BOARD OF HIGHER EDUCATION

REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Assessment and Accountability **NO**.: AAC 08-27

COMMITTEE DATE: June 13, 2008

BOARD DATE: June 25, 2008

MOVED: The Board of Higher Education hereby approves the application of **Westfield State College** to award the **Bachelor of Science in Chemistry.**

Upon graduating the first class for this program, Westfield State College shall submit to the Department a status report addressing its success in reaching program goals as stated in the application and in the areas of enrollment, curriculum, faculty resources and program effectiveness.

Authority: Massachusetts General Laws Chapter 15A, Section 9(b)

Contact: Aundrea Kelley, Associate Vice Chancellor for Academic Policy

June 2008

Westfield State College
Bachelor of Science in Chemistry

INTENT AND MISSION

Westfield State College (WSC) currently offers a Bachelor of Science in General Science, with concentrations in General Science and Chemistry, that is approved by the National Council for Accreditation for Teacher Education and the Massachusetts Department of Elementary and Secondary Education as a program for teacher licensure. The B.S. in General Science is very similar to chemistry majors at some comparable institutions. Offering a chemistry major could also enable the College to better serve student interests. Thus, the primary purpose in seeking to offer a Bachelor of Science in Chemistry is to more accurately recognize the preparation of graduates in chemistry, enhancing their employment opportunities, and to expand the College's ability to contribute to the Science, Technology, Engineering and Mathematics (STEM) Pipeline in Massachusetts by attracting more students interested in teaching chemistry at the high school level. These goals support the College's mission and help to meet the education needs of the community. Consequently, the Board Trustees granted approval for the proposed chemistry major on October 11, 2007.

NEED AND DEMAND

There is widespread acknowledgement of shortages, both within Massachusetts and nationally, of chemists. The U.S. Department of Education reports that only 36.9 percent of high school chemistry students in 1999-2000 were being taught by an instructor who had both licensure and an undergraduate major in chemistry. The *Commonwealth of Massachusetts Employment Projections 2004-2014* predicts a 10.9 percent growth rate in chemist positions and a 17.7 percent growth rate in the need for post-secondary chemistry teachers.

Within the Massachusetts State College system, chemistry programs exist at Bridgewater State, Framingham State, Salem State and Worcester State, but none of those institutions are located in the western part of the Commonwealth. Chemistry majors do exist at institutions in western Massachusetts, at American International College, Elms College, and Western New England College, as well as at the University of Massachusetts Amherst and the other colleges in the Five-College system. In comparison with these nearby institutions, WSC offers more affordable degree programs.

ADMISSION AND ENROLLMENT

The College predicts modest growth in the proposed program as a result of increased visibility, anticipating a total enrollment of 15-20 students across all four years of the undergraduate curriculum by the time the program is fully implemented in year three and expects ten chemistry graduates over the next three years.

PROGRAM ENROLLMENT PROJECTION

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4*
New Full Time	5	5	7	7
Continuing Full Time	9	11	13	17
New Part Time	0	0	0	0
Continuing Part Time	0	0	0	0
Totals	14	16	20	24

The proposed major would be marketed to Massachusetts high school students interested in teaching high school chemistry but would also likely attract some students interested in chemistry, but not in teaching, as well as transfer students from community colleges.

First-year students entering the program should have completed high school chemistry and physics and should have a mathematical background that includes Algebra II and Trigonometry. They would also have to meet Westfield State's overall criteria for admission, generally including a minimum GPA of 3.0 in required college preparatory course work and other measures of academic success.

Transfer students entering after two years at a community college should have completed two semesters each of calculus and calculus-based physics and a two-semester sequence in General Chemistry. For students who have completed at least 24 hours of college work, a minimum 2.3 GPA is required for admission into the proposed program, with a 2.5 GPA for students seeking licensure.

CURRICULUM (Attachment A)

The curriculum is designed to provide a basic grounding in chemistry, suitable for those planning to teach at the high school level, and adequate for students interested in pursuing graduate studies or employment in laboratories. Completion of the program requires a total of 120 credits, including 54 credits in chemistry, mathematics and physics. Students seeking licensure must complete 57 credits in these disciplines.

Students preparing for grades 8-12 teaching licensure in Massachusetts will be required to pass the appropriate Massachusetts Test for Educator Licensure (MTEL) in order to obtain that license. Based upon prior performance of graduates, the college anticipates a passing rate on the MTEL of 90 percent for those students who complete the licensure program.

RESOURCES

Faculty and Administration. The B.S. in Chemistry would not require additional faculty or staff, as faculty and staff serving the chemistry concentration in the existing B.S. in General Science program would continue to be available to the proposed major.

The proposed Chemistry Major would be housed in the Department of Physical Science at Westfield State College, with administration by the chair of the Department. Oversight of the curriculum would fall to the chair and to the Departmental Curriculum Committee. Operation of the program would be supported by the Department's existing laboratory technician. This structure represents a continuation of current practice for the Chemistry Concentration.

Physical Resources. Instructional facilities, laboratories, equipment and supplies are available for the proposed program and the budget includes line items for the acquisition of additional physical resources during the start-up and implementation of the major.

Fiscal. A copy of the budget for the B.S. in Chemistry is attached as Appendix B.

PROGRAM EFFECTIVENESS

The College submitted goals and corresponding objectives, strategies for achievement and timetable below.

Goal	Measurable Objective	Strategy for Achievement	Timetable
Contribute to STEM pipeline by increasing selection of chemistry as a major	Increase enrollment by 25 percent over five years	Publicize new major thorough brochures, college/department Websites, and create contact with science supervisors and guidance counselors	5 years from start of program
Increase pool of chemistry high school teachers in MA	Increase enrollment in teacher licensure program in chemistry by 25 percent over five years	In conjunction with above activities, create brochure which highlights the need for chemistry teachers. Meet with faculty at nearby community colleges	5 years from start of program
While increasing size of program, sustain employability of licensure students	Maintain 100% employment as high school teachers for those completing licensure requirements	Work to maintain and expand network of connections with school districts across the state. Keep apprised of chemistry teacher vacancies/transmit that information to students	Ongoing
While increasing size, continue	Full program review with external review completed on regular	Refine and administer on a yearly basis, graduating senior	Ongoing

to monitor program quality and effectiveness	cycle; maintain and/or implement student focused assessments of program progress	survey; implement senior seminar portfolio; track MTEL scores; review material from above noted assessments on a yearly basis; implement changes as indicated	

EXTERNAL REVIEW AND INSTITUTIONAL RESPONSE

The Chemistry Concentration of the General Science Major was reviewed by Dr. Morton Hoffman, Boston University, and Dr. Jerome Mullin, University of New England, on February 18, 2008. Overall the reviewers expressed strong support for the proposed program, noting that the B.S. in Chemistry will provide graduates with a degree title that reflects more accurately the dominant discipline represented in their curriculum, which, in turn, will enhance their competitiveness in seeking employment.

The reviewers found that while the curriculum is not as extensive as those in chemistry programs at many other institutions, it is adequate to prepare students for a variety of post-graduate opportunities, particularly in secondary education, but suggested that courses be enhanced to reflect national standards. They noted that there is an absence of a course in Analytical Chemistry and a second semester of Physical Chemistry laboratory as well as a general lack of laboratory contact time relative to most other chemistry degree programs around the country and within Massachusetts. The reviewers also noted that an additional faculty member in chemistry may be required within a few years.

In light of the reviewers' comments the College examined its requirements and compared them to similar programs at other institutions. In response, the College incorporated two additional courses in the degree program for all students, Advanced Inorganic Chemistry and Theoretical or Experimental Research. These courses have been submitted to campus governance and were recently approved by the President of the College. The College states that with these additional courses total laboratory time required of the proposed program would be within 90-100 percent of the laboratory time at other comparable institutions. The College also plans to transfer some of the instructional duties related to Introduction to Chemistry to part-time faculty so that full-time faculty can focus on teaching the additional required courses as the program grows.

STAFF ANALYSIS AND RECOMMENDATION

Board staff thoroughly reviewed all documentation submitted by Westfield State College and external reviewers. Staff recommendation is for approval for the Bachelor of Science in Chemistry.

Upon graduating the first class for this program, Westfield State College shall submit to the Board a status report addressing its success in reaching program goals as stated in the application and in the areas of enrollment, curriculum, faculty resources and program effectiveness.

APPENDIX A

CURRICULUM

Required (Core) Courses in the Major (Total # courses required = 16***)***		
Course Number	Course Title	Credit Hours
CHEM 0109	General Chemistry I	4
CHEM 0111	General Chemistry II	4
CHEM 0201	Organic Chemistry I	4
CHEM 0203	Organic Chemistry II	4
CHEM 02xx	Advanced Inorganic Chemistry	3
CHEM 0305	Physical Chemistry I	3
CHEM 0307	Physical Chemistry II	4
CHEM 0311	Instrumental Analysis	4
CHEM 0313	Biochemistry	3
CHEM 0350	Theoretical or Experimental Research	3
CHEM 0383	Senior Seminar in Chemistry	1
GNSC 0239	Current Topics in Science Seminar	1
MATH 0105	Calculus I	4
MATH 0106	Calculus II	4
PHSC 0125	Physics I	4
PHSC 0127	Physics II	4
	Subtotal Required Credits	54
Elective Courses (Total # courses required = 10 ***)*** *(attach list of choices if needed)*		
	Subtotal Elective Credits	30
Distribution of General Education Requirements Attach List of General Education Offerings (Course Numbers, Titles, and Credits) *See Appendix E*		# of Gen Ed Credits
Arts and Humanities, including Literature and Foreign Languages		24
Mathematics and the Natural and Physical Sciences (**satisfied by major courses)		13 (0)
Social Sciences		12
	Subtotal General Education Credits	36**

Curriculum Summary	
Total number of courses required for the degree	38
Total credit hours required for degree	120

ATTACHMENT B

ACADEMIC PROGRAM BUDGET

One-Time Start-Up Costs		***Annual Expenses***			
	Cost Categories	**Year 1 ($)**	**Year 2 ($)**	**Year 3 ($)**	**Year 4 ($)**
None	Full-Time Faculty *(Salary and Fringe)*	96,879	99,785	102,778	105,861
None	Part Time/Adjunct Faculty *(Salary and Fringe)*	8,200	8,446	8,699	8,959
None	Staff	62,059	63,920	65,837	67,812
None	General Administrative Costs	5,750	5,922	6,099	6,281
None	Instructional Materials, Library Acquisitions	12,575	12,952	13,340	13,740
Set-up for Physical Chemistry II Lab: $5,000	Facilities/Space/Equipment	18,250	20,250	22,250	24,250
(Brochure Design: $300)	Marketing	$500	$200	$200	$200
	TOTALS	204,213	211,475	219,203	227,103

One Time/Start-Up Support		***Annual Income***			
	Revenue Sources	**Year ($)**	**Year 2 ($)**	**Year 3 ($)**	**Year 4 ($)**
	Tuition	13,580	16,624	21,402	26,407
	Fees	59,346	70,536	88,171	105,805
	TOTALS	72,926	87,160	109,573	132,212