Department of Physical Sciences

Assessment Report
2010-2011

Mission/Purpose
The mission of the Department of Physical Sciences is to provide students with a strong background in the disciplines of physical science and to prepare students for further study in graduate or professional schools or for successful careers in chemistry or related fields. Emphasis is placed on the development of enhanced skills in critical thinking, communication, computer literacy, and modern technology as related to the field of chemistry.

I. Goals and Student Learning Outcomes, With Any Associations and Related Measures, Achievement Targets, Findings, and Action Plans

A. Goal: Address the major education issues of the region
Address the major educational, social, cultural, and economic issues of the region and in doing so promote a positive self-image of the institution and the area.

1. Outcome: Students will demonstrate a working knowledge in their major field of study
Students will demonstrate a working knowledge in the area of their field of study depending upon their major and track within the major.

   Student performance will be measured using standardized exams prepared by the American Chemical Society. These exams will be administered at the end of the General Chemistry and Organic Chemistry series.

      Source of Evidence: Standardized test of subject matter knowledge

      1. Achievement Target: 
      Student performance on ACS exams will improve by set amount each year. New exams will be purchased and administered this year for General and Organic chemistry. The results of the exams for this year will be used as the baseline for determining target for improvement in future years.

      2. Findings (2010-2011) - Achievement Target: Partially Met
      ACS exams have been administered in the General and Organic Chemistry courses. Recent information on the procedures used for established the norms for these exams has raised some concerns over the validity of this data. Further discussion will take place to determine the future of these exams within the department.

2. Outcome: Students will demonstrate the ability to read, evaluate, and interpret information
Students will demonstrate the ability to read, evaluate, and interpret numerical, chemical and general scientific information.

   a. Measure: Analysis of select questions from comprehensive final exams
   The extent to which students are able to successfully demonstrate the ability to read, evaluate, and interpret numerical, chemical and general scientific information will be determined by analyzing average scores on select questions from comprehensive
final examinations in CH 471, Biochemistry, and CH 480 Forensic Chemistry. Selected questions are those that require students to interpret a situation and provide an outcome based on their knowledge of chemistry.

Source of Evidence: Comprehensive/end-of-program subject matter exam

1. **Achievement Target:**
   Students will demonstrate proficiency in reading, evaluating, and interpreting numerical, chemical and general scientific information by obtaining an overall average of 75% or higher on the comprehensive final exam and a 75% or higher on select problems/questions to determine more specific strengths and weaknesses in content areas.

2. **Findings (2010-2011) - Achievement Target: Not Met**
   Based on the results from the CH 471 and CH 480 courses, this target was not met. The average score on the final exam in CH471 was 54.7%. The average score on the final exam for CH 480 was 85.3%. Three specific questions were selected from each final exam for further evaluation. These questions were selected specifically because of the need to exam students' ability to interpret data and formulate a response. For CH 471, the average scores for the selected questions were 29.5%, 27.3%, and 65.0%. For CH 480, the average scores for the selected questions were 45.0%, 25.0%, and 100.0%. These results indicate a general need for enhancement of interpretation and analytical skills.

3. **Related Action Plans (by Established cycle, then alpha):**
   **Development of additional activities targeted at interpretation of data**
   Since assessment of data interpretation skills indicated a need to enhance this skill in students, faculty will work to produce additional exercises that will develop this skill in students. This will specifically target 300 and 400 courses, but will also be included in lower level courses.
   **Established in Cycle:** 2010-2011
   **Implementation Status:** Planned
   **Priority:** High

3. **Outcome: Students will gain working knowledge of basic lab and research methodologies, data analysis and interpretation**
   Students will gain working knowledge of basic laboratory and research methodologies, data analysis and interpretation.

   a. **Measure: Student participation in and successful completion of lab assignments**
   Students will demonstrate a working knowledge of basic laboratory and research methodologies, data analysis and interpretation through participation in and successful completion of select lab assignments from CH 471, Biochemistry.

   Source of Evidence: Project, either individual or group

1. **Achievement Target:**
   Student scores on select lab assignments will meet or exceed 75% for the assignment. Assignments are scored based on data analysis, scientific merit, and proper lab procedure.

2. **Findings (2010-2011) - Achievement Target: Met**
   Based on the analysis of the selected lab assignments for CH471, this target was met. Three lab assignments were selected for this evaluation, with average
scores being 87.5%, 92.5%, and 100%. This indicates that students are gaining a working knowledge of lab skills and analysis of lab data.

3. **Related Action Plans (by Established cycle, then alpha):**
   **Enhancement of lab evaluations**
   Further lab assignments will be developed that will better assess student learning in specific areas. The assignments will be designed to specifically extract learning data in the areas of lab procedure, research skills, data analysis, and reporting of experimental findings.
   - **Established in Cycle:** 2010-2011
   - **Implementation Status:** Planned
   - **Priority:** High

b. **Measure: Increase the use of technology in the chemistry labs.**
   The use of technology will become more widespread in experiments performed in the chemistry labs. Emphasis will be given to the incorporation of computer-based probeware in the freshman labs.

   Source of Evidence: Administrative measure - other

   1. **Achievement Target:**
      At least 3 probeware-based labs will be incorporated into freshman chemistry courses in order to give students additional exposure to current technology.

   2. **Findings (2010-2011) - Achievement Target: Met**
      Two probeware-based labs were incorporated into the General Chemistry courses, and one probeware-based lab was incorporated in the Introductory Chemistry course. These experiments were well received by students and enhanced the objective of the experiments. Additional labs will be added as needed in future courses.

c. **Measure: Replace equipment on a set schedule**
   By replacing equipment on a set schedule, students are able to work with modern, functioning lab equipment. This will promote the University as a leader in current lab technology and reduce disruptions to the learning process which are sometimes caused by malfunctioning equipment.

   Source of Evidence: Administrative measure - other

   1. **Achievement Target:**
      Conduct a routine evaluation of departmental equipment and develop a set plan to replace aging equipment. Replacement costs will be covered by lab fees.

   2. **Findings (2010-2011) - Achievement Target: Met**
      A plan has been developed for the replacement of small aging equipment. This plan has started and will continue in the future as funding is available.

4. **Outcome: Students will demonstrate the ability to search and use chemical literature and communicate findings**
   Students will demonstrate the ability to search and use the chemical literature in both printed and electronic formats and communicate findings clearly and effectively.

   a. **Measure: Completion of written and oral assignments**
      By successfully completing written and oral assignments in CH 480, Forensic Chemistry, students will demonstrate the ability to search and use chemical
literature and communicate findings clearly and effectively. Each assignment is graded using a rubric that will evaluate specific content areas of the assignments such as content, format, and oral presentation.

Source of Evidence: Presentation, either individual or group

1. **Achievement Target:**
   Student papers and oral presentations will be scored using a rubric to judge strengths and weaknesses in the areas of content, format, and oral presentation. Students are expected to meet or exceed an average of 75% on each paper or presentation.

2. **Findings (2010-2011) - Achievement Target: Met**
   Based on the evaluation of written and oral assignments in CH480, this target was met. The assignment was evaluated based on content, format, and oral presentation with average scores being 94.5%, 94.4%, and 100% respectively. This indicates that students are becoming proficient in using chemical literature to produce written and oral reports.

II. **Goals and Other Outcomes/Objectives, With Any Associations and Related Measures, Achievement Targets, Findings, and Action Plans**

A. **Goal: Address the major education issues of the region**
   Address the major educational, social, cultural, and economic issues of the region and in doing so promote a positive self-image of the institution and the area.

   1. **Objective: Evaluate course curriculum**
      Evaluate curriculum of each course to ensure that students are receiving adequate preparation for a career in chemistry.

      a. **Measure: Use ACS guidelines and assessment exams to map the curriculum for each course**
      Since the department is working toward ACS accreditation, ACS guidelines and assessment exams will be used to map the curriculum for each course to ensure students are receiving an education that is comparable to that obtained at other institutions. An administrative review of curriculum maps will provide evidence for this measure.

      Source of Evidence: Administrative measure - other

      1. **Achievement Target:**
         A curriculum map of all course offerings will be completed.

      2. **Findings (2010-2011) - Achievement Target: Met**
         The curriculum has been examined for each course in which ACS exams are administered. In every case, it was determined that the current curriculum is sufficient to meet ACS guidelines.

      3. **Related Action Plans (by Established cycle, then alpha):**
         Continue course mapping
         The department will continue curriculum mapping with primary focus on the General and Organic series.
         **Established in Cycle:** 2009-2010
         **Implementation Status:** Finished
Priority: High

2. Objective: Provide students with quality programs
Provide students with quality programs and prepare them for careers and/or graduate school.

   a. Measure: Review current offerings and investigate the addition of new programs
   The department will review current offerings for chemistry majors and offer new programs as need is determined. The objective here is to make the chemistry program more marketable to incoming students, while maintaining a high standard for academic performance.

   Source of Evidence: Administrative measure - other

   1. Achievement Target:
      All chemistry degree tracks will be reviewed and revisions made as needed. Emphasis will be given to the creation of new program offerings as need is determined.

   2. Findings (2010-2011) - Achievement Target: Met
      A Pre-Pharmacy track within the Chemistry Comprehensive degree has been created. This track has been approved by the University Academic Council and ACHE. This program was created in response to the rising interest in careers in the pharmaceutical fields and will allow the department to better meet the needs of the region. The Pre-Pharmacy track is replacing the Biochemistry track.

B. Goal: Improve the financial status by seeking additional funding from public and private sources
Improve the financial status of the department by increasing its efforts at productivity and by seeking additional funding from public and private sources.

   1. Objective: Submit proposals for external funding
      Submit proposals to public and private sources for research funding. The department will strive to submit one proposal per year to a funding agency.

      a. Measure: Submit proposals for external funding
      Faculty will work closely with the Office of Sponsored Programs to complete these proposals.

      Source of Evidence: Activity volume

      1. Achievement Target:
         The department will submit one proposal per year.

      2. Findings (2010-2011) - Achievement Target: Met
         One external grant proposal was submitted this year, and two proposals are currently in the planning stage.

III. Other Plans for Improvement
   A. Continue working on grant applications
      Faculty will continue working on the preparation of grant applications.
Established in Cycle: 2009-2010
Implementation Status: Planned
Priority: High
Implementation Notes:
8/9/2011 In order to improve the financial status of the department, faculty members will continue to prepare grant applications.

B. Maintain contact with alumni
All alumni will be contacted by letter and email this year. In addition, the department Facebook page will become more active, and efforts will be made to add more alumni to this page.
Established in Cycle: 2009-2010
Implementation Status: In-Progress
Priority: High
Implementation Notes:
8/12/2011 Contact with recent alumni was maintained via Facebook and email. Future efforts will focus on contact with older alumni via alternate methods.

IV. Analysis Answers
A. What specific strengths did your assessments show? (Strengths)
One strength shown by the assessment is the dedication of the faculty to the improvement of the department. With the continuing efforts to obtain external funding and re-evaluate the chemistry curriculum, the faculty have demonstrated their desire to improve the chemistry program. Another strength indicated by the assessments lies in the laboratory program. Students are performing well in lab experiments and gaining valuable practical skills in lab procedures and evaluation of experimental data. Assessments also indicate a strength in student performance on written and oral assignments. Such assignments are based on performing searches of the chemical literature in order to produce written and oral presentations. Student learning in this area has excelled, and efforts will be made to produce more challenging assignments to advance student learning.

B. What specific weaknesses or challenges did your assessments show? (Weaknesses)
Assessments indicate that students need further skill in interpretation of data outside of the lab. The department will be working to improve student learning in this area. In addition, improved assessment methods will be incorporated to give a more detailed picture of student learning.

C. What plans were implemented?
During this year, the department was able to put in place a safety program that evaluates student understanding of lab safety principles. Students are required to pass a safety quiz with a minimum score of 80% before participating in any lab experiments. A new Pre-Pharmacy track in the Chemistry Comprehensive degree was developed and approved. This track will be open to students beginning in Fall 2011. Technology based lab experiments were introduced into freshman courses. These experiments use new equipment that was received last year.

D. What plans were not implemented?
Contact with alumni was not maintained at the desired level. Contact was maintained via Facebook and email with alumni from recent years, but plans to expand contact with older alumni via letters were not implemented.

E. How will assessment results be used for continuous improvement?
Additional learning opportunities will be developed to enhance student understanding in areas of weakness. Also, improved assessment methods will be used to give a more detailed assessment of learning. This should aid in the enhancement of learning in specific areas.