

FY2009 DEPARTMENTAL ANNUAL REPORT OF CONTINUOUS IMPROVEMENT

Department of Chemistry Fort Hays State University

I. DEPARTMENTAL OVERVIEW

The Department of Chemistry exists to provide education in all the major branches of chemistry, and to carry out limited research and service activities related to the chemical sciences, for the benefit of the people of Kansas. As one of the liberal arts, chemistry is an important part of the educational mission of Fort Hays State University. In addition, chemistry is an essential part of the education of those pursuing careers in medicine, pharmacy, dentistry, optometry, nursing, and other health professions, as well as careers in chemistry and related sciences. As a “central science”, chemistry is a useful field of study for majors in other fields also, such as education, art, business, agriculture, and many others.

The Department offers both B.A. and B.S. degree programs, as well as degree emphases in the areas of Biological Chemistry, Environmental Science, Forensic Science, and Teacher Education. The Department also participates in the Master of Liberal Studies graduate program. Aside from advising Chemistry majors, Chemistry faculty advise for a large number of Pre-Professional programs – including Pre-Medicine, Pre-Pharmacy, Pre-Dentistry, and Pre-Optometry – even when those students do not complete a degree in Chemistry. Departmental members act as resource persons for individuals and organizations seeking advice in matters related to chemistry, such as faculty members at community colleges, small companies throughout western Kansas, and private individuals with questions about the use or handling of chemical products.

Within the University, the Department of Chemistry offers advice and assistance in chemical matters, and participates in activities involving other science departments. Among these are Science Day, the Science Olympiad, and the Research and Creative Activities week. The Department strongly supports efforts to improve science education throughout Kansas, sponsoring its own Speakers Bureau and regularly acting as host for the annual Kansas College Chemistry Teachers Conference. Chemistry faculty members support research in chemistry by, among other things, annually presenting seminars based on recent results from the chemical literature.

A. Departmental Mission and Vision Statements

The Chemistry Department provides undergraduate education in chemistry for chemistry majors; for other science majors including the biological sciences, geology, and physics; and for other majors with a chemistry requirement such as agriculture and nursing. The department

also provides chemistry courses that satisfy General Education requirements of the University. Research activities of the department emphasize teaching upper-division undergraduate majors how to conduct research by providing the opportunity for them to work with a faculty member on a research project. The department serves as a regional resource on chemical matters through consultation and, if needed, laboratory analysis. The Chemistry Department seeks to prepare students for employment as chemists, for graduate school, for professional school, or for teaching, through a curriculum with major emphasis on laboratory instruction and computer usage in the chemical laboratory. The central focus of the department is to use the experimental nature of chemistry to help students develop their analytical and problem solving skills.

B. Departmental Goals, Objectives, and Strategic Priorities

DEPARTMENTAL GOALS

To work for improved scientific literacy in all Fort Hays State students.

To improve the quality of all entry-level chemistry courses, including The Chemist's View of the World, General Chemistry, and University Chemistry.

To utilize the assessment results in an ongoing review process to improve the quality of the chemistry programs.

To introduce direct data acquisition technology into the entry-level chemistry laboratories.

To obtain scientific instrumentation to replace non-functioning and/or obsolete equipment.

To obtain new scientific instruments representative of those currently used in the discipline.

To increase the sense of accomplishment students express in their evaluation of chemistry courses.

To improve the retention of qualified students as chemistry majors.

To increase the role of the Chemistry/Preprofessional Club in the activities of the department.

To expand the opportunities for students to participate in research projects.

To continue an active seminar program, and to make speakers available to high school science teachers.

To continue and expand the services provided to area chemistry teachers.

To encourage a regular pattern of faculty sabbatical leaves.

To bring the chemistry department into compliance with all state and federally mandated safety regulations as they evolve.

To aid the economic development of Western Kansas by providing expertise on chemical matters.

C. Department Productivity and Distinctive Accomplishments

The Department of Chemistry views its duties of teaching, scholarly research, and service to be inter-related and inseparable. As a consequence, no single measure of departmental productivity can adequately assess the activities of the members of the department collectively or individually. Furthermore, many activities of departments and individuals are not amenable to simple measurement or assessment, even subjectively. For example, there is no way to measure the intellectual growth and maturation of students over four years of college, or to assess the value of professional advice provided to external individuals or organizations. It should also be emphasized that the Chemistry Department provides services over and above advisement and coursework for Chemistry majors. Pre-Pharmacy students, who normally do not complete any undergraduate degree, and Pre-Medical students, who often major in fields other than Chemistry, are all advised and instructed by Chemistry faculty members. At the same time, certain comments about efforts and outcomes of the Chemistry Department or its members have a place here, and can act as sign posts to mark out some of the accomplishments of the past year, accomplishments that do not fit well within the categories below.

One of our Long-Term Strategic Initiatives for the past several years, specifically the revision of our B.S. degree program to better match American Chemical Society (ACS) guidelines for undergraduate chemistry curricula, has now reached completion. At the end of the 2008-09 academic year the Chemistry Department submitted a Pre-Application for ACS Approval of a Bachelor's Degree Program in Chemistry, and although the complete process for ACS Approval takes several years we are confident that we can meet the criteria they have established. Completion of this initiative is very much a milestone for the department, and the lion's share of the credit for this accomplishment must go to Dr. Eddie Olmstead and the other members of the departmental Assessment and Planning Committee. It is important to note that ACS approval is not in any way an "accreditation" of the degree or the department; and that the ACS is not an accrediting agency, rather it is a professional organization with an interest in standardizing chemistry curricula. Nonetheless, the department feels that the honor of ACS approval of its degree program will greatly benefit the department and the university, most directly by enhancing our ability to recruit top quality students as well as new and replacement faculty members. Other notable accomplishments in the category of improved educational opportunities include extensive preparations for the arrival of Kansas Academy of Mathematics and Science (KAMS) students in Fall, 2009; the completion of the process of shifting to a new and more useful placement test (the California Chemistry Diagnostic test) for incoming

freshman students; and revisions made in our capstone course for majors, Seminar in Chemistry. Results of these efforts are measured by some of the data in the tables below (e.g. outstanding scores on the National Survey of Student Engagement, NSSE). In addition, teaching excellence is shown this year by honors received by faculty members (nomination for a Pilot Award, as well as a Mortar Board “Top Prof” designation), and by an outstanding placement rate of our graduates in graduate/professional school or immediate employment.

Scholarly/research activity continues to be a high priority for departmental members, again as shown by the data in the tables below. Two factors should be kept in mind when examining these data. First, the department views involvement of undergraduate students in faculty members’ research projects to be of the highest importance, in spite of the time commitment that must be made in guiding and mentoring these students. Second, several factors conspired to limit our productivity in research this year, not least of which were the preparations for KAMS and the fact that two faculty members, one new and one returning, needed this year to plan or extensively revise their research projects. In spite of these challenges, the department maintained a notable level of scholarly productivity this year, and plans were developed to include KAMS students in research in the near future. Scholarly presentations – by Dr. Wiese, Dr. Olmstead, and Dr. Bencze – and scholarly publications – by Dr. Bencze and Dr. Wiese – were among the highlights this year.

Departmental service activities this year were likewise commendable. Drs. Donnelly and Wiese continue their professional service to the Wichita section of the American Chemical Society: one as newsletter editor and both on section committees. Dr. Wiese also took a leadership role in events that took place in connection with the national Chemistry Olympiad and the state Science Olympiad. Dr. Dorn and Dr. Olmstead both contributed to activities at the Middle School Girls Math/Science Camp, and once again Mr. Scott sponsored the campus-wide “Mole Day” event. All this was in addition to standard service activities, on college and university committees for example. The value of these contributions in teaching, research, and service cannot be simply assessed by numbers, but in the eyes of the members of the Chemistry Department their importance is unquestionable.

II. DEPARTMENTAL PERFORMANCE METRICS

A. Department Performance Indicators

Key Performance Indicator	FY2005	FY2006	FY2007	FY2008	FY2009
Freshmen	33	30	25	31	24
Transfer Students	8	7	6	7	7
Undergraduate (first majors/second majors)	93/4	84/3	75/5	85/3	84/1
MLS Majors	0	0	0	1	1
Major Retention	73.40%	67.03%	71.08%	73.97%	69.88%
Undergraduate Student Credit Hours	2623	2301	2058	1869	1990
Graduate Student Credit Hours	2	13	20	30	8
Tenured or Tenure-track Faculty (Headcount)	6	6	7	6	7
Non Tenure-Track Faculty (Headcount)	2	2	1	2	1
Other Faculty (Headcount/Sections Taught) [OTHER FACULTY AT 4 SECTIONS = 1 FTE FORMULA; INCLUDE NUMBER OF FTE AND SECTIONS TAUGHT]	0	0	0	0	0
Undergraduate Degrees	5	5	6	7	6
Briefly note 2-3 improvements over the last year prompted from the above enrollment indicators. Most indicators have stabilized, or actually risen, over the last three years; in particular, a major recruiting effort seems to have reversed a downward trend in SCH production. The addition of MLS students brings welcome opportunities for graduate education and research.					
Number of books, book chapters, and refereed articles published	5	3	5	2	2
Percent of faculty publishing refereed books, chapters, or articles	28%	28%	40%	28%	28%
Number of non-refereed articles and presentations	0	0	0	0	0
Percent of faculty publishing non-refereed articles or presentations	0	0	0	0	0
Number of scholarly performances and other creative activities	3	5	3	2	3
Percent of faculty in scholarly performances or other creative activities	28%	28%	13%	27%	40%
Total number of external grant applications submitted/percent of faculty submitting	3/14%	1/14%	1/13%	3/13%	2/13%
Total number of funded external grants/percent of faculty funded	3/14%	1/14%	1/13%	2/13%	1/13%
Briefly note 2-3 improvements over the last year prompted from the above scholarly/creative activities indicators. With one new faculty member and one faculty member returning from unpaid leave this year, these levels of scholarly activity are remarkably high, given that these faculty members are just starting, or restarting, their research activities. In addition, most of the scholarly publications and presentations this year included undergraduates as co-authors, in contrast to last year when none of the scholarly publications included undergraduate co-authors.					

Key Performance Indicator	FY2005	FY2006	FY2007	FY2008	FY2009
[NOTE: Each department MUST report at least two direct measures of student learning outcomes and two indirect measures. Examples of direct measures include: first-time pass rate or average scores on standard exit exam, number of students successfully completing reviewed portfolios. Indirect measures would include student satisfaction, alumni and employer data, or any other perception based data.]					
Direct Outcome 1 Score on standardized exam taken by majors at end of sophomore-level course; mean score/national mean	42.0/43.1	42.6/43.1	39.2/43.1	35.9/43.1	34.0 (See Appendix 1)
Direct Outcome 2 Average grade in capstone course: Seminar in Chemistry	82.9%	80.7%	82.1%	80.5%	75.7%
Indirect Indicator 1 Alumni Achievement Award Winners	0	1	1	1	1
Indirect Indicator 2 Percent of Alumni Surveys returned describing the education in chemistry superior or above average	100%	85.7%	87.5%	50.0%	100%
Senior students' Level of Academic Challenge			49.24	48.18	58.57
Senior students' Active and Collaborative Learning			52.38	49.52	62.86
Senior students' Student-Faculty Interaction			61.67	52.00	61.33
Senior students' Enriching Educational Experiences			40.08	45.08	51.83
Senior students' Supportive Campus Environment			65.97	70.00	79.44
Briefly note 2-3 improvements over the last year prompted from the above student learning/engagement indicators. With extraordinarily high NSSE results it's clear that seniors in Chemistry feel that they are benefiting from an excellent education at FHSU. A continuing trend of Alumni Achievement Award winners, and a return to very high ratings on our Alumni Surveys, indicate that our alumni have a similar view.					
[NOTE: Departments may pick up to three key performance indicators they currently measure but are not captured above. These measures could be used to track departmental results on specific yearly goals. Examples might include: number of SRPs attended, number of new freshmen contacted. (These will vary by department based on goals.)]					
Outcome/Indicator 1 Contact hours per week/full-time faculty members (excluding department chair)	14.7	16.9	16.1	13.3	14.6
Outcome/Indicator 2 Number of letters to prospective freshmen	1138	1368	1311	953	1099
Outcome/Indicator 3 Lab contact hours per week for B.S. degree, FHSU/Regional University average	38/27.3	38/27.3	38/27.3	36/27.3	36/27.3
Briefly note 2-3 improvements over the last year prompted from the above indicators. Faculty teaching contact hours, while still dangerously high, have been maintained below the maximum set by the American Chemical Society (15 credit hours) for instructors in a Bachelors' degree program. Recruiting efforts, as measured by letters to prospective freshmen, have rebounded.					

B. Department Quality Initiatives and Results

FY2009 Quality Initiatives	Results
<p>1. Preparation for the Kansas Academy of Math and Science (KAMS) All of the natural science departments on campus are making plans for the arrival of the first KAMS students in the Fall of 2009, but there are special concerns that the Chemistry Department must work to manage. Among these are sharply increased numbers in our CHEM 120 and 122 lab classes, liability and logistical issues in having high school students working on research projects, and pedagogical changes required for achieving educational goals with these gifted but younger students.</p>	<p>Since budget constraints made it impossible for a new KAMS faculty member in Chemistry to be hired, it became necessary for the current faculty members to make plans to handle the KAMS duties on an overload basis. Evening lab sections for CHEM 120L are planned for the fall, and the instructors for CHEM 120, both lecture and lab, have been making plans for the new challenges of the KAMS students. At a departmental long-range planning meeting in January detailed discussions were held regarding KAMS and its impact on departmental activities over the next several years. Faculty members are also beginning to assemble plans for research projects that can involve the KAMS students, and inter-disciplinary and cross-disciplinary projects are being specially emphasized. A multi-disciplinary committee has been formed to discuss workforce development in science, technology, engineering, and math (STEM), and although the STEM committee's work is not expected to be completed any time soon it is anticipated to have an impact on the future of KAMS. Since the KAMS students will end their formal chemistry course work with CHEM 122 the department has been focusing on maximizing the educational benefits of the freshman course sequence, lecture and lab, as its measure of progress in this initiative.</p>
<p>2. Revisions to Freshman Chemistry Lab Experiences The Long-Term Strategic Initiative to move towards American Chemical Society (ACS) approval of our B.S. degree program (see below) has focused on advanced classes in the program. The activities of our Freshman Lab Supervisor have been very beneficial, but have focused mainly on the details of established lab procedures and the mechanics of report writing and grading. It is time now to consider the pedagogy of freshman lab experiences in light of modern views of chemical educators, particularly with regard to safety and educational utility.</p>	<p>Again, budget constraints made it impossible for a new Freshman Lab Director to be hired, so the faculty member currently acting as Lab Supervisor, Dr. Stephen Donnelly, has taken on some of the duties expected to be handled by the Lab Director. In particular, experiments in CHEM 120L and 122L that have limited success in achieving the educational goals of those classes are being weeded out, and a search for better lab activities has begun. In some cases this has required only simple substitutions of new materials or procedures for old ones, such as the use of only freshly prepared or obtained chemical reagents. In addressing issues of pedagogy, however, a great deal of time must be set aside for the selection, meta-testing, and up-scaling of new lab procedures for these classes. Without a Lab Director dedicated to just this task this must now be considered effectively a Long Range Departmental Initiative (see below), taking at least a few years to realize significant progress. The Lab Director was also to have included the issues of environmental impact and safety in making these revisions, so these are additional factors that will lead to unavoidable delays in making progress on this initiative. It should be emphasized, however, that major strides have been made in the quality and efficiency of the freshman-level Chemistry lab experiences over the past several years. Among these have been a complete revision of the format of many lab procedures and reports, notable increases in the safety and educational utility of freshman lab experiences, and a sharp reduction in turn-around-time for graded lab reports.</p>

FY2010 Quality Initiatives	Responsible Party, Resources, and Plan
<p>1. Chemistry Faculty Retreat As noted above, budget constraints led to severe restrictions on departmental initiatives in FY 2009, and this necessarily leads to an increased emphasis on maximizing utility while minimizing cost in all activities. In addition, several new issues have come up in connection with carrying out the FY 2009 initiatives, such as the utility and practicality of our computerized chemical inventory system, and these issues require more time and consideration than we have been able to give to them. Finally, the process of achieving approval of our B.S. degree program by the American Chemical Society (ACS, see "Departmental Highlights") is not a simple matter, but is instead expected to periodically take up large blocks of time when faculty members are already on overload.</p>	<p>Dr. Jim Hohman will solicit suggestions from other faculty members regarding time(s) and day(s) for a departmental retreat, and will also seek input regarding the order and prioritization of agenda items to be discussed at this retreat. Input will also be sought from alumni and friends of the department. The major focus of the retreat's agenda will be on long-term issues, consciously avoiding, if necessary, the intrusion of immediate but short-term departmental concerns. As a consequence, each agenda item will be selected with a view to where we want the department to be 5 years, 10 years, or 20 years from now. All activities of the department – including teaching, research, and service – will be considered in setting the agenda, and a consensus will be sought at the retreat regarding both the direction we want to go and the goals we want to achieve. Costs for the retreat are expected to be minimal, though resources may be sought through administrative channels or possibly from alumni. Once the retreat is over a detailed report regarding our discussions and conclusions will be made available to the faculty members and, if desired, to the dean and/or provost.</p>
<p>2. Improvements in Freshman Lab Experience As noted above (FY 2009 Quality Initiatives), both the preparation for KAMS and the revisions to freshman chemistry lab experiences had to be extensively modified last year because budget constraints prevented us from hiring needed personnel. This has led to teaching contact hour loads that cannot be maintained by current faculty for long, and may jeopardize our effort to achieve ACS approval of our B.S. degree program.</p>	<p>Dr. Jim Hohman will seek input from other Chemistry faculty members regarding the job description for a new faculty position, namely that of Freshman Laboratory Director. This person will be expected to take on many of the extra duties that currently are overloading the faculty instructors of CHEM 120L and 122L. In addition, this person will be charged with making improvements to these lab courses in the form of wholly new or extensively revised experiments, for the benefit of both our regular college students and the incoming KAMS students. Once the duties have been fully delineated an Action Plan will be submitted for filling this position. Once approved, this position will be filled by a nationwide search, and the search criteria will include the importance of research that complements current faculty members' and could involve students below the Junior level. Many benefits are expected from this initiative, not least of which will be our ability to scale up for larger numbers of KAMS students in the future, and enhanced likelihood of ACS approval of our B.S. degree.</p>

C. Institutional Quality Results

FY2009 University Initiatives	Department Activities/Results
<p>Increase access and retention for Hispanic students</p>	<p>In the course of deliberations regarding the Academic Opportunity Awards (AOAs) this year, the department actively sought to increase the number of applicants, including Hispanic students. An effort was also made to make decisions on AOAs earlier than in past years. As of this date, both these efforts seem to have resulted in an increase in the number of acceptances of AOAs.</p>

Increase the quantity and quality of K-12 teachers educated	The formation this year of a committee to explore opportunities for cross-disciplinary research among the natural sciences is expected to lead in time to more well rounded and better prepared K-12 educators. Plans being developed for KAMS (see above) are expected to increase the numbers of students interested in teaching careers.
Improve undergraduate students' foundational skills	The changes made in freshman laboratory experiences (see FY 2009 Quality Initiative 2 above) are designed both to improve the fundamental skills of these students and to improve their retention in programs administered by the Chemistry Department.
Enhance physical wellness of students, faculty, and staff	The Chemistry Department supports university-wide efforts to improve the physical health and well-being of all students, faculty, and staff, but views its direct involvement in these efforts to be outside the department's mission.
Internationalize the campus and curriculum	The study of chemistry is inherently international in scope, and all introductory Chemistry courses at FHSU include descriptions of contributions made to the field by persons from a wide variety of nations and backgrounds. On-going efforts to attract more Hispanic students (see above) are also part of the department's response to this initiative.

II. FY2009 STRATEGY AND OPPORTUNITIES FOR IMPROVEMENT

A. Departmental Reflection of Strengths, Needs, Opportunities, and Threats (SNOT)

[DISCUSSION OF YOUR DEPARTMENT'S STRATEGIC PLANNING PROCESS. RESULTS OF STRATEGIC PLANNING SHOULD BE RECORDED BELOW. DEPARTMENTS ARE NOT EXPECTED TO ENGAGE IN FORMAL STRATEGIC PLANNING ANNUALLY, BUT SOME SYSTEMATIC STRATEGIC PLANNING MODEL SHOULD BE IMPLEMENTED. IF A SWOT ANALYSIS IS USED, PLACE IN SPACES BELOW; IF A DIFFERENT MODEL IS USED, THEN SUBSTITUTE.]

Current Strengths	Current Needs
First, it must be stated that the Chemistry Department is what it is because of highly dedicated and capable faculty members. Each of the full-time faculty members possesses the terminal degree in chemistry, and they represent all the major sub-disciplines within the field. Second, the department benefits from outstanding facilities in Tomanek Hall, and numerous pieces of state-of-the-art equipment and instrumentation. Finally, programs administered within the department – both major degree programs and pre-professional programs – are well established and highly regarded.	One chronic concern, that of excessive teaching contact hours (see II. A, under "Outcome/Indicator 1" as well as Appendix 3), has eased over the past few years but remains a concern. This reduces time available for curriculum development and for research – so necessary in an advancing technical field like chemistry – and it may jeopardize our participation in new and proposed programs like KAMS and the PSM. Another concern is that we are the only Chemistry Department among the 6 four-year institutions within the Regents system that has no degree program approved by the American Chemical Society (ACS).

Future Opportunities	Future Threats
<p>One positive development is the recently completed revision of our B.S. curriculum to better match guidelines set by the ACS for undergraduate degree programs in chemistry (see above and below). The application process for ACS approval of our B.S. program has begun, and once approval is granted the results are expected to include tremendous recruitment opportunities. Another related opportunity is the increased emphasis on chemical research as a standard part of the undergraduate curriculum. Finally, new faculty members bring with them the energy and enthusiasm needed to inspire students for academic excellence and professional achievement.</p>	<p>One ominous development is KAMS: as noted above under FY 2009 Quality Initiatives, the Chemistry Department has special concerns and challenges in both the expected numbers and the expected educational needs of these students. Since no new Chemistry faculty member is expected to come on board in the near future to manage many of the KAMS activities, every member of the department will have to quickly adapt to unfamiliar circumstances. Another looming problem is the limited space available for laboratory research within the department, and it should be noted that research is also a required activity for the KAMS students.</p>

B. Opportunities for Improvement

[NOTE: Long-term OFIs are meant to be resource-intensive changes requiring permanent or one-time resources that can favorably impact the department over the long-term.]

Long-Term Strategic Initiatives	Resources Required	Expected Result
<p>1. As discussed above (under SNOT analysis), we are the only Chemistry Department among the 6 four-year institutions in the Regents system that does not have a degree program approved by the American Chemical Society (ACS). For both recruitment and assessment purposes, we have developed a modified version of our B.S. degree program that would meet ACS guidelines for approval, and have completed the ACS Pre-Application process. Now we need to complete our final application and prepare for ACS scrutiny, including a site visit by ACS officials.</p>	<p>ACS guidelines include strict restrictions on the number of teaching contact hours for each faculty member each year, and this will almost certainly require an increase in FTE Chemistry faculty. The Lab Director position (see under FY 2010 Quality Initiatives) is designed to make it possible for us to meet these restrictions while still being fiscally responsible. ACS guidelines also include the encouragement of undergraduate research, and this will require some additional resources. Finally, there are expected to be some costs in connection with the ACS site visit.</p>	<p>As discussed above (under FY 2009 Quality Initiatives), KAMS duties must be handled on an overload basis for the time being, but to avoid exceeding ACS limits on contact hours the overloads must end after FY 2010 at the latest. The final application will happen during either FY 2010 or 2011, and the ACS site visit is expected during FY 2012. If ACS approval is granted, departmental recruitment materials will immediately be modified to indicate the new status of our B.S. degree. Recruitment of increased numbers of top quality students, and recruitment of top quality new and replacement faculty members, are both expected to be enhanced. B.S. graduates are also expected to enjoy a competitive advantage in job seeking.</p>

<p>2. Multi-disciplinary and cross-disciplinary workforce development in science, technology, engineering, and mathematics (STEM) is viewed as essential by all the natural science departments, not only for the future of FHSU but also for the future of our state, region, and nation. Problems and challenges that we will face – from climate change to economic upheaval – will require persons with broad and cross-disciplinary STEM backgrounds rather than the narrow single-discipline focus that was previously sufficient. It is also vital that future science educators have a broad view of the STEM fields so that they can provide a useful context for decision-making by the general public in seeking solutions to these problems.</p>	<p>A multi-disciplinary and cross-disciplinary STEM workforce committee has been formed and has begun discussions, particularly about enhancing research opportunities at FHSU. In the end, the major resources that are needed are for more lab space and facilities for STEM research, almost certainly meaning a new research building on campus. This of course would mean a very sizable commitment by the state, so the committee is currently developing a proposal to be presented first to the FHSU administration, focusing on current strengths of the science departments in STEM workforce development. In addition, some new instrumentation and equipment will be needed for cross-disciplinary research projects.</p>	<p>The committee hopes to present at least a preliminary proposal for a multi-disciplinary STEM research building sometime in FY 2010 to the FHSU administration with input from the FHSU Foundation. Items to be included in the proposal are the need for multi-disciplinary STEM research at FHSU, advantages of STEM workforce development at FHSU over larger research universities, an estimate of the cost, and outcomes expected from establishment of these research facilities. Among these outcomes are expected to be establishment of FHSU as a premiere educational institution for science students, preparation of science graduates for careers of the future rather than the past, and teachers capable of enlightening their students and the general public regarding multi-disciplinary science issues.</p>
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I. SUPPORTING MATERIAL

A. Department Degree Program Affinity Diagram(s)

Department of Chemistry Affinity Diagram for Baccalaureate (B.A./B.S.) Program

Characteristics of Chem Program	Expected Learning Outcomes	Curriculum	Assessment Approach and Methods	Results	Curricular and/or Pedagogical Changes
<p>Knowledgeable Chemists must have an extensive base of fact, terminology, and theory in order to interpret results and solve problems.</p> <p>Analytical/Precise Chemists must use higher level reasoning skills to solve problems without allowing imprecise data to interfere.</p> <p>Dedicated/Patient Chemists must deal with problems that do not meet immediate success.</p> <p>Creative/Resourceful/Innovative Chemists solve experimental and theoretical problems using a core of knowledge and available resources.</p> <p>Objectively/Intellectually Honest Chemists must view all data without bias and must rigorously adhere to the premise that all data are reported without alteration.</p> <p>Curious/Inquisitive Chemists rely on experimentation to obtain information and test all inferences.</p>	<p>Goal A to become highly proficient in laboratory techniques used in research in chemistry and related fields Objective #1 to make experimental observations Objective #2 to manipulate common laboratory apparatus Objective #3 to operate common instrumentation and to properly use the results in experimental work Objective #4 to develop the skill necessary to acquire experimental data directly by computer Objective #5 to interpret experimental results and use the data to make valid inferences</p> <p>Goal B to acquire the ancillary skills that are required of a practicing chemist Objective #1 to solve chemical problems of both a theoretical and experimental nature Objective #2 to retrieve chemical data from the original literature by using printed abstracts and computer database methodology Objective #3 to communicate scientific findings in writing and/or orally Objective #4 to be proficient in the application of computer technology to solve chemical problems as well as the use of databases, word processing, and spreadsheets</p> <p>Goal C to attain a theoretical background which provides a thorough understanding of the discipline Objective #1 to be thoroughly based in the major areas of chemistry Objective #2 to use basic knowledge to explore the interdisciplinary areas of chemistry Objective #3 to apply chemical knowledge to appropriate problems in the other natural sciences Objective #4 to relate chemical knowledge to other scientists as well as to non-scientists</p> <p>Goal D to instill in the learner scientific methodology Objective #1 to be objective in the evaluation of data Objective #2 to demonstrate leadership characteristics Objective #3 to maintain intellectual honesty</p>	<p>Program Core Curriculum Introduces the discipline CHEM 101 Orientation to Chemistry Develops knowledge and problem-solving skills MATH 110 College Algebra CHEM 120 University Chemistry I CHEM 122 University Chemistry II CHEM 350 Chemical Analysis CHEM 340 Organic Chemistry I CHEM 342 Organic Chemistry II Develops laboratory and experimental skills CHEM 120L Univ. Chem. Laboratory I CHEM 122L Univ. Chem. Laboratory II CHEM 350L Chemical Analysis Laboratory CHEM 340L Organic Chem. Laboratory CHEM 342L Organic Chem. Laboratory II Develops scientific communication skills CHEM 675 Seminar in Chemistry</p> <p>B.A. Curriculum Develops knowledge and problem-solving skills MATH 331 Calculus Methods PHYS 111 Physics I PHYS 112 Physics II CHEM 430 Survey of Physical Chemistry Develops laboratory and experimental skills PHYS 111L Physics I Laboratory PHYS 112L Physics II Laboratory CHEM 430L Sur. of Phys. Chem. Laboratory Broadens the knowledge base CHEM Electives</p> <p>B.S. Curriculum Develops knowledge and problem-solving skills MATH 234 Analytic Geometry and Calc. I MATH 235 Analytic Geometry and Calc. II PHYS 211 Physics for Sci. and Engin. I PHYS 212 Physics for Sci. and Engin. II CHEM 632 Physical Chemistry I CHEM 634 Physical Chemistry II CHEM 656 Instrumental Analysis CHEM 666 Inorganic Chemistry Develops laboratory and experimental skills PHYS 211L Physics for Scientists and Engineers I Lab PHYS 212L Physics for Scientists and Engineers II Lab CHEM 360L Biochemistry Laboratory CHEM 632L Phys. Chem. Laboratory I CHEM 634L Advanced Physical and Inorganic Lab CHEM 656L Advanced Instrumental and Physical Lab</p> <p>General Education Curriculum Develops the knowledge required to be educated Liberal Arts component Develops the skills required to be educated Foundation Studies Component</p>	<p>WRITTEN EXAM: California Chemistry Diagnostic Examination is administered to all students who take CHEM 120, University Chemistry I. The results are used as a measure of the starting level for chemistry majors.</p> <p>WRITTEN EXAM: American Chemical Society Cooperative Examinations are administered at the conclusion of several courses in the core, B.S., and B.A. curricula. The results are used to compare the performance of FHSU chemistry majors to the performance of other students on nationally standardized exams.</p> <p>PROGRAM AUDIT: A program audit that includes the course prospectus, final comprehensive examination, chemistry majors' grades and final exam scores, and a class average of the final exam is maintained for each required chemistry course.</p> <p>CAPSTONE COURSE: CHEM 675, Seminar in Chemistry, challenges the students to research, organize, and present seminars during their senior year. The entire chemistry faculty have input into the grading of the students in this course.</p> <p>ALUMNI SURVEY: All students who graduate with a degree in chemistry are surveyed two years after their graduation. The results are used to improve the program.</p>	<p>See Appendix 1 for typical results from Standardized Exam</p> <p>See Appendix 2 for Results of Capstone Course.</p> <p>In a recent Alumni Survey, 100% of alumni would recommend FHSU Chemistry programs to a son or daughter.</p>	<p>As noted above (FY 2008 Quality Initiative 2), this is a new placement exam, and it will be used to determine student preparedness.</p>

B. Department Staffing Plan

Department of Chemistry
Date Prepared – June 2009

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Current Department Needs	Faculty Member	Faculty Expertise	Retirement (Birthdate)	Assigned Instructional FTE	Rank Current Date	Degree Completed	Track
Analytical General Inorganic	Olmstead	Analytical Inorganic Chem. Ed.	08/08/1967	1.0	Assistant Professor, 2002	Ph. D.	Tenured
Biochemistry Physical General	Bencze	Biochemistry Physical	02/17/1972	1.0	Assistant Professor, 2008	Ph. D.	Tenure Track
General Inorganic	Rumpel	Inorganic Physical Chem. Ed.	03/17/1936	1.0	Professor 1968	Ph. D.	Tenured
General	Scott	General	03/11/1945	0.5	Instructor 2000	M.S.	Temporary
Organic General	Hohman	Organic	08/18/1952	0.5 (Admin), 0.5 (Instruct)	Professor 1997	Ph. D.	Tenured
Physical General Environmental	Donnelly	Physical Environmental	10/31/1964	1.0	Assistant Professor, 2003	Ph. D.	Tenure Track
Organic General	Dorn	Organic	09/05/1961	1.0	Associate Professor, 2001	Ph. D.	Tenured
Biochemistry General	Wiese	Biochemistry	01/09/1964	1.0	Professor 2007	Ph. D.	Tenured

C. Bibliography of Departmental Scholarly Activity

1. Enzymatic Activity of α -L-Fucosidase and L-Fucokinase Across Vertebrate Animal Species . Bradley J. Honas, Urlene M. Glassman and Thomas J. Wiese. *Comparative Biochemistry and Physiology, Part B* 153: 359-364, 2009.
2. Investigation of the Copper Binding Site and the Role of Histidine as a Ligand in Riboflavin Binding Protein. Sheila R. Smith, Krisztina Z. Bencze, Kristen A. Russ, Kristen Wasiukanis, Marilee Benore-Parsons and Timothy L. Stemmler. *Inorg. Chem.*, 2008, 47 (15), pp 6867–6872.

D. Department Program Assessment Results

1. [See Appendix 1, Raw Scores on Standardized Exam.]
2. [See Appendix 2, Scores for Capstone Course, CHEM 675 Seminar in Chemistry.]
3. [See Appendix 3, Department of Chemistry Faculty Contact Hours per Week.]

E. Other Departmental Information**Appendix 1: Raw Scores on Standardized Exam*, Department of Chemistry**

Student No.	Spring, 2005	Spring, 2006	Spring, 2007	Spring, 2008	Spring, 2009**
1	53	43	36	40	18
2	37	30	29	41	42
3	44	50	63	52	25
4	56	36	46	37	31
5	53	33	52	32	32
6	47	60	38	47	47
7	52	55	29	21	30
8	55	56	34	39	49
9	38	27	34	31	60
10	33	34	36	30	33
11	40	51	39	45	26
12	35	61	33	25	35
13	40	32	41	37	47
14	48	29		37	26
15	33			38	29
16	31			37	26
17	25			21	26
18	46				36
19	47				28
20	27				
21	51				
22	34				
23	40				
24	43				
Mean					
Score	42.00	42.64	39.23	35.88	34.00
Std. Dev.	8.99	12.43	9.58	8.53	10.24

*American Chemical Society Cooperative Exam in Organic Chemistry, Form 2002. (Note: this exam is administered at the end of the sophomore-level chemistry course, CHEM 342 Organic Chemistry II.)
Maximum score = 70.

**A new edition of the American Chemical Society Cooperative Exam in Organic Chemistry, Form 2008, was used, and no norms have been established yet.

Appendix 2: Scores* for Capstone Course CHEM 675 Seminar in Chemistry

Student Number	Fall, 2005	Spring, 2006	Fall, 2006	Spring, 2007	Fall, 2007	Spring, 2008	Fall, 2008	Spring, 2009
1	234.50	239.70	257.40	205.10	225.30	202.26	198.20	231.72
2		233.50	200.50	260.70		225.90	227.58	198.00
3		206.30		243.10		200.10		229.00
4		206.40		184.70		234.30		194.58
5		244.40		256.00		205.34		204.20
Mean	234.50	226.06	228.95	229.92	225.30	213.58	212.89	211.50
Std Dev		18.40	40.23	33.40		15.48	20.77	17.58

*Maximum score = 280

Appendix 3: Department of Chemistry Faculty Contact Hours per Week*

Faculty Member	Fall, 2006	Spring, 2007	Fall, 2007	Spring, 2008	Fall, 2008	Spring, 2009
1	16	17	14	11	15	18
2	17	19	16	12	13	13
3	14	18	16	16	17	15
4	15	18	13	12	17	12
5	22	15	11	11	14	13
6	11	11	14	14	14	14
Mean Contact Hrs	15.83	16.33	14.00	12.67	15.00	14.17
Standard Deviation	3.66	2.94	1.90	1.97	1.79	2.39

*Full-time faculty members, excluding chair. Note that American Chemical Society guidelines specify no more than 15 contact hours per week per faculty member.

General Parameters

- No more than 20 pages, excluding appendix information.
- Report submitted electronically to Dean, Assistant Provost for Quality Management, and Provost.
- Note deadlines attached below.

Annual Timeline for Department Annual Report

March 1	Draft template distributed to Deans.
April 15	Final template and Directions distributed to Department Chairs. Selected enrollment data (fall 20 th day counts) distributed to Chairs and Deans in the departmental template.
June 1	Student system information (graduates, SCH) delivered to Chairs.
June 1	Final cutoff date for elements to be considered in the Department's Annual Report.
June 30	Complete Department Annual Report due to Deans, Assistant Provost for Quality Management, and Provost. Submit electronically.
August 15	Completed College Annual Report due to Assistant Provost for Quality Management and Provost.