

Student Learning in the School of Chemistry & Materials Science



SLOA ASSESSMENT GRANT

2014-2015

Why Upgrade SCMS SLOA?



- **Online SLOA only covered these courses**
 - Chemical Connections (1st year)
 - Organic Chemistry II (2nd year)
 - Organic Chemistry II Lab (2nd year)
 - Physical Chemistry I (3rd year)
 - Physical Chemistry Lab (3rd year, writing intensive)
 - Biochemistry Lab (3rd year, writing intensive)
- **There were no assessments for analytical chemistry**
- **The analytical chemistry sequence was changing**

The Plan



- **The analytical team took the lead**
 - One pre-tenure faculty member
 - One tenured faculty member
 - Two lecturers
 - One research professor
- **We decided to focus on two course sets**
 - CHMA 161/165 Quantitative Analysis and Lab
 - CHMA 211 Instrumental Analysis and Lab
- **The assessments to shape course design**

The Timeline



Date	Plan	Actual
January, 2015	SLOA plans were presented to the department	Done
February – April, 2015	The analytical team meets once a month to implement SLOA for two courses	Done
April, 2015	Presentation to SCMS faculty	Done early

Outcomes



1. Define, develop strategies for, and solve conceptual and quantitative chemical problems
2. Apply the scientific method to measure, analyze, interpret and predict chemical phenomena
3. Utilize, interpret and critically evaluate the chemical literature
4. Develop effective laboratory techniques and safe laboratory practices
5. Communicate technical information in written and oral forms
6. Develop team skills including leadership, being an effective team member, and interacting productively within a diverse group of peers
7. Develop the capacity to apply chemical principles and practice to the discovery, interpretation and application of new knowledge

1. Define, develop strategies for, and solve conceptual and quantitative chemical problems



Demonstrate understanding of the mathematical underpinnings of equilibrium and acid/base

▼ **Measure:** Quantitative Chemical Analysis - Composite of Exam Questions
[COS-CHMA-161]
Course level; Direct - Exam

Details/Description: CHMA 161 Quantitative Chemical Analysis. Composite of exam questions pertaining to equilibrium and acid/base chemistry

Acceptable Benchmark: 80% of students receive a grade of C or better.

Implementation Plan (timeline): Collection every three years by faculty teaching courses. COS-CHMA-161 data will be used to assess quantitative reasoning skills. Start Fall 2015.

Key/Responsible Personnel: Department Head

2. Apply the scientific method to measure, analyze, interpret and predict chemical phenomena



Utilize statistical analysis and propagation of uncertainty to validate results

▼ **Measure:** Instrumental Analysis Lab Propagation of Uncertainty in Lab Reports [CHMA 265]
Course level; Direct - Student Artifact

Details/Description: Instrumental Analysis Lab - Results and calculations sections of lab reports

Acceptable Benchmark: 80% of students receive a grade of C or better

Implementation Plan (timeline): Collection every 3 years for faculty teaching courses.

Start in Fall 2161.

Analysis in the Spring.

Key/Responsible Personnel: Department Head

4. Develop effective laboratory techniques and safe laboratory practices



Majors should acquire the following skills:

- 1. Follow Standard Operating Procedures and other written instructions.**
- 2. Accurate and precise preparation of solutions including buffers**
- 3. Synthetic chemical methodology**
- 4. Use of modern instrumentation to analyze results**
- 5. Safe laboratory practice**
- 6. Knowledge of green laboratory practices**

4. Develop effective laboratory techniques and safe laboratory practices



Accuracy and Precision in the Lab

Students will use standard methods to prepare solutions and obtain results using modern instrumentation.

▼ **Measure:** Analytical Methods - Following Protocols in Lab (COS-CHMA-165)

Course level; Direct - Student Artifact

Details/Description: Follow Standard Operating Procedures and other written instructions.

Accurate and precise preparation of solutions including buffers

Accurate and precise results with unknowns

Use modern instrumentation to analyze results

Acceptable Benchmark: 80% or better obtain proper values within acceptable analytical range

Implementation Plan (timeline): Start data collection in Fall 2015. Collect every third year.

Data analysis during the following summer.

Key/Responsible Personnel: Analytical chemistry team.

SCMS head

7. Develop the capacity to apply chemical principles and practice to the discovery, interpretation and application of new knowledge



Choose an appropriate analytical instrumentation technique to carry out an analysis

▼ **Measure:** Instrumental Analysis - course embedded exercises (CHMA 261)

Course level; Direct - Exam

Details/Description: Students will solve an open-ended problem on an exam.

Acceptable Benchmark: >80% of students will receive a C or better on this assessment.

Implementation Plan (timeline): Start in Fall 2016 and repeat every third year during the fall semester. Data analysis during the following summer.

Key/Responsible Personnel: Analytical Chemistry Team
SCMS Head

Progress So Far



- **One Student Learning Outcome from Analytical Chemistry was assessed for the 2015-2016 year**
- **We did not meet expectations.**
- **The analytical team is working on improving performance in the appropriate courses this semester.**