

Academic Program Review for Chemistry (BS & MS)
Western Carolina University
Jimmy Reeves (external reviewer) & Wes Stone (internal reviewer)
5-6 March 2012

I. Introduction

- a. The visit and the review team:
 - i. The review team consisted of Dr. Jimmy Reeves (Professor and Chair, Department of Chemistry and Biochemistry at the University of North Carolina at Wilmington) and Dr. Wes Stone (Associate Professor, Department of Engineering and Technology, Western Carolina University).
 - ii. Prior to the on-site visit, there was a conference call on 23 March 2012 coordinated by David Onder (Office of Assessment, Western Carolina University) to ensure adequate pre-visit preparation.
 - iii. The visit itself was conducted 4-6 March 2012. Sunday March 4th consisted of an off-site dinner meeting between the review team and departmental administration. Monday March 5th contained the bulk of the assessment visit. Tuesday March 6th was used for exit meetings and report generation. Details of these activities are provided below.
- b. The on-site visit consisted of the following:
 - i. Sunday, 4 March 2012: The review team met with Dr. Cynthia Atterholt (Department Head, Department of Chemistry and Physics) and Dr. Bill Kwochka (Associate Department Head, Department of Chemistry and Physics) at Dr. Atterholt's home, followed by dinner in downtown Waynesville. The discussion centered on an overview of the program strengths and needs. Commonalities and potential partnerships between the programs at UNCW and WCU were also discussed.
 - ii. Monday, 5 March 2012:
 1. The review team met with Interim Provost Dr. Beth Tyson Lofquist. This kickoff meeting set the expectations for this visit with some preliminary ideas being raised.
 2. Following the meeting with the provost, the review team met with Interim Dean of Arts and Sciences Dr. Gibbs Knotts and Associate Dean of Arts and Sciences Dr. David Butcher. Similarly, this meeting set additional expectations and highlighted several known areas in need of attention.
 3. Dr. Atterholt conducted a tour of the teaching and research laboratories for the Chemistry and Forensics programs. Chemistry faculty members Dr. Scott Huffman and Dr. David Evanoff joined the tour and shared their lab expertise throughout the remainder of the tour.
 4. The review team was joined for lunch by a group of 12 Chemistry students—eight undergraduate and four graduate students. The discussion spanned a

wide range of topics, including the strengths and weaknesses of the program; comparison of these programs to others at other institutions; career interests; tutoring; lab instruction; undergraduate research opportunities; access to Chemistry faculty; and more.

5. The review team met with 12 Chemistry faculty members. No administrator above the associate department head level was present. The discussion focused primarily on the needs and challenges faced by the Chemistry faculty, especially since budget constraints have placed a heavy load on the department.
6. Three Chemistry alumni, Dr. Jason Clement, Mr. Paul Davis, and Mr. Wes Bintz, met with the review team to discuss how the programs have prepared them in their field, as well as to compare the program in its past state to its current form.
7. The review team spent some time identifying its findings and began to draft this review.
8. The review team was joined for dinner in Sylva by four Chemistry faculty members—Dr. David Evanoff, Dr. Channa De Silva, Dr. Jason Clement, and Dr. Brian Dinkelmeyer. The discussion included a range of topics, mostly centered on the findings and potential solutions.

iii. Tuesday, 6 March 2012:

1. The review team met with Dr. Beth Tyson Lofquist, Dr. Gibbs Knotts, Dr. Cynthia Atterholt, and Mr. David Onder to review the findings from this visit.
2. The review team outlined the content to include in the report that follows.

II. Analysis of Program

a. Undergraduate program:

The undergraduate program is well designed and executed, and the department has maintained a consistent, impressive number of majors. In response to pressures to limit the number of hours required for the program, a streamlined core curriculum was adopted, with tracks such as health sciences as well as the traditional ACS approved bachelor of science degrees. The ACS approved 4+1 option, which allows students to take cross-listed courses that count for both the undergraduate and graduate requirements, is especially innovative. This approach is sound, but we do have a concern that although the ACS approved tracks did meet the minimum standards of the ACS Committee on Professional Training, they require fewer hours (64) than other certified programs. For example, the number of hours required in UNCW's certified BS degree is 76 hours. This restriction could put WCU students at a competitive disadvantage when applying for graduate school or employment in the chemical industry.

The department does an excellent job of involving students in research, a critical activity for training scientists. These experiences should lead, eventually, to publications, but some faculty feel that the documented increase in teaching loads significantly hinders their ability to publish. Because publication of research is so critical to documenting student achievements and to achieving funding for research, this issue needs to be addressed. A second important aspect of training chemists is providing them access to the sophisticated instrumentation that is so central to modern chemistry. Unfortunately, much of the current instrumentation is aging and will need to be replaced, and more costly instruments acquired more recently require service contracts to ensure their maintenance. Access to modern instrumentation is vital to training scientists, so this problem needs to be addressed.

b. Graduate program:

Graduate enrollment has decreased slightly over time, due in part to lack of financial support. Most chemistry programs in the US offer full tuition remissions as well as support in the form of teaching assistantships, but North Carolina schools are prohibited from waiving tuitions. However, support in the form of additional teaching assistantships is highly recommended, especially in light of increased enrollments in service courses such as introductory chemistry and organic, fueled in part by the Forensic Sciences Program. Providing additional assistantships so that introductory and organic chemistry laboratories can be taught by graduate students is both cost effective and central to attracting additional graduate students into the program. Because of the relatively small number of graduate students and the additional burden on faculty to fill the teaching void created by the increased enrollments cited above, the graduate curriculum relies heavily on cross listed courses (400/500 level). This is a concern because it is very difficult to provide graduate level instruction in this type of course. The Department of Chemistry and Biochemistry at UNCW has developed a full slate of graduate-only distance learning courses, and providing WCU graduate students with the opportunity to take one or more of these offerings as part of their graduate training should be vigorously pursued. However, it is also very important that faculty in the WCU chemistry department be given the opportunity to develop standalone graduate courses by providing room in their teaching schedules and by

attracting additional graduate students to their program, so these courses can enroll enough students to meet the minimum course enrollment standards.

The research opportunities afforded to graduate students are impressive, and this aspect of their training appears quite effective. However, as mentioned above, training of scientists must include providing them access to modern instrumentation; mechanisms to fund maintenance contracts and provide funds for acquiring additional equipment is critical. In this regard, an effort on the part of the WCU administration to redistribute overhead receipts from grants is an important first step in addressing this critical issue. It is recommended that in addition to providing support for maintenance contracts, the administration establish a rotating equipment fund that will allow departments to acquire needed “big ticket” equipment and replace aging instruments in a consistent manner.

- c. The creation of an assessment committee is an excellent response to the University’s focus on continuous planning, It is important that this committee continue to evaluate the departments’ programs and student Learning Outcomes so that assessment measures are developed that can be quantified on an ongoing basis and used to develop strategies that provide continuous improvement of these outcomes. The review team is particularly impressed with the work of Carmen Huffman both in authoring a detailed and well-designed self-study and in chairing the newly created assessment committee.

III. Analysis of Faculty

- a. In reviewing the faculty curriculum vitae, holding discussions with Chemistry students, and conversing with Chemistry faculty, the review team concluded that the Chemistry faculty provides a strength to the BS and MS programs that is vital to the success of these programs.
- b. Qualifications – The Chemistry faculty members possess the credentials necessary to ensure the success of these programs. The pedigree of their undergraduate and graduate institutions is solid and enables them to continue delivering strong curricula to the BS and MS students in Chemistry.
- c. Resources and Support – The Chemistry faculty members are in a difficult position with regard to resources and support. Financial constraints in the current economic climate have limited faculty, but they are still being held to the same requirements for tenure,

promotion, and reappointment. Laboratory equipment is adequate to support research, but without appropriate service contracts, those resources will not continue to do so. As lab equipment ages, it will be necessary to upgrade and replace, but financial challenges make this more difficult.

- d. Lab Coordinator – Our assessment shows that faculty are spending valuable time in preparation for general chemistry labs. Alternatively, the hiring of a full-time 12-month laboratory coordinator could free these faculty members up for graduate-level course development and fundamental research, including both undergrad and graduate students.
- e. Publishing research is a key component to a Chemistry faculty member's professional development. With a healthy level of research involving undergraduate students, it is important that the faculty increase their level of publications to include undergraduate students. This will benefit both the faculty and the students. An increase in graduate students and the addition of the lab coordinator (mentioned above) should provide additional opportunities for faculty to focus on these publications.

IV. Analysis of Operational Facilities and Budget

- a. Does the program have adequate facilities to meet their instructional needs?

The facilities are currently adequate with regard to space, but there is limited room to expand the facilities or find space for additional faculty. Laboratory space is well laid out and equipment, though aging, is adequate to meet current instructional needs of the large enrollment service courses, but increasing enrollments will put additional stress on the both the space and the equipment. The review committee recommends that funds be made available on an annual basis to being to replace equipment so instructional quality can be maintained.

Equipment for the upper division and graduate courses and for research is also adequate to satisfy current needs, but loss of funding for maintenance contracts can lead to significant repair expenses, or loss of the use of these instruments altogether. This loss could compromise the educational quality of the program.

- b. Does the program have adequate budget to meet their educational mission?

The operational budget is adequate to cover the instructional and professional development needs of the faculty. However, as mentioned above, the reviewers have concerns about the lack of budget resources for equipment. Moreover, the lack of

secretarial support is a very serious problem, recently exacerbated by the additional demands put on the position by the Forensic Science program. These combined programs share one secretary. By comparison, the Department of Chemistry and Biochemistry at UNCW, which has a program approximately comparable in size to the combined programs of Chemistry, Physics and Forensic Sciences, has three full time administrative staff.

- c. Does the program have adequate budget to meet their educational mission?

The budget for ongoing instructional expenses appears adequate, but as mentioned above, additional funds for equipment upgrades and maintenance agreements must be found to assure that high quality of instruction can be maintained.

- V. Summary of program strengths and areas for improvement

The undergraduate program is strong and the amount of student involvement with research is impressive, but pressures resulting from increased enrollments and loss of teaching resources threaten to reduce this valuable contribution to the education of their undergraduates, as well as compromise the ability of faculty to carry out publishable research. The recommended improvements in the graduate program (see below) are designed to increase the number of graduate students and provide additional graduate-only courses that will significantly strengthen the curriculum.

- VI. Summary of Recommendations

Based on the information outlined above, the review committee makes the following recommendations:

- a. Address the need for laboratory preparation and provide additional teaching for large enrollment courses by hiring a full time (12 month) instructor/lab coordinator with responsibilities for overseeing laboratory preparations and teaching four laboratory sections in Fall semester and four laboratory sections in Spring semester, with additional duties in the summer to be determined by the Chair. This would also eliminate the counterproductive practice of assigning tenured or tenure track faculty with the preparation of these labs.
- b. Increase graduate enrollment and address significant shortages in laboratory instructors by providing additional Teaching Assistantships that utilize these graduate students to cover laboratory sections.

- c. Provide additional graduate-only courses in the WCU graduate curriculum by offering students the option of taking online distance graduate courses offered by UNCW that count directly toward their degrees requirements.
- d. Increase the banding category (salary) for the departmental secretary/administrative assistant to make it commensurate with the responsibilities of the position and shift the responsibilities that pertain to the Forensic Program to staff supported by that program.
- e. Redirect overhead receipts, especially those generated by faculty in the programs served by Chemistry (Forensic Sciences and Chemistry), to reestablish the maintenance agreements on equipment and provide a rotating equipment fund to replace aging instruments in a coherent way.