

PROGRAM REVIEW CERTIFICATION

Institution: University of Maryland Eastern Shore

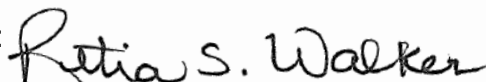
Academic Unit: School of Agricultural and Natural Sciences
Department of Natural Sciences

Program Reviewed: Chemistry

**Year in which the review
process was completed**

Program Reviewer(s): Dr. Sonali Raje
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Submitted by:



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Submission Date: October 19, 2012

**UNIVERSITY OF MARYLAND EASTERN SHORE
SCHOOL OF AGRICULTURAL NATURAL SCIENCES
DEPARTMENT OF NATURAL SCIENCES**

INTERNAL AND EXTERNAL REVIEW - 2012

**BACHELOR OF SCIENCE DEGREE PROGRAM IN CHEMISTRY
(with the American Chemical Society Guidelines for a Periodic Report)**

OVERVIEW

The Bachelor of Science in Chemistry is among several degree programs offered in the Department of Natural Sciences (DNS). This program is certified by the American Chemical Society. Other degree programs offered in DNS are: B.S. in Biology and Environmental Sciences with minors in Biology, Chemistry and Physics; Teacher Education in Biology and Chemistry; M.S. and Ph.D. in Toxicology; and a two-year pre-Pharmacy program with minors in Biology, Chemistry, Environmental Sciences and Physics.

UMES offers courses leading to additional degrees in collaboration with two different programs within the University System of Maryland: 1) combined four-year B.S./five-year M.S. programs in Marine Sciences and Environmental Chemistry with the University of Maryland Center for Environmental and Estuarine Studies (CEES), and 2) M.S. and Ph.D. degrees in Marine-Estuarine-Environmental Sciences (MEES).

The Department also provides courses which satisfy the campus' general education requirements including biological and physical sciences.

Mission

The mission of the DNS is to prepare students for employment in the diversified fields in biological, physical and environmental sciences and health related occupations. These programs also prepare students for entry into graduate and professional schools.

OBJECTIVES AND GOALS

1. Train students through demonstration, mentoring and personal experience to gain knowledge and develop chemical skills necessary to conduct scientific research.
2. Impart students with contemporary laboratory techniques and skills required to conduct scientific investigations.
3. Provide students with the academic curricula necessary to develop a strong understanding and knowledge of chemical theory and practice.

4. Expose teacher candidates in Chemistry from diverse cultural backgrounds to the breadth and depth of content knowledge in Chemistry and related sciences necessary for fulfilling requirements of teaching careers in diverse cultural settings.
5. Train future teachers in Chemistry who will be competent in the application of modern technological advances in innovative ways of thinking and approaching critical issues related to both science and education.
6. Provide future teachers the opportunity to acquire mastery of skills through constant reflection of their teaching and techniques that are used to obtain, analyze, and interpret scientific information.
7. Provide development opportunities to faculty to accomplish the objectives above.

FIVE-YEAR ENROLLMENT AND DEGREE DATA

Chemistry	2008	2009	2010	2011	2012	Totals
Enrollment	45	63	66	66	72	312
Graduates	5	3	10	3	16	37

SUMMARY OF INTERNAL AND EXTERNAL REVIEWS

Program Strengths

An ACS approved program in chemistry requires a substantial institutional commitment to an environment that supports long-term excellence; UMES has such an infrastructure in place as well as well-qualified faculty and capable Chemistry students. The external reviewers found the following evidence of a positive institutional environment at end of Spring 2012:

1. UMES is accredited by the Middle States Commission of Higher Education (MSCHE). UMES science teacher education programs are also accredited by the National Council of Accreditation for Teacher Education (NCATE) and National Science Teachers Association (NSTA).
2. The Chemistry Group is a part of the Department of Natural Sciences (DNS). It meets monthly and has autonomy. The Chair of the DNS manages the budget for all three groups, the Department of Chemistry, Department of Biology and the Department of Environmental Sciences.
3. UMES has a superior 32 million dollar DNS science facility completed in 2005. The Chemistry Group has other resources that include UMES Title III funds, MBRS RISE funds, significant faculty grant funds, and both faculty and student funded research placements.
4. The Chemistry Program has maintained and usually exceeds the number of required yearly graduates for an ACS (American Chemical Society) program.
5. The Chemistry Program faculty members have all of the attributes required by ACS in standard 3.1. They also have a highly qualified adjunct staff (over 60% hold doctoral degrees) and meet all requirements of standards 3.2 - 3.4.

6. The teaching loads in Chemistry Group reflect their commitment to student research and independent study. Both the DNS and the Chemistry Group anticipate a need for more staff, faculty, and office space for growth in 2012-2013.
7. The Chemistry Program requires students to participate in independent study with a faculty mentor, supports contact collaboration between undergraduate and graduate students, and encourages student participation in summer internships. These activities, as well as training sessions in lab safety and management skills, and on-going faculty coaching enable the Chemistry Group to prepare effective undergraduate student tutors.
8. The Chemistry Program safety equipment, locations, maintenance checks, safeguards for using the equipment, and operating procedures are addressed in the document.
9. The curriculum includes introductory courses, foundation courses and in-depth courses as required.
10. The major also has 450 lab hours required which exceeds the required 400 hours.
11. The program teaches all foundation courses annually and the frequency of the foundation and in-depth courses reasonably allows students to complete requirements in four years.
12. Students have access to adequate scientific journals (either print or online) and they also have access to *Chemical Abstracts*.
13. A recent Course Redesign initiative undertaken by the department shows an improvement in student pass rates by 15%.
14. The University provides orientation sessions for transfer students. The program requires students to conduct research with faculty and submit a comprehensive written report. As mentioned in the attached report, students are familiarized with using existing chemical literature, scientific ethics and good laboratory practices while conducting research. A specialized initiative undertaken by the Chemistry department also allows minority students to conduct research in other research intensive institutions throughout the nation.
15. As shown in the internal report, students are consistently provided with opportunities to enhance professional skills in addition to academic coaching. These include problem solving skills, good laboratory practices and safety skills, chemical literature skills, communication skills ethics and team skills.
16. The implementation of the GRE exam or a part of the GRE exam for exiting graduates is used as a summative assessment of the program.

Internal Review (Program Self Evaluation)

The Chemistry Group meets routinely on a semester basis and may call additional faculty meeting as necessary. All undergraduate majors are required to take a senior research course and prepare a written report. It has created its own Senior Seminar that will better prepare students for an in-depth review of their own Chemistry background, seek further certifications, and/ or graduate school admission. Perhaps the strongest evidence of a vital faculty, a dynamic Chemistry program, and engaged undergraduate majors is the data reported in "Grants to Enhance Instruction and Curriculum" and "Grants for Faculty and Undergraduate Research".

These accomplishments (although indirect evidence) strongly suggest a UMES Chemistry Group commitment to institutional and program mission statements and ACS standards.

Specific Observations and Recommendations from the External Review:

1. In regard to the grants and research data, it appears that the number of UMES students engaged in undergraduate research and/or accepted into graduate programs or research positions is possible because of the faculty's commitment to quality advising. Chemistry Group faculty members are probably so busy mentoring current students that they have not been able to address formal alumni activities. This is an area of in which UM System development grants and/or UMES funds and expertise to interview alumni or sponsor an alumni events would be helpful.
2. Since the new Chemistry group Senior Proficiency Seminar will be taught in this academic year, it is an excellent time to collect early baseline data and work with external consultants to maximize the evolving structure of this potentially valuable course with significant diversity representation.

Program's Response/Plan for Addressing Recommendations:

1. The department will consider surveying alumni for input on how to take the Chemistry Program to the next level and make it more relevant to the market needs. A Retention Coordinator position has been requested to: develop and administer alumni survey seeking input from DNS Alumni who majored in Chemistry and other areas. With the current overloaded faculty, it is not practical to interact with the alumni in a meaningful way.
2. The Science Proficiency Seminar is designed to prepare students for competitive exams, such as GRE, MCAT, DAT, etc. It will also provide data to assess how strongly students are being prepared, academically.

Mechanisms for following up and Assessing Progress for Chemistry:

All recommendations will be included in the Chemistry program Strategic Plan 2012-2013 academic year as an addendum. Progress towards their accomplishments will be monitored using the current UMES form for the Strategic Plan Progress Report. The form details 1) Indicator Baseline, 2) Indicator Target 3) Actual Indicator Results and 4) Changes Planned, Implemented or underway for each recommendation.