
Standardized ACS Chemistry Subject Exams in CHE 215 & 232	YES	Every two years
Tracking five exam questions in CHE 342 344,, 360, & 372	No	Every two years
Success percentage in CHE 351 electronic skills on literature search project	No	Every two years
Deficient writing cases in CHE 361 and 363	No	Every two years
Lack of computer-based tools capability in CHE 230, 316, and 360	No	Every two years
Participation in ISU University Research Symposium	No	Spring semesters
Success percentage in lab practical exams from CHE 233, 251, 316	No	Every two years
Assignments from ten randomly selected students in CHE 216, 233, 361	No	Every two years
Completions of on-site safety training	YES	Every two years
Count of courses with pre-lab safety talks from CHE 216, 231, 233, 316, 361 and 363	YES	Every semester
Count of students ejected from labs for unsafe practices	No	Every two years
Count of students doing independent work	YES	Every two years

## FEEDBACK

Stakeholders and Others	Information Sought	Collection Methods
Current students	(1) Course and instructor satisfaction (2) Advising satisfaction and effectiveness	End-of-semester course evaluations Advising survey every other year
Alumni	Program satisfaction; strengths; weaknesses	Annual Alumni Survey
Employers	Success of students placed from our program	Communication with Chair and the Department's corporate liaison
Graduate and professional schools	Success of students pursuing PhDs elsewhere	Tracking outcome through maintaining contact with students
Professional society	Compliance of program with national standards	Outcome of 5-year accreditation review by the American Chemical Society

## **ANALYSIS AND RESPONSE TIMELINE**

- June 1 Chair reviews submitted data and requests any missing or incomplete items from the prior academic year.
- September 1 Chair submits summary of data and indicates areas of concern to Executive Committee, including any areas of lingering shortfall and/or lack of progress from the prior year's Assessment cycle and action plan.
- October 1 Executive Committee meets and reviews how well Assessment Benchmarks have been met or are approaching the intended performance level for each of the Outcome Measures. Feedback will be incorporated to provide a composite picture of the Department's effort on the five Program Goals. Where there is a substantial shortfall and lack of progress, the Executive Committee will formulate an action plan, which may involve review and change in courses, curricula, facilities, faculty effort, and so on.
- December 1 Any action plans from the Executive Committee will be forwarded to an appropriate faculty committee in the Department (e.g., Courses and Curricula, Facilities, Undergraduate Programs) for further analysis and/or implementation. It is conceivable that some action plans will be directed to the faculty as a whole and will then be discussed at a spring faculty meeting.
- February 1 Committees respond to action plans and submit summary of responses to Chair.
- March 1 Chair and Executive Committee submit Assessment Report to University Assessment Office.
- May 1 Action plan and responses included in the Department's Annual Report which is distributed to faculty.