Department of Chemistry
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Degree Program(s) Assessed	Assessment Methods	Number of Individuals Assessed
B.S.	Exit Interviews with Chairman (oral, students' written remarks on file); Graduate Student Research Symposia; Input from Colleges served by the Department of Chemistry, and the Honors Program Director; and Research Reports from Capstone Course (CHEM 4990). In 2003-2004, 17 students were enrolled in the Capstone Course.	6
M.S.	Exit Interviews with Chairman (oral, students' written remarks on file); Graduate Student Research Symposia; and Input from Colleges served by the Department of Chemistry, and the Honors Program Director.	2
Ph.D.	Survey of Alumni; Exit Interviews with Chairman (oral, students' written remarks on file); Graduate Student Research Symposia; and Input from Colleges served by the Department of Chemistry, and the Honors Program Director	6

Number of Individuals Assessed: For all degree programs for the 2003-2004 academic year, 26 students were assessed. This number consisted of only current majors and graduate students.

Analysis Findings

The analyses of the data from the various categories listed in the 2002-2003 assessment report indicate that progress continues to be made in the direction of making major improvements on how chemistry is presented to our patrons, both majors and non-majors, at the undergraduate and graduate levels.

In keeping with the national and international trends that prevail in the sciences today, our focus has been to give greater emphasis in the classroom to experimental methods and procedures and to their applications in future commercially directed technologies. From students input, our efforts appear to be working. This exposition begins in the lecture halls even before a student has stepped into a laboratory. Students will often ask what value is Chemistry to me when my chosen career path is something that does not use Chemistry. A satisfactory way to answer that question is to be creative enough in the classroom to illustrate how critical Chemistry applications are in every conceivable profession by exploiting the contents of the vast libraries of multimedia files.

Another factor is to convey the realization that science is now firmly in the hands of hyphenated disciplines: e.g. chemistry-biology; chemistry-nutrition; chemistry-medicine, etc., and this has to be emphasized throughout all of our degree programs.

Modernizing the experimental experiences in teaching laboratories is a money intensive investment and especially so when student enrolment numbers are increasing. The main issue is the cost for purchasing sufficient quantities of small pieces of specialized equipment items and not the replacement of consumables. For this we rely heavily on student laboratory fees. Updating or simply maintaining computer technology is another significant financial factor. We have been fortunate in successfully competing for Student Technology Fees from within the College and have made sound fiscal decisions on the investment of Student Laboratory Fees by forbidding their use for more general day-to-day Department maintenance expenditures.

With each year we endeavor to add one more multi-user scientific instrument to the UTL (Undergraduate Teaching Laboratory), a facility that provides direct hands-on experience to students in advanced undergraduate laboratory courses that includes CHEM 4990 the undergraduate research Capstone Course. Service and maintenance of the UTL instruments, and other major scientific instrumentation in the Department as a whole, is provided by competent full time A&P staff employees who are specialists in managing and operating nuclear magnetic resonance (NMR), mass spectrometry (MS) and general analytical laboratory facilities.

A research infrastructure Federal competitive grant proposal was submitted June 2004 to the National Science Foundation for the purchase of three new spectroscopic instruments, and an Undergraduate Summer Research Experience proposal will be submitted to the same agency by September 2004 for the grant to begin in the summer of 2005.

Even although the difference between the two BS degree plans offered by the Department is diminishing, the faculty voted to continue the American Chemical Society (ACS) degree plan. In order to maintain ACS accreditation without receiving sanctions for sub quality offerings, there is a premium on finding the faculty and graduate student personnel and the material resources to establish advanced laboratories in Inorganic/Materials chemistry and in Physical Chemistry. It is possible that with the convergence of the three classical areas of Analytical, Inorganic, and Physical chemistry into one, a single laboratory syllabus will satisfy the ACS requirements. But to do that, the number of total lab credit hours must remain the same. Undergraduate majors are constantly encouraged to become involved in undergraduate research beginning as early as the second semester of their freshman year. The experience can be continued throughout the duration of their program and they are encouraged to change advisers whenever it is convenient and of interest to them to do that. This past year was a banner year in undergraduate research participation in spite of the reduced number of research faculty positions.

The Department has been understaffed in the number of tenure-track (tenured) faculty for the last three years decreasing from a full complement of 19 FTE's to the current (June 2004) number of 14 FTE's. The attrition was due to death, non-reappointments, and voluntary departures. To restore these vacancies more effectively we altered our recruiting practices. Instead of advertising for people in very specific and very limiting areas of expertise, we broadened new faculty searches to solicit applications from experimental chemists of any kind, except Biochemistry. Using this tactic we succeeded in recruiting two Assistant Professors and one Associate Professor (with tenure) over the last 8 months, ostensibly raising the number of tenure-track and tenured faculty to 17 FTE by August 2004. It happened that the new Dean for Arts & Sciences is also a chemist raising the faculty FTE count to 18. Since that recruitment coup however, 3 other faculty will have departed by August, one by retirement, one by non-reappointment, and one by election, leaving a net total of 15 FTE by August 2004. All three had significant grant support from which considerably large F&A will be lost to the University. Their departures also impact on the matriculating class for the 2004 Fall semester in that some entering students may have chosen our program because of the reputations of these scientists.

The Hypothesis Based Learning (HBL) paradigm that has been bestowed with national accolades in the past has received continued recognition. It is a wave of the future for US K-12 science education. HBL has been and continues to be the cornerstone program in the more general innovative instructional initiative called the Center for Science Literacy (CSL) that embraces other sciences on campus besides Chemistry. We are hopeful that its success and popularity will survive the change over of the CTL administration.

As a result of the precipitous decline in the number of tenured/tenure track faculty, and the lack of sufficient resources to hire replacement faculty, a significant proportion of our undergraduate classes were taught by temporary or adjunct faculty. This unacceptable situation needs to be remedied as expeditiously as possible. On the positive side however, the Department does have a requirement that all classroom instructors must have earned the terminal (PhD) degree. We have been very fortunate to have several A&P staff members who have PhD degrees that serve the teaching and research support facilities and laboratories who have distinguished themselves in the classrooms. However, since they are not regular graduate faculty, they cannot contribute to graduate level instruction.

The special service course CHEM 1414 for all Engineering except Chemical Engineering majors has matured into its third year and is now the "property" of the Inorganic/Materials chemistry faculty. Past problems with improper enrolments appear to have been resolved. Feedback from Engineering faculty has been very supportive of this service to their student body. At the request of the Honors College one CHEM 1414 laboratory section was designated as an Honors section. All students attended the same lecture class but the Honors lab had the more contemporary and challenging laboratory syllabus combined with regular supervision from the faculty instructor. The Department now contributes to the Honors College in three ways, through CHEM 1314 H, CHEM 1414 H (lab only), and CHEM 1515 H.

Decisions from professional organizations to no longer accept CHEM 1215 as a prerequisite and to replace it with CHEM 1314, means that there will be a change in the enrolment demographics that will affect both courses. The benefactors will be the students in CHEM 1215 since class sizes and student/faculty ratios will decrease. CHEM 1314 enrolment figures are already high and with the demand for larger auditorium spaces

to compensate for our faculty vacancies problem, we can anticipate an increase in the number of class sections. This means that more instructors will be assigned to teach 1314 and one conceivable consequence could be the elimination of the Honors section.

The improvements we have observed in the contents and the conduct of our upper division and graduate courses, both lectures and laboratories, are reflections of the instructors' personal new excitement for the subject material. We eagerly anticipate more with each new addition to the graduate faculty.

We are still plagued by the problems associated with graduate student recruitment. This will become more critical as the number of faculty increases, so there are fewer research assistants per capita, and the enrolment numbers increase meaning more lab sections and making it difficult to identify sufficient numbers of TA's to meet these instructional needs. The demographics on GA recruitment are very unrewarding for Departments outside the top 100 graduate programs in the country. Fewer and fewer domestic students are committing themselves to advanced degrees in Chemistry and the other hard sciences and nationally imposed political constraints have significantly reduced the number of international applications. With major research institutions having the reputations and the financial resources, they get the first pick from the recruitment class. Evidence is that even the first picks are less well prepared for graduate work than ever before, making our incoming class wanting in talent.

Uses of Assessment Results

(a) *Faculty Recruitment:* Faculty recruitment is one of the two most pressing problems we face for the immediate future. From the figures reported above the Department will have 4 vacancies by August 2004. The deficit is especially critical in the area of Organic Chemistry where only 3 of the full complement of 5 organic faculty remain, which is an insufficient number to meet the regular 6 courses that are offered each and every semester. These numbers tell an incomplete story in that 3 of the 15 faculty members anticipated to be here in August 2004 are collectively 15 years past retirement age. At any time the number of open faculty lines could increase to 5, 6, or 7 out of a total complement of 19.

The pressure on our meeting our commitments first as a large service department and second as one of the most productive research departments in the OSU system could take a heavy toll from active faculty if we do not receive priority status in hiring faculty. The ultimate costs to the University if we are forced to increase faculty teaching loads of the current faculty are: non-competitiveness in seeking research dollars; a serious loss of earned soft money from grants and contracts; the reduction in our research productivity; and further flight of current faculty.

While the tactic of emphasizing experimental chemistry allows us to compile a large broad based applicant pool, the more serious problem remains as to where startup money will come from in times of weak budgets. We will endeavor to convince the VP for Research and Technology Transfer that investing dollars from the State funded Homeland Security and Bioterrorism initiative as startup packages for new Chemistry faculty is a very wise double-edged investment and the most likely to accomplish the 4 to 1 financial return on each State dollar invested as mandated by the Legislature. We feel this way because of the central role that Chemistry occupies in so many of the hyphenated or hybrid science "disciplines".

(b) *Graduate Recruitment, Financial Support, and Programs:* Very much of what might happen in the graduate program will depend upon the directions taken and decisions made by the new leadership in the Graduate College, specifically the Dean/Associate-VP for Research. We would sincerely hope that the operation of the College office become more efficient and user friendly. Much of what is done at the College level regarding the handling of applications could more easily be done at the Department level because of the commitment and interest faculty have in enhancing our recruiting percentage.

If the University is to reach its goal of being among the top 100 research schools in the country, better support has to be provided to graduate students either directly, through new State funding, or indirectly through soft money. The former is very unlikely to happen in the immediate future.

Research assistants have a financial advantage over teaching assistants, their being supported for 12 months, and in some instances having tuition and fees covered from grants. Since most new GA's enter as TA's, creative ways are needed to provide 12-month employment for TA's and/or cover the costs of all tuition and fees.

One suggestion is to try to persuade the Administration to return a higher percentage of the F&A to the Department and the PI to be used as discretionary funds to enlarge upon the annual support for GA's and most especially TA's. This is not too unwieldy a suggestion if the successful faculty recruitment program we have started is completed, in which case more research dollars will be earned by the Department, which translates into more F&A dollars to the University.

A less ambitious goal for courses is to introduce more and more special topics and multidisciplinary course offerings that will appeal to broader audiences and stimulate collaborative research programs. This tactic is also intended to compensate for the low enrolment figures we would expect if students were only Chemistry majors and classes might not make on the programmed regular rotation.

(c) *Undergraduate Majors:* The number of undergraduate majors has increased by a few percent over the last year. More students are eager to become involved in undergraduate research, even beginning as early as the second semester of their freshman year. We have been able to accommodate most all of them with about half receiving some financial support. Once again the success of our undergraduate majors program is attributable to the direction and encouragement they receive from Dr. [redacted] the undergraduate chemistry advisor.

(d) *Specialty Courses:* Our commitment to providing specialty courses for the College of Engineering (CHEM 1414) and the Honors College (CHEM 1314 H, CHEM 1414 H, and CHEM 1515 H) has been well received by the Colleges served. It is our intent to expand the same service to include the Colleges of Agriculture and Human Environmental Sciences but putting them into effect will be postponed until our faculty roster is returned to its full complement.