APPENDIX III

ASSESSMENT PLANS

Department of Chemistry and Biochemistry
DEPARTMENTAL GOALS FOR UNDERGRADUATE STUDENTS

DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

Submitted March 15, 1990

The Department of Chemistry and Biochemistry has a long-standing commitment to the education of students in our programs. The Department seeks to develop the following in our students: 1) proper attitudes with respect to study habits and work skills, 2) a sense of the history and philosophy of chemistry, 3) a total awareness and understanding of the role of chemistry in shaping and contributing to societal goals, and 4) an ability to think critically and solve problems in a societal context.

Knowledge

1. A fundamental knowledge of the principles and practice of analytical, inorganic, organic, and physical chemistry. For some emphasis areas this list would include biochemistry.

2. A basic understanding of chemistry and its relationship to society and technology.

3. An understanding of mathematics and physics and their application to chemistry.

4. An awareness of ethical issues associated with the practice of chemistry.

5. An understanding of how scientific inquiry is practiced, including developing hypotheses, making predictions, designing experiments, drawing conclusions, and public reporting of results.

6. An understanding of how computers and scientific instrumentation are employed in the practice of chemistry.

7. An ability to interpret and draw conclusions from data collected by themselves or others.

8. An awareness of the importance and use of the scientific literature, especially as it related to chemistry.
Skills

1. An ability to carry out common laboratory procedures.
2. An ability to clearly communicate, both in writing and orally, with other scientists and the general public.
3. An ability to operate common chemical equipment and instrumentation.
4. An ability to locate and use the chemical literature.
5. An ability to use computers, especially in applications involving word processing and data acquisition, manipulation, and analysis.

Attitudes

1. An appreciation for the ways in which scientific knowledge is tested and developed.
2. A respect for scientific evidence as opposed to opinion and dogma.
3. A willingness to consider alternative hypotheses and to test such hypotheses.
ASSESSMENT PLAN FOR UNDERGRADUATE STUDENTS

DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

Submitted March 15, 1990

The assessment plan for the undergraduate chemistry major is designed to ensure the congruence of the knowledge, skills, and attitudes of the program's goals and objectives statement with a student's abilities, practical skills, and perceptions of his/her environment upon graduation.

1. To ascertain the student's mastery of the concepts of the various subdisciplines of chemistry, each student will take a nationally-normed standardized test; for example, the exams administered by the Educational Testing Service, or exams in each subdiscipline written by the American Chemical Society. These exams will be taken during the spring semester of each year prior to the student's expected graduation or at the conclusion of the appropriate course. The exams will be administered at a time such that each student will receive information on his/her performance prior to graduation.

(K1, K3, K6, and K7)

Medical technology students are required to take and pass a registry exam in order to begin employment. There are two exams administered by two different accrediting agencies; the American Society of Clinical Pathologists and the National Certification Agency for Medical Laboratory Personnel. The exams are not a graduation requirement, but every student completing the clinical experience takes each exam. The medical technology students will take only the registry exam because they do not take inorganic or physical chemistry which constitute about 50% of the ETS exam. Numerical results from each exam are available to the program coordinator and will be reported to the Dean of the College or his designated body, individual results will not be reported.

2. Each graduating senior will be required to complete an interview with either the Chair of the Department or with a faculty member from another department, the choice of the student, on the completion of his or her program. The interview will give the student the opportunity to express his/her opinion about the program, in what ways the program is successful or unsuccessful in educating the student, the resources within the Department and University he/she has found the most useful, the requirements involved in various courses, and his/her plans after graduation. In addition, each graduating senior will be required to fill out a questionnaire designed to assess his/her satisfaction with the Department, the program, and the faculty. The questionnaire will be designed in portions with open-ended questions and questions which rank the answers on a numerical scale.

3. The success of our graduates in their chosen occupations will be determined by the answers to a series of questions mailed to the current addresses of the graduates. The set of addresses is maintained both within the Department and by the Alumni Association.
The progress of our graduates will be monitored both one year and five years following graduation by questions such as:

a. What is your current employment position?  
   or  
   Are you enrolled graduate or professional school?

b. With what company/corporation are you currently employed?  
   or  
   In what type of graduate or professional program are you enrolled?

c. When (what year) did you graduate from UNC?  
   Do you have any post-graduate education?

d. Which of the chemistry courses at UNC did you find the most/least useful?

e. What experiences at UNC did you find the most/least useful?

f. How does your training at UNC compare with employees or students in similar positions in your company or institution?

(All Goals)

4. About 70 percent of the chemistry majors completing the program take CHEM 499 course, "Seminar and Research in Chemistry" as part of their program requirements. As part of the course requirements, students are to give oral presentations each semester and, at the conclusion of their research, to present a complete seminar and to write a research paper (thesis) on the work they have completed. The research experience typically involves a survey of the literature, often involving computerized searches, several months of laboratory investigation, interpretation of the results, and, finally, a formal presentation. All of this is done under the supervision of a faculty member. Students not taking CHEM 499 are required to have an advanced laboratory experience. This experience, although more structured than CHEM 499, does require a synthesis of previous knowledge, problem solving, and the presentation of results in both written and oral form. Student feedback is provided by both course grades and conferences between the student and the course instructor responsible.

(K1, K5, K6, K7, K8, S1, S2, S3, S4, S5, A1, and A3)

5. The Chemistry Department is proud to offer a Bachelor of Arts program which is accredited by the American Chemical Society. This accreditation involves a review of the entire program every five years and a report submitted to ACS every year on the number of majors graduating and the degree program they have followed. The
Department will host a visitor from ACS for a site visit every three to four years as part of assessing student results and the reaccreditation process.

(All Goals)

6. Laboratory skills are a prerequisite for success in chemistry and a requirement for the chemistry major. Each student completing a major must pass the laboratory portions of general, organic and analytical chemistry as a requirement for passing the course; and must pass the physical chemistry laboratory courses in order to graduate. In addition to these required courses, the student must complete an advanced laboratory course in order to graduate.

(S1, S2, S3, S4, and S5)

7. Assessment data will be used as a basis for departmental decisions for program revision. The Department generally sits as a committee of the whole to make curriculum changes. In the past, ACS visitations and program guidelines, as well as alumni surveys, played an important role in developing or enhancing the Department's offerings. The data from alumni surveys and ETS results will serve as additional pieces of information upon which we base our program improvement.

8. The budget for the assessment program will include approximately $1,100 for a site visit from ACS every three to four years, $100 for alumni and graduating senior surveys, and $100 for ETS exams (depending upon the number of majors).

9. The ultimate responsibility for the assessment program will reside with the Chair of the Department; however all faculty will participate in the survey process, the administration of ETS exams, and the interpretation of the data. As mentioned above, all program decisions based on the assessment will be made by the entire faculty.
Student Outcomes for Graduate Programs
Department of Chemistry and Biochemistry

Ph.D. in Chemistry Education

To successfully complete the Ph.D. Program in Chemical Education each student must meet the following standards.

1. **Meet the requirements for admission to the program.**
   - A score of at least 400 on each section of the GRE and a combined score of at least 1500.
   - Passing score on qualifying examinations in three subdisciplines of chemistry content, or passing grade in corresponding undergraduate course.

2. **Complete the program of study with 3.00 GPA or higher.**
   - 24 hours of graduate course work in chemistry (12 if entering with a masters degree in chemistry)
   - 16 hours of graduate course work in education (7 if entering with a masters degree in science education)
   - 94 total hours of graduate course work (64 if entering with a masters degree), of which at least 70 (40 if entering with masters degree) must be completed at UNC.

3. **Demonstrate competence in chemistry content knowledge.**
   - Passing written and oral comprehensive examinations in three fields: chemistry education and two chemistry disciplines.

4. **Demonstrate competence in research in chemistry.**
   - Completing a masters-level research project in chemistry judged to be satisfactory by a departmental faculty committee.

5. **Demonstrate competence in research in chemistry education**
   - Completing 8-12 credit hours of graduate courses that qualify as research tools as defined by the graduate school and as supported by the departmental Graduate Committee.
   - Successfully completing and defending a doctoral research dissertation judged to be satisfactory by the student’s doctoral committee.

6. **Demonstrate competence in teaching.**
   - Successfully completing a one-semester teaching practicum under the direction of a faculty member. The practicum must involve preparing a course syllabus and assignments, presenting oral instruction, and constructing and evaluating student assessments.
7. Demonstrate competence in written scholarly communication.

Completing a written dissertation on the doctoral research project that is judged to be satisfactory in style and content by the student's doctoral committee.
Submit a written scholarly paper to a peer-reviewed journal for publication. Acceptability of the journal is determined by the student's program advisor and doctoral committee.

8. Demonstrate competence in oral communication.

Present three public research seminars, each of which is evaluated independently by departmental faculty members.

Students completing the program are qualified to work in the chemical education field at a variety of levels: such as, coordinator or supervisor in the secondary school, chemistry instructor at two- and four-year colleges and universities or chemical educators at a university. At the professional level, program graduates are qualified to do fundamental research in chemical education and to direct chemistry research at the undergraduate level.
Master of Arts in Chemistry, Emphasis in Education

To successfully complete the M.A. Program, Emphasis in Education each student must meet the following standards.

1. Meet the requirements for admission to the program.
   Passing score on qualifying examinations in three subdisciplines of chemistry content, or passing grade in corresponding undergraduate course.

2. Complete the 30-hour program of study with 3.00 GPA or higher.
   23-31 hours of graduate course work in chemistry
   3-11 hours of graduate course work in education
   4-8 hours of electives
   8-12 hours of the chemistry hours must be completed in graduate courses that qualify as the research component, as defined by the departmental Graduate Committee.

3. Demonstrate competence in chemistry content knowledge.
   Passing written comprehensive examinations in three fields: general chemistry and two other areas selected from chemistry education and any other chemistry subdiscipline.

4. Demonstrate competence in research in chemistry or chemistry education.
   Completing a masters-level research project judged to be satisfactory by the student’s faculty committee.

5. Demonstrate competence in written scholarly communication.
   Completing a written report on the research project that is judged to be satisfactory by the departmental graduate committee. This report may take the form of a thesis or a paper to be submitted for publication.

6. Demonstrate competence in oral scholarly communication.
   Presenting two public research seminars, each of which is evaluated independently by departmental faculty members.

7. Demonstrate competence in oral scholarly communication.
   Presenting two public research seminars, each of which is independently evaluated by departmental faculty members.

Successful completion of this degree will enhance advancement opportunities in the education field and provide a teacher advanced training in content and pedagogy. The degree can also qualify persons to teach at the junior or community college level.
Master of Arts in Chemistry, Emphasis in Research

To successfully complete the M.A. Program, Emphasis in Research each student must meet the following standards.

1. Meet the requirements for admission to the program.
   - Passing score on qualifying examinations in three subdisciplines of chemistry content, or passing grade in corresponding undergraduate course.

2. Complete the 30-hour program of study with 3.00 GPA or higher.
   - 12-18 hours of graduate course work in chemistry
   - 12 hours must be completed in courses that qualify as the research component, as defined by the departmental Graduate Committee.
   - 0-6 hours of electives

3. Demonstrate competence in chemistry content knowledge.
   - Completing written a comprehensive examination in the chemistry subdiscipline that represents the major area of study.

4. Demonstrate competence in research in chemistry.
   - Completing a masters-level research project in chemistry judged to be satisfactory by the student=s faculty committee.

5. Demonstrate competence in research in chemistry or chemical education.
   - Completing a research project judged to be satisfactory by the student=s faculty committee.

6. Demonstrate competence in written scholarly communication.
   - Completing a written thesis on the research project that is judged to be satisfactory by the student=s faculty committee.

7. Demonstrate competence in oral scholarly communication.
   - Presenting two public research seminars, each of which is independently evaluated by departmental faculty members.

Successful completion of this degree will enhance chances for professional advancement and expand employment opportunities. Further education in a Ph.D. program is also a possibility.