Chemistry Program

2011 Self Study

Previous Review: 2004

External Reviewer: Robert Newlands, Professor of Chemistry, Rowan University
Self Study author: The Chemistry Program, Louise Sowers, Editor
History, development and expectations of the Program:
Chemistry is often referred to as the central science; providing the foundation at the molecular level for its majors as well as other disciplines. The mission of the Chemistry Program at Stockton is and always has been “providing a small and excellent individualized curriculum emphasizing a modern theoretical and technical approach to the subjects of chemistry and biochemistry.” Through our unique curriculum offerings we are able to prepare our majors for professional careers in chemistry and for continuation to graduate and professional schools by providing the educational foundation and laboratory skills needed by chemical professionals. The flexibility and the design of our curriculum also allows for us to support other programs throughout the college in providing the needed foundation in chemistry; for the health sciences, environmental and marine sciences, and others.

The members of the chemistry faculty are also members of the wider college community, crossing disciplines and working as an integral part of the School of Natural and Mathematics Sciences, sharing knowledge, teaching courses across disciplines, writing collaborative grants and serving the School and College in implementing and planning new endeavors. Members of the Chemistry Program are also engaged members of the community at large. They serve the local community as well as the professional community through activities in local schools and professional organizations.

The Chemistry Program last underwent a self study in 2004. The external consultant was Dr. Linda Betz of Widener University. Dr. Betz’s formal report can be found in Appendix A.

Brief Program History

The chemistry degree program (CHEM) was one of the majors offered when the College opened in 1971. The first two CHEM degrees were awarded in June 1973. Retired program faculty members Edward Paul, Jonathan Griffiths and Shelby Broughton prepared the first design of the program and through their leadership over the last 40 years continued to make minor adjustments to the major to maintain currency. The program was first evaluated in 1973 by the noted chemical educator Henry Bent.

In the 1970’s the program grew to include eight full-time faculty members with specialties in each of the major disciplines of chemistry; in analytical, biological, inorganic, organic, and physical chemistry. But with the addition of each new faculty member, the program also sought out those that could make strong contributions to the introductory courses and who had a strong interest in the pedagogy of teaching and general education.

In 1979, the program was evaluated Otto Theodor Benfey. His report focused on issues of faculty diversity, laboratory safety, research space, and support for untenured faculty. While almost half of the chemistry majors were women, no female faculty members in chemistry had been tenured since the opening of the college. The issues observed by Benfey were addressed during the next decade. During the 1980’s the chemistry faculty stabilized somewhat with the

After the 1984 self-study and evaluation by Jerry Bell, the program successfully sought external grants for new instrumentation and began to modernize the instrumental holdings, by offering instruments that were integrated with computers. In 1987 the program was approved by the American Chemical Society (ACS) to offer the ACS certified degree. This became an official track in chemistry and continues to be offered to the majors.

The program was evaluated by Ronald Musselman in 1988 as the focus became incorporating computers more fully into the chemistry curriculum. In the 1990’s, the F wing laboratory redesign occurred and we went from laboratory that was a large, open, interdisciplinary laboratory to smaller laboratory spaces more suitable for our developing teaching patterns. Individual faculty research areas were created for the first time. Electronic lecture-demonstration classrooms were designed in 1994 and the chemistry lecture rooms (B-015 and B-016) were constructed. These rooms are still in use today, primarily as dedicated lecture rooms for chemistry.

The self-study and evaluation by James Spencer in 1994 helped focused the program’s attention on the teaching of its introductory courses. Ada Casares was tenured in 1992 and Kelly Keenan in 1998. Thus, at that time, 6 of the 9 program faculty now had tenure. Under the guidance of Kelly Keenan, the program offered a biochemistry track within the CHEM degree in 1996. A ninth program faculty line for a second biochemist was approved in 1996 and Brian Rogerson was hired. A separate major in Biochemistry/ Molecular Biology (BCMB) was approved by the State, and the first BCMB degrees were awarded in 1998. Administration of both the CHEM and BCMB degrees is the responsibility of the chemistry program, although the BCMB faculty has been acting more autonomous in approving and awarding degrees without the discussion with the chemistry faculty in recent years.

The Chemistry Program underwent self study in 1999 with Wilmer Stratton as the external evaluator. In his report, he recommended that faculty take advantage of the sabbatical program. At that time, only Shelby Broughton, Ed Paul and Louise Sowers had been awarded sabbaticals. Since 2000, Ed Paul, Jonathan Griffiths and Louise Sowers have applied and been awarded sabbaticals. He also made recommendations for changes in the curriculum for Chem IV.

In the 2004, evaluation of the program was conducted by Linda Betz of Widener University. Her recommendation strongly focused on two areas. The first was the physical facilities. It was noted that the laboratory facility was overcrowded for both teaching and research and the physical facilities needed updating. This will now be easily addressed when the new science building opens in 2013. She also suggested that “It is important that each of the faculty stay involved in the planning of this facility, at every stage, until completion. No matter how qualified and cooperative your architects and building contractors are, only the chemistry faculty will know what works and what does not.” To this end the faculty have been involved in the design thus far, but will need to stay involve as equipment and designs move forward. Her
second comment focused on what she saw as strength of the chemistry program. She noted that the faculty was quite successful in identifying and recruiting chemistry majors from the introductory chemistry classes. She encouraged this work to continue. During this cycle, Kristen Hallock-Waters received tenure as the environmental chemist and Elizabeth Pollock (physical biochemist) was hired in 2006 to take on the responsibility of teaching the chemistry course for nurses and to provide additional support for the biochemistry major. Ed Paul entered the transition program to retirement in 2007 and Marc Richard, a material scientist, was hired as his replacement. The decision not to hire a classically trained physical chemist was consciously made so to help better prepare our students as the next generation of chemists.

For the past forty years we have tried to maintain a chemistry program which is student focused. Program faculty teach the introductory courses in 40 person sections so as to allow for interaction with the students. Laboratories have capacities of 18 to 24 students for reasons of safety and pedagogy. Advanced courses are smaller and include the use of instrumental and computer based techniques. Instrumentation is intended to be used by the students with proper training. The required research or research-internship leads to student presentations of non-class work in both written and oral formats.

There were three important curricular considerations discussed in the last review: It was noted that curricular changes within biochemistry allowed it to be moved from a track to a major, the addition of an environmental chemistry tract was initiated and a planned start-up of a computation chemistry track was to be added to the program. At the time of the review in 2004, Biochemistry and Molecular Biology (BCMB) had become a major and appear to be thriving by evidence of the number of students drawn to it. This major has stabilized and appears to be in a steady state. In part, some of the increase in the BCMB enrollments can be attributed the articulation for pre-pharmacy. Students who are accepted into the pre-pharmacy articulation program are declared BCMB majors. The popularity of this agreement with pharmacy schools was a big boost for the enrollment in BCMB. An articulation agreement with the Ernest Mario School of Pharmacy at Rutgers University was signed in 2004. It allows students to come to Stockton for either 2, 3 or 4 years, complete the prerequisites, or then transfer to Rutgers. Students would then earn a B.S. in BCMB from Stockton and the Pharm.D. degree from Rutgers. Students enter this program as high school seniors and it seems that Admissions handles most of the recruiting.

In 2004, the Environmental Chemistry tract was relatively new and still in the state of flux. The external evaluator said “the curriculum looks more like an environmental science program, than an environmental chemistry program”. While this may be true, Stockton has had a strong history in environmental science and this environmental chemistry track has attracted strong students from environmental science, who would not have otherwise taken advanced chemistry courses. There have been some minor adjustments to this track during this review period, but those changes have been to adjust courses that have changed in ENVL. For example, the major was restructured to include specific areas and courses in those areas to give breath to the major at the intermediate level. All students choose upper level courses in each of the categories of
chemistry, biology and environmental science. There have been modifications to both CHEM 3530 Environmental Chemistry and the Environmental Chemistry track within the Chemistry curriculum. Changes were facilitated by both a successful National Science Foundation Course Curriculum and Laboratory Improvement Grant (PIs: Dr. Kristen Hallock-Waters, Dr. Louise Sowers, and Dr. Raymond Mueller) and by the hiring of an environmental chemist in the Environmental Studies Program, Dr. Tait Chirenje. The track is housed in both Environmental Science and Chemistry. The requirements are identical in both Programs. This allows students to enter this track from either Program. While there has been some discussion to consider restructuring the major to meet the American Chemical Society (ACS) requirements, it is generally felt that this would not be as attractive to ENVL oriented students at Stockton. With the diversity of interests of the core faculty teaching in environmental chemistry, we now offer courses in Atmospheric Chemistry (Hallock-Waters, independent study), Water Chemistry (Chirenje, independent study), Soil Science (Mueller), Remediation & Biotechnology (Chirenje), and Pollution & Regulation (Chirenje) as well as offer a variety of senior research topics based in analytical, water, soil, and air pollution chemistry (Chirenje, Hallock-Waters, Mueller, & Sowers).

The computational chemistry track discussed in the last review was never realized. The faculty member who was hired as the specialist in this area moved into the Computational Science Program. While there is still a course officially listed in the college bulletin for computation chemistry, it has not been taught in this review period.

At this review, some changes have been made to specific courses, but the greatest impact has been that caused by retirement in key faculty. Edward Paul and Jonathan Griffiths retired in 2008 and 2010. These two members have for most of the last 35+ years provided guidance and direction to the Program. Since their departure, other members have begun to assume the many tasks that these two members did for so many years. Marc Richard was hired to replace Edward Paul and has just received tenure and promotion, giving stability to the Physical Chemistry sequence. With Jonathan’s retirement, Bruce Hietbrink was hired as his replacement. The organic sequence is now being led by Ada Casares.

In this review cycle, assessment has become the focus of the College, the School and the Program. We have undertaken numerous assessment studies and hope to receive feedback in this evaluation on our progress and suggestions for future studies and activities that will help us better prepare our majors for careers in the twenty first century.
All statistics quoted in this report have been generated by Institutional Research and the School of Natural and Mathematical Sciences. Raw Data for this information can be found in Appendix B. Yearly summaries as reported by the Chemistry Coordinator can be found in Appendix C. The five year report to the American Chemical Society is located in Appendix D.

**External demand for the program**

In general, the following comment (http://gaussling.wordpress.com/2010/04/01/chemistry-the-volatile-profession) concerning the future of chemistry majors is of concern. The author states, “I think that we are seeing a phase change in how the chemical industry does business. The acceptability of outsourcing R&D is the reason for my pessimistic view. It has become axiomatic in many organizations now that R&D must be outsourced to countries where the overhead rate is substantially lower. And the outsourcing of R&D can only be bad for US chemists”. The outsourcing and the current economic environment is making it difficult for graduates to obtain stable employment. Currently many of the graduates not going onto graduate or professional schools obtain temporary employment via clearing houses. Scientist and engineers are accustomed to seeing their job market change over short periods of time. What appears to be a booming career options for an entering freshman has often been a bust for the same student as a senior after their four years of an undergraduate education.

It is understandable that job growth in this economy is somewhat unpredictable, however it is expected that an overall grow of 3% will occur for chemist in the next decade (http://www.bls.gov/oco/ocos049.htm#outlook), although much of the contribution comes from material scientists which are included in the grouping. Much of the gain is expected to be driven by biotechnology as manufacturing opportunities decline. Quality control is expected to continue to play a major role, so these opportunities for the undergraduate should remain as stable as the industry.

**Enrollments:**

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<th>2004</th>
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<th>2006</th>
<th>2007</th>
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<th>2009</th>
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<td>6</td>
<td>13</td>
<td>6</td>
<td>9</td>
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We have observed, over the years, that the number of chemistry majors appear to be cyclic and even tied to the job market. If you look at our enrollments, this cyclic trend can be observed. Stockton graduates about 5% of the number of degrees granted in chemistry in the state of New
Historically, enrollments in the service courses (Chem I, II, III and IV) fluctuate depending on what majors are driven by society at the time. These courses are heavily driven by environmental science, marine science, biology and some of the health sciences majors such as physical therapy. So as demand for these majors increase or decrease, so do chemistry enrollments. Our recent surge during this review was due to the introduction of the Doctorate in Physical Therapy. As with the last push from physical therapy in the 1990’s, this too will reach a state of equilibrium.

In the future, changes to health science curriculums (introduction of a BA/BS in Health Sciences) may have a more significant impact. It will be interesting to see how the current proposed changes in the philosophy of the School of Health Sciences will impact these service courses in the next review cycle. While they will offer some health science courses in the sciences, the chemistry program strongly opposes the School of Health Sciences offering courses in chemistry taught by non chemist faculty.

The cyclic nature of the number of graduates can be observed compared to other institutions of similar size within the state. It should be noted for comparison that Montclair offers a graduate degree in chemistry as well as an accelerated BS/MS which, in general, accounts for its ability to attract a larger number of chemistry graduates. But even Rowan University, with all of its growth and expansion is averaging approximately the same contributions to the total graduates in the state of New Jersey as Stockton.
Chem I has steadily increased over the review period and at the current time we are almost at the maximum the physical facility can contain. In the fall, we are now offering 240 seats and somewhat less in the spring. Normal add/drop attrition during the semester does reduce our numbers. This stress will be greatly reduced in two years with opening of the new science building. In the new facility there will be two general laboratories that will be able to be scheduled for additional laboratory sections. During the review period we have seen a 28% increase in enrollments for this course.

Two years ago, Biology implemented two changes in their curriculum that impacted the chemistry sequence. Historically, students needed Chem II, at least concurrently, to move onto the second biology course. When the biology curriculum was revised, Chem II became a prerequisite for Genetics (a sophomore course), allowing students to put off chemistry for at least one semester (if they wished to stay on track). The result of this change has shifted some of the enrollment pressure in Chem I from the fall to spring, hence leveling the enrollments over both semesters. However, Biology will be returning to the original sequencing of requiring Chem II for the second biology course in the coming year.

In the organic sequence, Chem II is a required course for the biologist, while Chem III is optional. However, in both cases these courses have both seen approximately a 25% increase in enrollments during the review cycle. Some of this can be accounted for in the increase number of chemistry minors. Many of the biology students are seeking out the minor to strengthen their position in the job market.
Additional enrollment pressures have also been noted in Chem IV. An additional laboratory section has been added in the spring to account for the increased number of students. This course has undergone about a 35% increase in enrollments during the review period.

Interestingly, there has been a significant increase in physical chemistry and less so in lab methods (analytical). These two courses are often chosen by biochemistry majors to fulfill their requirements. With the overall increase in enrollments in that major due to pre-pharmacy, it is only natural to these increases spilling over into other upper level courses as well.

**What are the program’s contributions to General Education?**

When program enrollments increase and are demanding, contributions to General Studies generally suffer. There are selected General Studies courses that are highly demanded and always fill to capacity. Members of the chemistry program work together to let faculty who teach these courses continue to offer them. This may mean that not all faculty get to routinely teach general studies courses. Chemistry faculty average 0.75 – 1 General Studies course per academic year. This accounts for between 6-15% of their academic load. While tenured faculty are contracted to teach 33% of their course load in general studies, the only way this number can approach the suggested value is for the college to hire additional faculty, which we know in these economic times is not likely. In the School of Science and Mathematics, the average for faculty is one course per year. Even so, members of the chemistry program are unable to meet this need.
Therefore, the program will continue to work to offer the highly demanded General Studies courses and to offer opportunities for other General Studies courses as faculty request.

**Faculty, gender, longevity, rank/status, terminal degrees, % of courses taught by full-time vs. adjunct faculty**

At present higher education is under siege by the state of New Jersey. Higher education is critically underfunded. Part of Stockton’s more recent efforts to offset some of these shortfalls in funding has been through increasing student enrollment. For the sciences, and even more so for chemistry, which is a major support program for numerous other majors, the increased enrollments have forced the administration to hire more part time and adjunct faculty. While it is reported that Stockton reports the greatest number of full time faculty teaching its classes, more and more of this responsibility is being turned over to part-time and adjunct faculty. It is a reality that is somewhat disturbing and has changed the dynamics of the program. For example, in the fall of 2008, 14% of labs for Chem I were taught by adjuncts and all lectures in the I-IV sequence were taught by full time faculty. For the coming fall (2011) 38% of the labs in the I-IV sequence will be taught by part-time/adjunct faculty, but more disturbing is that as of the writing of this report, 4 of 12 lecture sections in the I-IV sequence will be taught by part time or adjunct faculty. In all fairness, two of the sections are covered because one full time faculty member is on family leave. Even correcting for this we have moved from 0% of part-time/adjunct to 21 % in our lectures and have reduced full time faculty over to covering 64% of all courses in 3 short years. Finding competent and engaged faculty for these positions has always been a challenge due to the lack of any significant chemistry industry nearby.

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<th>Fall 2009</th>
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<td>—Associate Professor</td>
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<tr>
<td>—Assistant Professor</td>
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<tr>
<td>—Instructor/other</td>
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<tr>
<td>—15+ years</td>
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<td>0</td>
<td>1</td>
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<td>1</td>
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<tr>
<td>—10+ years</td>
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<td>1</td>
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<tr>
<td>—5 years or less</td>
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<tr>
<td>%Tenure/Tenure Track</td>
<td>91%</td>
<td>91%</td>
<td>100%</td>
<td>100%</td>
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<tr>
<td>% of courses taught by full-time faculty</td>
<td>74%</td>
<td>80%</td>
<td>89%</td>
<td>81%</td>
<td>77%</td>
<td>64%</td>
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Specific data on the student population can be found in Appendix B. In reviewing recent data, it was discovered that slightly more than half of our chemistry majors are transfer admits. The program has reached out to the community colleges and offered an informative session concerning Stockton’s curriculum. In May 2011, the six southern community colleges were invited on campus for an afternoon session. Four sent representatives and discussions on how to better serve this transfer population began. Stockton faculty continue to work with some of these institutions and serve as a resource. We are presently working with Camden County College on an articulation agreement for their chemistry students.

**Major curricular changes**
During this review cycle a new course, “Introduction to Research”, was added to the curriculum in 2009. While much of the student population in this course is generated by invitation, it is open to all freshman and sophomores who have completed Chem I. This course introduces students to research, chemical literature and ethics at a much earlier time in their undergraduate career. The platform for the course is faculty’s current research. Faculty who teach the course use topics from their research as the primary material for the course with identified skills as the basis for the outline of the course. Two faculty, Marc Richard and Kristen Hallock-Waters have taught the course using their work in trace explosives and terpene analysis of Atlantic white cedars to introduce students to research. Thus far, the course has been successful in helping to attract new majors and preparing students for internships off campus. Several students have successfully written for Board of Trustee Fellowships and REUs as a result of this course.

**Important facilities/resources changes/needs**
In Dr. Betz’s 2004 self study report, she commented on the crowded facility, especially for faculty research. A new science building has long been in the planning stages and ground breaking has just occurred in July of 2011. The chemistry faculty has been engaged in the initial planning of this facility and is prepared to continue to be an active part in the design phase as equipment and specific areas reach final design. This facility will provide close proximity of faculty offices and research areas, helping to ease the current difficulty of faculty having to be physically present in the F wing lab facility in order for their students to do research. All of the chemistry faculty will be able to move to the new building. There will be two general chemistry laboratories, an organic, analytical/pchem/inorganic laboratory, and biochemistry will finally
have their own workspace as well. The members of the chemistry faculty are excited about this new facility and hope that it will provide the additional physical space to meet college needs.

In 2009, Louise Sowers received equipment from the Drug Enforcement Administration. This equipment had an initial value of $375K. Two gas chromatographs (GC), a gas chromatograph-mass spectrophotometer (GC-MS) and a liquid chromatograph (HPLC) were added to Stockton’s instrumental holdings. These instruments were upgraded by the Transportation Security Laboratory through the Cooperative Research & Development Agreement for which she and Marc Richard are principle investigators. These instruments are used to support student research on trace explosives and in the Introduction to Research course.

An inventory of the instrument holdings does show that some are aging and should likely be replaced when the move to the new building occurs. Current Instrument holdings can be found in Appendix E.

Assessment:

The chemistry program has been extremely active in the process of assessment. A complete summary of assessment activities can be found in Appendix F.

CHEM I, II, III, IV

The faculty associated with the teaching of CHEM I and IV, General Principles (Marc Richard, Brian Rogerson, Louise Sowers, Rogers Barlatt, Kristen Hallock-Waters and Elizabeth Pollock) decided to introduce WileyPLUS online homework in the general chemistry sequence. Having done this for three semesters, it became important to determine whether increased student engagement with CHEM I was having an impact on student learning. Using the first semester exam as a baseline indicator of how freshmen students initially approach studying, Brian Rogerson noticed an improvement in performance compared to the cohort taking the course in the prior academic year, who were not
Importantly, a similar trend was observed when median scores for the American Chemical Society (ACS) final examination were examined. During semesters when WileyPlus was not used, the median score was below the national median. However, during the two semesters since WileyPlus was implemented, the median score was at or above the national median. Whether the steady assignment of online homework is actually having an impact on learning will require an analysis of whether the student cohorts being compared are indeed similar. High school class rankings, math SAT scores and determining how many of the students were actually first semester freshmen, might shed additional light on the significance of these preliminary results.

The Program has also investigated more qualitative assessments of Wiley Plus. For example, Marc Richard designed IDEA questions that probed student perception of the entire WileyPLUS online package and how it helped them learn chemistry. The aggregate data for all CHEM I lecture sections during fall 2009 (n=170) clearly showed that the vast majority of students answered “More true” or “True” in response to the following three questions:
(a) WileyPLUS had an overall positive impact on my learning
(b) WileyPLUS helped reinforce material from lecture and lab
(c) WileyPLUS helped me remain engaged with material
This has encouraged us to proceed with introduction of WileyPLUS into the teaching of CHEM IV where similar assessments are now being conducted by Rogers Barlatt and Kristen Hallock-Waters. Furthermore, Brian Rogerson is also testing the impact of WileyPLUS online homework and associated resources on students in his Biochemistry course. This is the first time such a pedagogical strategy has been tried in this junior-level course.

Kristen Hallock-Waters will continue the use of the ACS examination for the full year of general chemistry (CHEM I + IV) to assess the extent to which students carryover into CHEM IV what they learned in CHEM I.

On the organic chemistry side, Ada Casares continued her research collaboration with Dr. John Penn of West Virginia University on Computer Instruction and Assessment in organic chemistry (CHEM II). As a follow up to their past collaborative study "Tools for performing organic reaction mechanisms over the web", she carried out some preliminary assessment of what Stockton students learn in CHEM II using the online instructional databases that constitute a fundamental part of the way she teaches the course. By comparing student performance on the online tests versus standard “paper” exams with questions that were not in the database, she tentatively concluded that students using computer instruction were making progress with respect to the learning goals of the course.

In addition, Jon Griffiths shared with the CHEM program the results of a 15-year study using the ACS examination in organic chemistry as an assessment tool to gauge learning after students completed the CHEM II + III sequence. The test was administered as a final exam for the CHEM III course. As with CHEM I, he found that the median performance was below the national median. Interestingly, when he compared the median score of the period spanning the first 9 years versus the median score of the most recent 6 years, he found that the latter score was significantly lower, meaning that recent cohorts were performing less well than earlier ones. One interpretation was that this may be the result of an increased number of students taking CHEM III due to recent changes in chemistry requirements made by some NAMS programs. Whether this resulted in a decrease in the average level of academic preparedness of CHEM III student cohorts remains to be determined. A more detailed analysis of class demographics is required to settle this question.

Based on our assessment workgroup discussions, Shanthi Rajaraman has included questions in her CHEM II and CHEM III exams to test the following:

1. Structure, property correlation (qualitative goal)
2. Plotting and interpreting graphed information (quantitative goal)

To assess their understanding of graphs, she has been incorporating questions involving graphs/figures from which they are required to interpret information and arrive at answers. Shanthi has been able to see where the students are getting the concept and where they are losing it, based on layering of questions on certain topics. These questions are a regular feature in her
tests—she is able to accurately gauge where the students have not grasped the concept and also judge the level of challenge a student can take on, based on these layered questions leading from lower level (something that involves slightly more than direct reproduction of presented information) to higher level (synthesis questions).

An organic chemistry workgroup has been recently formed that is beginning to review and revise CHEM II laboratories in order to introduce the assessment of specific learning outcomes for each laboratory exercise. The workgroup is not only made up of full time faculty, but includes all part-time and adjunct faculty.

*Experiential Chemistry (A GNM course)*
This course was taught again after a brief absence from the schedule. Marc Richard is taking over the reins of this course from Jon Griffiths who designed and taught it for many years. Jon is retiring. This GNM course is unique since it is the only general studies course taught entirely in the laboratory. A major revision of the course text, originally written by Jon Griffiths, has been completed. In addition, Marc Richard has begun a two-year assessment of the course in collaboration with the Center for Workshops in the Chemical Sciences. An outside evaluator administered a survey and conducted face-to-face interviews with students. This past summer Marc participated in a week long workshop conducted by the Center and the evaluator will be returning do a second assessment.

*Exit exam*
For the first time in the spring of 2011, the ACS “DUCK” test was administered to graduating seniors. This group had little time for preparation. They were told two weeks in advance that they would be given the exam. No other information was provided to the students. The average for the 10 students taking the exam was a 28/60. This is the 34th percentile. The high was a 37/60 which is in the 74th percentile. The program has not had time to analyze this data but it intends to continue administering the exam to track progress.

Appendix C contains detail reports over the review period concerning all aspects of assessments that are currently being undertaken and the actions they generate.

Faculty Scholarship by Faculty

Appendix G list faculty scholarship by faculty. These raw numbers from the college’s institutional research group does not reflect the true activity of the chemistry faculty. Some faculty do not always report their activity in a way that it is officially recorded by the college. Faculty research at Stockton has always been student centered. Every chemistry major is required to complete a senior thesis as part of their graduation requirements. They can either work with faculty and present at the Chemistry or Biochemistry Senior Symposium or complete an external internship. Each internship has a faculty sponsor and must have a research component to it.
In Appendix H, copies of grant applications/reviewers comments and current research agreements can be found.

In this review cycle, Louise Sowers and Marc Richard have formed a strong working relationship with the Transportation Security Laboratory (TSL). Each holds a visiting scientist position at TSL through Oak Ridge Institute. They have had a Cooperative Research Agreement (CRDA) in place for two years. They have received over $30K in supplies, supporting their work on trace explosives. Five internships at TSL have been offered to students in their research group in the last two years and three students have obtained full time employment with contractors supporting TSL. In addition, they have received chemical instrumentation valued at $375K from the DEA to support this work. Students in this research group have received three Board of Trustee fellowships and three REUs. In addition to this ongoing research, Marc Richard collaborates with colleagues at the Universidad del País Vasco to study the structure-property relationships in ferromagnetic shape-memory alloys. His scholarly work has resulted in peer-reviewed publications, government-only technical reports submitted to the TSL, and presentations at regional and national meetings, with student co-authors and presenters. Louise Sowers also continues her collaboration with Dr. Earl Benjamin at Arkansas State.

Dr. Pollock’s research involves the investigation of the impact of environmental changes, be they physical or chemical, on the full array of biochemical processes of an organism. In particular, she is interested in understanding how metabolite levels in an organism change in response to stress and whether or not these changes can be correlated to specific biochemical pathways or indicators of reduced fitness of an organism to its environment. Using NMR-based metabolic profiling, she studies a number of non-model organisms of ecological significance. Projects include analysis of development of the American eel and the impact of parasite infection, the adaptation of algae to extreme temperatures and the consequences of exposure to anthropogenic compounds on plant development.

Rogers Barlatt’s research activities have been centered on students’ projects. He has supervised many projects on a wide range of topics including the synthesis and characterization of thermochromic complexes and the study of phase change materials by thermal analyses. His current interests include the investigation of thermochromic nickel and copper complexes and the development of lab exercises that would make use of microscale techniques in the synthesis of inorganic compounds. One such exercise is in the current CHEM IV lab manual. Rogers continues to serve as a Reviewer in the National Science Foundation Grant Proposal Evaluation Panel.

In collaboration with Dr. John Penn of West Virginia University, Ada Casares continues to explore what can be done in chemistry teaching with the new computer capabilities available. For several years she has been a significant contributor to this system, helping to design the question bank and assessment tools. This system is the basis for the Wiley-Plus Organic Computer component used with Organic Chemistry Wiley Textbooks.
As the environmental chemist, Kristen Hallock-Waters often joins Environmental Science faculty and provides the chemical expertise. At the time of the last self-study, Dr. Hallock-Waters and Dr. Sowers had received a National Science Foundation Course, Curriculum, and Laboratory Improvement grant. Although this grant was written primarily to improve undergraduate education, the instrumentation acquired through this grant enhanced research opportunities as well. Several peer reviewed abstracts based on incorporating research projects into the curriculum were accepted at national meetings. Her current interest has been focused on the characterization of terpenes in Atlantic White Cedar (Chamaecyparis thyoides). This project is in collaboration with Dr. George Zimmerman of the Environmental Studies program and the Atlantic White Cedar Project. This type of characterization has never been done for Atlantic White Cedar. Dr. Zimmerman has been studying Atlantic White Cedar for years, but did not have any chemical analysis. Together they provide the expertise in both forest ecology and analytical chemistry to work together to assess the impact of deer browsing on the expression of terpenes as a response to the stress imposed by herbivores.

Brian Rogerson’s research continues to be strong with the acquisition of several grants on gene expression and immunity studies. He has developed strong working relationships with some of the biology faculty and they have been successful for securing funding. He has been awarded four grants during this time period and has mentored nine student projects.