FY2013 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 Scholarly and Creative Activities events. The Department strongly supports efforts to improve science education throughout Kansas, for example in its active participation in programs like the Kansas Academy of Mathematics and Science (KAMS). 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 undergraduate students, including KAMS students, 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

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 computer-based data acquisition technology to entry-level chemistry students.

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

For the past ten years the Chemistry Department has been making modifications to our B.S. degree program to match American Chemical Society (ACS) guidelines for undergraduate chemistry curricula, and over the past four years we have successfully navigated the complex process for achieving ACS approval of our program. This process included a Pre-Application, an exhaustive Self-Study Questionnaire, a personal presentation and review before the ACS Committee on Professional Training, and a site visit by an ACS representative. At their April 2013 meeting this Committee concluded that our chemistry program "meets the spirit and intent of the ACS Guidelines for approved schools", and voted "to include Fort Hays State University on the list of colleges and universities approved by the American Chemical Society." This resounding success is confirmation of both the high quality of our degree program and its viability for the future, and it is all the more noteworthy in being an assessment by an outside agency that has worked for decades to develop and refine criteria for excellence in Chemistry degree programs. (It is also notable that the Committee's letter specifically mentioned the increase in FTE Chemistry faculty, which happened in FY 2012, as a factor in their favorable decision.) All the Chemistry faculty and staff contributed to this successful outcome, but the lion's share of the credit must go to the department's Assessment and Planning Committee, which worked tirelessly over several years to review, update, and recast every aspect of our degree program. This was also highly beneficial in preparation for the Regents' Program Review of our Chemistry baccalaureate program taking place during the 2012-13 academic year. Another important curricular development this year has been a proposal to develop a Master of Professional Studies program in Chemistry, as a means of reinvigorating the graduate program in Chemistry that was lost in the early 1980s. Courses to complete our draft MPS curriculum still need to be developed, and additional FTE faculty need to be sought, with the intention of gradually increasing the frequency of offerings of graduate-level courses in Chemistry as more students are attracted into this program. Extensive discussions have been held this year on the subject of our University Chemistry lab courses, to streamline lab procedures, better align lab and lecture work, minimize waste, and improve both pedagogy and safety. This, in addition to ongoing efforts to advance learning in all our classes (refinement and expansion of online homework, improved placement of incoming students by assessment of math skills, etc.), all attest to the high degree of importance attached to teaching by the Chemistry faculty. A Pilot Award nomination was one outward sign of the effectiveness of these teaching efforts.

Research and other creative activities are increasing in importance as well, a consequence of our increasing enrollments and decisions by some students in the KAMS program to continue at FHSU to complete a Chemistry degree. The KAMS program requires some research efforts, so it is not surprising that some KAMS research students would want to continue these efforts in pursuit of their baccalaureate degrees. Several current KAMS students made presentations of their research results at the "Undergraduate Research Day at the Capitol" in Topeka in April, and at least two former KAMS students are now carrying out research in Chemistry. The faculty were likewise busy with research, with two outside grant proposals submitted, two technical publications that appeared, and three presentations of research results made this year. The two newest Chemistry faculty members have already begun work with undergraduate researchers, so progress in this category is expected to continue.

Service at all levels also continues to be highly esteemed by the Chemistry faculty. On-campus service has included the Faculty Senate (one faculty member serving as President-Elect this year), several university committees (Promotion Committee, Tenure Committee, Academic Advising Committee, etc.), and participation in events like the Science Day and the Regional Science Fair. Professional service activities have particularly included work with the Wichita section of the American Chemical Society, as chair and as newsletter editor. This was all in addition to standard service activities like the various departmental committees, attendance at Student Recognition Programs, and advising of Pre-Professional students who are not Chemistry majors.

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. In short, the value of the department's 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	FY2009	FY2010	FY2011	FY2012	FY2013
Freshmen	**24**	**30**	**48**	**40**	**37**
Transfer Students	**7**	**2**	**5**	**8**	**7**
Undergraduate (first majors/second majors)	**84/1**	**89/2**	**110/2**	**108/4**	**112/7**
MLS Majors	**1**	**1**	**3**	**1**	**2**
Major Retention	**76.67%**	**78.26%**	**82.76%**	**77.08%**	**84.62%**
Undergraduate Student Credit Hours	**1990**	**2135**	**2344**	**2362**	**3094**
Graduate Student Credit Hours	**8**	**27**	**29**	**20**	**23**
Tenured or Tenure-track Faculty (Headcount)	**7**	**7**	**7**	**7**	**7**
Non Tenure-Track Faculty (Headcount)	**1**	**1**	**1**	**2**	**1**
Undergraduate Degrees	**6**	**9**	**7**	**7**	**7**
Briefly note 2-3 improvements over the last year prompted from the above enrollment indicators. Factors that show historic improvements include total number of majors, major retention rate, and undergraduate SCH production. The first two of these factors are expected to ultimately result in increased numbers of graduates.					
Number of books, book chapters, and **refereed** articles published	2	2	0	1	2
Percent of faculty publishing **refereed** books, chapters, or articles	28%	28%	0	14%	25%
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	2	5	4	3
Percent of faculty in scholarly performances or other creative activities	40%	13%	13%	28%	25%
Total number of external grant applications submitted/percent of faculty submitting	2/13%	2/13%	3/13%	3/13%	2/13%
Total number of funded external grants/percent of faculty funded	1/13%	2/13%	1/13%	3/13%	2/13%
Total number students successfully completing an undergraduate research/creative project				4	6
Briefly note 2-3 improvements over the last year prompted from the above scholarly/creative activities indicators. The increases in numbers of publications and in percent of faculty published, for the second year in a row, indicate a quite respectable level of scholarly achievement. Undergraduate students involved in chemical research are also increasing.					
[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.]					

Key Performance Indicator	FY2009	FY2010	FY2011	FY2012	FY2013
Direct Outcome 1 Score on standardized exam taken by majors at end of sophomore-level course; mean score/national mean	34.0 (See Appendix 1)	33.9/43.1	42.8/43.1	41.8/39.5	39.8/39.5
Direct Outcome 2 Average grade in capstone course: Seminar in Chemistry	75.7%	81.5%	81.8%	77.5%	83.6%
Indirect Indicator 1: Alumni Award Winners	1	0	0	1	0
Indirect Indicator 2 Percent of Alumni Surveys returned describing the education in chemistry superior or above average	100%	100%	100%	80.0%	100%
Dept senior students' Level of Academic Challenge **[FHSU LAC SCORE, DEPT LAC SCORE]**	54.65 58.57	55.9 59.34	56.4 52.44	56.2 56.58	58.5 68.57
Dept senior students' Active and Collaborative Learning **[FHSU ACL SCORE, DEPT ACL SCORE]**	45.34 62.86	46.1 48.13	43.9 57.62	44.5 47.42	45.1 52.38
Dept senior students' Student-Faculty Interaction **[FHSU SFI SCORE, DEPT SFI SCORE, N, %]**	45.34 61.33	41.0 48.15	38.5 61.67	38.4 45.00	38.6 55.56
Dept senior students' Enriching Educational Experiences **[FHSU EEE SCORE, DEPT EEE SCORE, N, %]**	34.72 51.83	34.0 43.98	32.9 43.08	32.7 31.75	34.0 49.87
Dept senior students' Supportive Campus Environment **[FHSU SCE SCORE, DEPT SCE SCORE, N, %]**	59.57 79.44	60.3 57.41	60.8 62.78	59.8 56.944	61.9 76.85
Number of NSSE participants **[NUMBER OF DEPT SR STUDENTS, PERCENT]**	13 39%	7 44%	10 71.4%	4 19.05%	3 33.3%
Briefly note 2-3 improvements over the last year prompted from the above student learning/engagement indicators. Average score on sophomore-level standardized exam once again exceeded the national mean, and results from the capstone course and Alumni Survey are exceptionally positive. NSSE scores in all categories show notable increases from last year, and are significantly higher than overall FHSU scores.					
[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)	14.6	15.4	13.7	13.7	13.8
Outcome/Indicator 2 Number of letters to prospective students	1099	1786	1362	1479	1213
Outcome/Indicator 3 Lab contact hours per week for B.S. degree, FHSU/Regional University average	36/27.3	36/27.3	36/27.3	36/27.3	36/27.3
Briefly note 2-3 improvements over the last year prompted from the above indicators. Thanks to an increase in FTE faculty last year, teaching contact hours remain below the maximum of 15 set by the American Chemical Society's guidelines. Recruitment efforts are shifting to more electronic means, reducing the number of hard-copy letters sent to prospective students.					

C. Department Quality Initiatives and Results

FY2013 Quality Initiatives	Results
1. Chemical Inventory Improvements At the time we moved into Tomanek Hall the Chemistry Department had a computer-based inventory system for chemicals and pieces of scientific equipment, but this system has not been upgraded in more than a dozen years. A modern chemical inventory system is much more than a simple spreadsheet of information; it must be capable of sophisticated chemical searches, and it must be able to manage data related to safety (e.g. MSDS information) as well as proper handling and disposal. Since it has also been several years since our last physical inventory of chemical stores, it would be desirable to complete that prior to an upgrade.	The original initiative included time to consider several options, such as the merits of a custom-made inventory system versus a commercially available one, but as the fall semester progressed the old system began showing signs of imminent failure, prompting us to move up the timeline. After consultations among the Chemistry faculty, Chemistry storekeeper, and various vendors, a CISPro chemical inventory software system was purchased and installed on a dedicated computer in the Chemical Storeroom. This system came with a bar-code label printer and bar-code reader to allow for more rapid dispensing of materials from the storeroom while still maintaining essential inventory control. As part of the Chemistry faculty retreat in January, time was set aside for the faculty to receive a brief introduction to the new system and to review its much improved capabilities. Through the spring semester student labor was employed to carry out a physical inventory of the chemical storerooms, and to apply the bar-code labels to containers. Once this portion of the initiative is completed, the plan is to add much of the chemical equipment in the storeroom to the inventory system as well. Since the system has the capability of allowing access to a great deal of useful information (e.g. MSDS information, grades of chemicals, names of vendors, etc.) the ultimate result will be much faster, safer, and more efficient handling, dispensing, and disposal of materials held in the Chemical Storeroom.
2. Tracking of Incoming Freshmen Students enrolling in our University Chemistry I class are completing a math questionnaire so that we can advise them regarding their likelihood of success in that class. Extensive analysis over the past 2 years has shown that this assessment has the greatest predictive value, even compared to well regarded chemistry placement tests. At the same time, numerous examples can still be cited in which the predictions are not borne out; furthermore there is the question about the best way to use this assessment information. This is particularly a matter of concern because of the potentially detrimental effects on retention and persistence of Chemistry majors who are poorly prepared.	During the Spring 2012 semester, the math course questionnaire was administered to all incoming freshman attending pre-enrollment sessions. Students who were identified with poor math coursework preparation were encouraged to enroll in College Algebra in Summer 2012. The completion of College Algebra and retention of these students were then tracked by Dr. Eddie Olmstead through the 2012-2013 school year. For our purposes, retention success was defined as passing CHEM 120, passing CHEM 122, and remaining chemistry majors. Of the 11 students identified as “at risk” by the questionnaire, none of the students completed College Algebra during the summer. For the 11 “at risk” students, only 5 (45%) remained as chemistry majors, 2 (18%) passed CHEM 120, and 1 (9%) passed CHEM 122. Overall, only 1 of 11 at risk students (9%) met all three criteria for retention success. For the 30 students identified by the questionnaire as well prepared, 24 (80%) remained as chemistry majors, 24 (80%) passed CHEM 120, and 17 (57%) completed CHEM 122. Overall, 15 (50%) of 30 well-prepared students met all three criteria for retention success. Clearly, inadequate math coursework preparation is a major factor in the attrition of chemistry majors and encouraging these students to complete College Algebra in the summer before matriculation is not an effective remedial strategy. Strategies for addressing the math deficiency of the “at-risk “students will be a major focus of the Retention/Persistence Committee proposed below as a FY2014 Quality Initiative.

FY2014 Quality Initiatives	Responsible Party, Resources, and Plan
1. Improvements in Chemistry Retention/Persistence. Though numbers of Chemistry majors have been increasing in recent years (see above), one ongoing concern has been the small numbers of students completing baccalaureate degrees in Chemistry. Our major programs rarely meet the Regents' minimum of 10 B.A./B.S. degrees in a given year, and the importance of this issue was emphasized in the course of our Program Review in 2012-13. As noted above (in the second of the FY 2013 Quality Initiatives), we have developed an excellent tool for identifying "at risk" incoming freshman students. The next steps are to develop a successful intervention strategy for reaching these students and to extend our efforts towards improving persistence throughout the chemistry major program. These could include modifications to specific classes (e.g. changes to topics covered or pre-requisites) or to the overall program (e.g. changing course sequences), or possibly methods to provide remediation or assistance to at-risk students.	Dr. Jim Hohman will appoint a new departmental Retention/Persistence Committee to examine this issue from a holistic perspective, looking for the causes for our loss of majors over the entire program and developing detailed solutions to present to the rest of the Chemistry faculty members. This committee is planning to begin work in the summer of 2013, and at least some analysis of the problem and/or proposals for solutions are expected at the first departmental meeting of FY 2014. All options for improvements in persistence will be open for discussion, and the approved recommendations will be a high priority for the department for the foreseeable future. Because of the detailed analysis of our major programs completed recently (due to the ACS approval process and the Program Review mentioned above), it is anticipated that specific proposals will be forthcoming rather quickly, and it should be noted that some changes focused on improving the success rate of our students are already well developed (e.g. online homework systems). New proposals expected to emerge from the committee's deliberations may involve purchasing of materials, software, etc., so submission of one or more Action Plans is a possible early outcome of this initiative. Though this initiative moves to a high priority in FY 2014, two further points should be emphasized. First, improving persistence is a long-term challenge, so solutions must also be viewed from a long-term perspective. Even if beneficial changes are made immediately we cannot reasonably expect increases in our numbers of graduates for perhaps 2-3 years. Second, this challenge is multi-faceted, and may even change over time as changes in student demographics occur, so we intend for the Retention/Persistence Committee to continue its analysis and development of new solutions for years to come.
2. Comprehensive Program Evaluation As noted above, the department used the results of our Academic Audit (almost 10 years ago) to set the stage for the application for approval of our B.S. degree by the American Chemical Society (ACS). With the successful outcome of that approval process, it now seems appropriate to take a broader view of our entire undergraduate program in terms of overall learning outcomes,	Dr. Jim Hohman will appoint members to the department's Assessment and Planning Committee, different from those on the Retention/Persistence Committee, and assign them the duty of initiating a review of departmental learning outcomes, and the means by which the department meets and assesses these learning outcomes. Among the goals for this committee in this context will be the following. First, a re-examination of the program's current learning outcomes, the procedures currently in use to meet these outcomes, and the tools now being used to measure these results will be conducted, with the goal of seeking improvements in all three. Second, development of wholly new learning outcomes, curricular approaches to meeting these new outcomes, and new assessment tools will be considered, and any of these which pass muster will be presented to the entire department. (In

curriculum, and assessment. Our concern is two-fold: to avoid "resting on our laurels" now that ACS approval is in hand, and to scrutinize aspects of our program for potential weaknesses, particularly in areas not addressed by the ACS approval process. Another issue relevant in this context is the importance of reviewing and assessing certain specializations (e.g. Pre-Pharmacy, and our degree emphases) that our students pursue, with the goal of determining the effectiveness of these specializations.	making these judgments, the committee will be expected to include specific and unambiguous measures of learning outcomes as an important criterion.) Third, procedures for gathering information about students not completing our major programs, including Pre-Pharmacy students, will be examined and proposed, with an eye to developing a more accurate "success rate" over and above a simple count of the numbers of Chemistry graduates. Fourth, a review of degree emphases currently available will be completed, and any emphases judged to be performing poorly (based on both qualitative and quantitative measures) will be recommended for possible discontinuation. The committee's report by the end of FY 2014 will be expected to include their recommendations for substantive changes in the department's Affinity Diagram, and may also include proposals for Action Plans to bring about these changes.

D. Institutional Quality Results

FY2013 University Initiatives	Department Activities/Results
Align Programs and Services with North Central Kansas Technical College (NCKTC)	The department has begun a review of programs offered by NCKTC in areas related to chemistry (e.g. Pharmacy Technician, Nursing) and will be considering possible changes – for example, in course offerings – that might be mutually beneficial.
Increase Enrollment	Efforts made to increase student participation in research and in the course of the ACS approval process (both mentioned above) are expected to continue to result in high SCH production, and ultimately lead to larger numbers of Chemistry graduates.
Improve Persistence and Retention	The Program Review process generated much discussion among the Chemistry faculty members about retention/persistence, and resulted in numerous proposals for changes, including changes in topics covered in the Orientation to Chemistry class (e.g. chemical problem-solving). The department's new Retention/Persistence Committee is in the process of developing possible new proposals.
Improve Student Learning	Approval by the ACS of our B.S. degree in Chemistry during FY 2013 was the clearest definitive statement of the outcome of our efforts to improve student learning. Initiatives mentioned above (regarding retention/persistence and student research participation) are also relevant in this context.

III. FY2013 STRATEGY AND OPPORTUNITIES FOR IMPROVEMENT

A. Departmental Reflection of Strengths, Needs, Opportunities, and Threats

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 lecturers who teach Chemistry classes at FHSU possesses the terminal degree, and they represent all the major sub-disciplines within the field of chemistry. Second, the department benefits from outstanding facilities in Tomanek Hall, and teaching tools (e.g. software, "clickers", etc.) well designed for a top quality chemical education. Finally, programs administered within the department – both major degree programs and pre-professional programs – are well established and highly regarded.	One chronic problem, that of excessive teaching contact hours (see II. A, under "Outcome/Indicator 1" as well as Appendix 3), remains a matter of concern. American Chemical Society (ACS) guidelines limit Chemistry faculty to no more than 15 contact hours, and maintaining this average this year has been possible only because of the recent increase in FTE faculty. Our concern is less time that is available for curriculum development and for research – so necessary in a technical field like chemistry – and a very real inability to offer advanced elective classes. In addition, now that we have ACS approval of our B.S. degree program (see above) we are required to maintain teaching contact hours at or below the 15-hour maximum.
Future Opportunities	**Future Threats**
Since we now have ACS approval of our B.S. program we have a unique opportunity to promote this degree path to prospective students. This, coupled with our increased numbers of Chemistry majors (see above), has the potential to generate larger numbers of graduates in the not-too-distant future. Another related opportunity is the increased emphasis on chemical research as a standard part of the undergraduate curriculum. In addition, the proposed Master of Professional Studies in Chemistry has the potential to enhance the attractiveness of graduate study in Chemistry at FHSU. Finally, new faculty members bring with them the energy and enthusiasm needed to inspire students for academic excellence and professional achievement.	A particular threat that has increased in importance over the past year has been the availability of useable lab space, particularly for the University Chemistry classes. With the increased size of the KAMS program, and the increased enrollments mentioned above, we're concerned that these demands may stretch our facilities to near the breaking point. A number of possible solutions are being considered, but all will require potentially expensive re-working of Chemistry lab spaces. A related threat is the availability of technical instrumentation: some of our most useful pieces of lab equipment are old enough to require extensive servicing in the near future, while others are simply not state-of-the-art any longer.

B. Opportunities for Improvement

Opportunity for Improvement	Resources Required	Expected Result and Completion Date
1. As discussed above (under SNOT analysis), we have now completed our long-term initiative seeking American Chemical Society (ACS) approval of our B.S. degree. Now it is time to build on this success by finding ways to improve retention and persistence of students in all our degree programs. We have begun to do a better job of informing prospective students about our programs, so now we need to look for ways to alert them to the skills they'll need to achieve success, intervene more quickly when a student's progress is in jeopardy, and (where necessary) modify our curriculum to better promote their success.	We propose to develop an integrated assessment and record-keeping system to address the following questions. First, what are the characteristics (academic background, lab skills, etc.) of the students who go on to the highest levels of achievement in our programs? Second, once we've identified these characteristics, would increased scholarship support to these students improve their persistence through the program? Third, what characteristics of students who struggle in their Chemistry programs can be addressed by the faculty by modifications of our curriculum? Fourth, what other kinds of modifications are most likely to improve long-term persistence in our programs? Reassigned time for the faculty who carry out this assessment and record-keeping will be the main resource needed, but so far has not been forthcoming.	Research done over the past two years has made a good start on the kind of integrated assessment and record-keeping system envisioned; in particular, we have found that assessing the math background of incoming students provides useful predictive information regarding the likelihood of success in University Chemistry I. Over the next two to three years we plan to expand upon that by looking for other factors that may have predictive power, such as the length of time since the last chemistry class or the extent of study in related fields like physics. We also will seek information about students who drop their Chemistry programs regarding the reasons for this change. By FY 2015 we expect to have a body of information that will lead to proposals for changes in our curriculum as well as ways to better support our students.
2. About 8 years ago the department completed an Academic Audit of its B.S. degree program, which revealed important curricular improvements that were needed, and we are well advanced in making these changes. Course topics have been streamlined and (where necessary) coalesced, and in-depth coursework has been added to the B.S. curriculum. As noted above (under SNOT analysis) we now need to consider our needs in terms of research space and instrumentation; that is, we need to consider our "hardware" needs now that the "software" parts of our curriculum have been upgraded.	To solve the problem of laboratory space – for research as well as for expected increases in enrollments in advanced lab classes – we will continue to need a complete analysis of the types and amount (i.e. both quality and quantity) of lab space needed. Now that some of the needs have been identified, resources will be needed for the re-purposing of spaces currently being used for other purposes. A similar process is in the works to identify chemical instrumentation that is most urgently needed. Finally, reassigned time for the writing of Action Plans and grant proposals will complete this process.	We completed a detailed analysis of lab space and instrumentation needed in FY 2013, and submitted Action Plans for improvements in both these areas. Two Action Plans, one for a replacement high purity water system and one for new electrochemical equipment, were funded, suggesting that the original analysis was beneficial. The expansion of the KAMS program also is a factor here, since KAMS students need both research space and research-quality instrumentation. This is clearly a never-ending process, although we hope to reach a point where this initiative will move to a lower priority by FY 2016 if we continue to have success in strategic planning and funding of grant proposals.

IV. SUPPORTING MATERIALS

A. Department of Chemistry – Affinity Diagram for the BA/BS in Chemistry (Version: 01/01/2012)

Characteristics of Majors	Expected Learning Outcomes	Curriculum	Learning Outcome Measures	Assessment Results	Curricular/Pedagogical Changes
Knowledgeable Chemists must have an extensive base of fact, terminology, and theory in order to interpret results and solve problems. **Analytical/Precise** Chemists must use higher level reasoning skills to solve problems without allowing imprecise data to interfere. **Dedicated/Patient** Chemists must deal with problems that do not meet immediate success. **Creative/Resourceful/ Innovative** Chemists solve experimental and theoretical problems using a core of knowledge and available resources. **Objective/Intellectually Honest** Chemists must view all data without bias and must rigorously adhere to the premise that all data are reported without alteration. **Curious/Inquisitive** Chemists rely on experimentation to obtain information and test all inferences.	1. To thoroughly understand the theoretical underpinnings within: a) analytical chemistry, b) biochemistry, c) inorganic chemistry, d) organic chemistry, & e) physical chemistry; 2. To attain proficiency in laboratory techniques used in chemistry and related sciences; 3. To master critical thinking skills and scientific modes of communication needed by chemists; and 4. To come to a broad appreciation of: a) scientific ethics, and b) the scientific method.	**Program Core Curriculum** **Introduces the discipline/sci. ethics** CHEM 101 Orientation to Chemistry **Introduces scientific method, develops knowledge & 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/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 101 Orientation to Chemistry CHEM 675 Seminar in Chemistry **B.A. Curriculum** **Develops knowledge & problem-solving skills** MATH 331 Calculus Methods PHYS 111 Physics I PHYS 112 Physics II CHEM 430 Survey of Physical Chemistry **Develops laboratory/experimental skills** PHYS 111L Physics I Laboratory PHYS 112L Physics II Laboratory CHEM 430L Sur. of Phys. Chem. Laboratory **Broaden the knowledge base** CHEM Electives **B.S. Curriculum** **Develops knowledge & 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 662 Biochemistry I CHEM 666 Inorganic Chemistry **Develops laboratory/experimental skills** PHYS 211L Physics for Scientists and Engineers I Laboratory PHYS 212L Physics for Scientists and Engineers II Laboratory CHEM 632L Phys. Chem. Laboratory I CHEM 634L Phys./Inorg. Chem. Laboratory CHEM 656L Adv. Instrumental/Physical Laboratory CHEM 662L Biochemistry I Laboratory **General Education Curriculum** **Develops the knowledge required to be educated** Liberal Arts component **Develops the skills required to be educated** Foundation Studies Component	**Direct Measures:** **1. 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. **2. WRITTEN EXAM:** American Chemical Society (ACS) 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. **3. 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. **Indirect Measures:** **1. 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. **2. 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.	The incoming CHEM 120 classes in Fall 2009-2011 scored in the 30th percentile relative to national norms on the California Chemistry Diagnostic Examination For AY 2010/2011, the CHEM 120 class scored (mean score) in the 42nd percentile nationally on the ACS exam. The CHEM 122 class scored in the 58th percentile (mean score), representing significant improvement compared to the national norm over the course of the first year. Seminar scores in AY 2012-13 were at higher levels than at any time in the previous four years, as noted above. In FY 2013, 100% of Alumni Surveys returned described their chemical education as "Superior" or "Above Average".	

B. Department Staffing Plan

Department of Chemistry
Date Prepared – June 2013

(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 General	Bencze	Biochemistry Physical	02/17/1972	1.0	Assistant Professor, 2008	Ph. D.	Tenure Track
Physical	Cruz	Physical	06/16/1978	1.0	Assistant Professor, 2012	Ph. D.	Tenure Track
Freshman Laboratory	Stramel	General	05/31/1953		Instructor, 2011	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.	Tenured
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
Chemical Education	Magee	General, Chemical Educ.	03/11/1973	1.0	Assistant Professor, 2012	Ph.D.	Temporary

C. Bibliography of Departmental Scholarly Activity

1. “Structural properties of platinum(II) biphenyl complexes containing 1,10-phenanthroline derivatives”. D. Paul Rillema, Arvin J. Cruz, Brandon J. Tasset, Curtis Moore, Khamis Siam, and Wei Huang; *Journal of Molecular Structure*, 1041, (2013), 82-91.
2. “Electronic and Photophysical Properties of Platinum(II) Biphenyl Complexes Containing 2,2’-Bipyridine and 1,10-Phenanthroline Ligands”. D. Paul Rillema, Arvin J. Cruz, Curtis Moore, Khamis Siam, A. Jehan, Derek Base, T. Nguyen, and Wei Huang; *Inorganic Chemistry*, 52, (2013), 596-607.

D. Department Program Assessment Results

Appendix 1: Raw Scores on Standardized Exam*, Department of Chemistry

Student No.	Spring, 2009	Spring, 2010**	Spring, 2011**	Spring, 2012	Spring, 2013
1	18	30	53	51	25
2	42	50	38	34	42
3	25	26	49	64	40
4	31	33	34	46	37
5	32	27	47	37	60
6	47	35	38	38	40
7	30	26	49	32	45
8	49	45	31	52	44
9	60	42	39	34	20
10	33	35	36	44	46
11	26	38	64	16	32
12	35	16	50	26	27
13	47	31	47	52	57
14	26	48	43	48	42
15	29	26	28	51	39
16	26		39	54	36
17	26		45	32	44
18	36		41		
19	28				
Mean Score	34.00	33.87	42.83	41.82	39.76
Std. Dev.	10.52	9.43	8.69	12.11	10.23

*American Chemical Society Cooperative Exam in Organic Chemistry, Form 2008. (Note: this exam is administered at the end of the sophomore-level chemistry course, CHEM 342 Organic Chemistry II.) Maximum score = 70, national mean score = 39.5.

**A different edition of the ACS Cooperative Exam in Organic Chemistry, Form 2002, was used.

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

Student Number	Fall, 2009	Spring, 2010	Fall, 2010	Spring, 2011	Fall, 2011	Spring, 2012	Fall, 2012	Spring, 2013
1	210.34	243.60	210.80	228.00	200.00	237.00	216.50	224.00
2	218.70	230.66		212.00	222.00	200.00	233.62	241.24
3	228.58	231.50		242.00		225.80	251.48	
4		243.20		214.00			245.20	
5		175.42		268.00			231.86	
6		223.34					229.28	
7		246.66						
8		257.52						
Mean	219.21	231.49	210.80	232.80	211.00	220.93	234.66	232.62
Std Dev	9.13	25.08		23.09	15.56	18.97	12.34	12.19

*Maximum score = 280

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

Faculty Member	Fall, 2009	Spring, 2010	Fall, 2010	Spring, 2011**	Fall, 2011	Spring, 2012	Fall, 2012	Spring, 2013**
1	17	14	13	12	13	14	12	13
2	15	12	14	15	15	15	14	15
3	15	15	16	13	17	15	13	9
4	18	14	14	14	14	11	14	15
5	16	18	14	13	14	14	15	15
6	16	15	13		12	10	14	16
							12	
Mean Contact Hrs	16.17	14.67	14.00	13.40	14.17	13.17	13.43	13.83
Standard Deviation	1.17	1.97	1.10	1.14	1.72	2.14	1.13	2.56

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

E. Other Departmental Information

ACS Chemistry for Life

American Chemical Society

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Cathy A. Nelson, *Secretary* (202) 872-4589

29 April 2013

Dr. Edward H. Hammond, President
Office of the President
Fort Hays State University
600 Park Street
Hays, KS 67601-4099

Dear President Hammond,

As you know, the Committee on Professional Training of the American Chemical Society has been cooperating with your university in the evaluation of your undergraduate chemistry program. A Visiting Associate of the Committee, made a visit to your campus in January last year, followed by an update from Dr. Hohman on certain areas of concern to the Committee. At our meeting this month, the Committee reviewed Dr. Hohman's report and was particularly pleased to learn that three new faculty and instructional staff members have been hired. The Committee concluded that your university's chemistry program meets the spirit and intent of the ACS Guidelines for approved schools. I am pleased to advise you of the decision of the Committee to include Fort Hays State University on the list of colleges and universities approved by the American Chemical Society.

The inclusion of a department on the approved list of the Society is not granted for any defined period of time. All approved schools are required to report annually (as instructed by the CPT Secretary) on the degrees granted, chemistry faculty, and course offerings and to prepare a more extensive reevaluation report on a regular schedule, currently every five years, unless there appears to be reason to submit such a report earlier.

Your bachelor's degree graduates who have majored in chemistry or other certifiable degree tracks and have fulfilled the minimum requirements as adopted by the Society are eligible for admission as members to the Society following graduation. The chair of the chemistry program may certify these graduates to the Society in the spring after graduation, per the instructions that will be sent to the department chair every year. ACS approval does not require all chemistry graduates to meet certification requirements or to be certified. For instance, there may be students whose major study in chemistry serves as a means to achieve entrance to other fields. Such graduates may elect to substitute other courses more appropriate to their goals, and those graduates would thus not qualify for certification.

The Committee does not insist that your catalog or web pages mention ACS approval. However, it is helpful to the student to know in advance exactly what type of program is recommended by the Society for an undergraduate education in chemistry and the course work that would be required for certification of the graduate to the Society. We hope that adequate provision will be made, either in your catalog or by other means, for a prospective chemistry student to have this information readily available.

Finally, the Committee asked that the chemistry faculty give some attention to the rigor of the chemistry component of one of the program's in-depth courses by the time that the first periodic report is due. Details are given in the letter to Dr. Jackson.

General Parameters

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

Annual Timeline for Department Annual Report

April 1	Final template and Directions distributed to Department Chairs. Selected enrollment data (fall 20th day counts) distributed to Chairs and Deans in the departmental template.
June 1	Student system information (graduates, SCH) delivered to Chairs. 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.