COMPREHENSIVE INSTRUCTIONAL PROGRAM REVIEW

★

Chemistry Discipline
Moreno Valley College
Academic Year 2011-2012

★

RCCD | RIVERSIDE COMMUNITY COLLEGE DISTRICT

Contact Person
Dr. Diane Marsh

Submitted
February 2011

Web Resources:
http://www.rccd.edu/administration/educationalservices/ieffectiveness/Pages/ProgramReview.aspx

Need Help? Contact Dr. Jim Thomas (Jim.Thomas@norcocollege.edu) or David Torres (David.Torres@rccd.edu))

Table of Contents

COMPREHENSIVE PROGRAM REVIEW
CHEMISTRY DISCIPLINE
MORENO VALLEY COLLEGE 2011-2012

A. Mission and Relationship to the College(s)

The main roles that the Chemistry discipline plays are to provide education in chemistry for transfer preparation, program preparation, and general education.

Chemistry Discipline Mission Statement:

> "The Chemistry Discipline provides learning opportunities to diverse students in Chemistry leading to skills (e.g. problem solving and analytical thinking) needed for transfer, health programs, and general education."

Moreno Valley Mission Statement:

> "Responsive to the educational needs of its region, Moreno Valley College offers academic programs and student support services which include baccalaureate transfer, professional, pre-professional, and pre-collegiate curricula for all who can benefit from them. Life-long learning opportunities are provided, especially, in health and public service preparation."

Chemistry's Relationship:

Baccalaureate Transfer: Chemistry classes are a typical part of the freshman and sophomore level curriculum in university offerings, particularly for science majors. At MVC we teach Introductory level chemistry (CHE 2A) to prepare students for subsequent college-level chemistry courses. General (freshman level, 1AB) is offered as part of the Honor's program as well as a course for students who are not in the Honor's program. Offerings are transferable to 4 year institutions including CSU and UC. Organic (sophomore level, 12AB) Chemistry is not offered at MVC due to lack of suitable lab facilities, additional full-time faculty in the discipline, and adequate budget for supplies and equipment.

Pre-professional: Introductory Chemistry classes (2AB) are also necessary for many nursing and allied health programs, including the Nursing, PA, and Dental Hygiene programs.
The content of chemistry classes requires critical thinking in mathematical problem solving as well as the ability to assimilate and apply many abstract concepts and theories. Students who study chemistry often find that their abilities are stretched and strengthened due to the challenging material presented. Many transfer schools require Math majors to take Chemistry.

General Education Requirements: Understanding basic chemical concepts is important to the General Education breadth requirement. Many important issues in the news today (i.e. Global Warming) require "chemical literacy" to understand.

B. History

1. Major Developments

- **Full-time Faculty in the discipline has decreased from 9 to 6 faculty.** This is largely due to un-replaced retirements. The situation at Riverside is dire. This will have a negative impact on biology, nursing, and other health programs.

- Chemistry enrollments, particularly for Chemistry 2A, are up with high fill-rates and efficiency. Waiting lists for Chemistry 2A had over 250 students in Fall 2007. Riverside had reached their facilities capacity (when they have enough faculty).

- At Norco, there is a need for offering more chemistry courses such as (2A, 1A, 1B, 12A, 12B). However, due to the limitations of current facilities some of these courses cannot be offered.

- The Laboratory Technician position has not been reclassified across the District to reflect the higher skills required to meet current needs. Similar duties are performed by the Laboratory Technicians at all three campus. We need to reach parity in the classification for the District at the higher skill level.

- At Riverside, groundbreaking has been approved for building a new Nursing and Science Center.

- At Moreno Valley, Chemistry 1AH and 1BH Honors courses have been approved and will be offered beginning Fall 2008.

2. Recommendations from the last program review.

Summary

I. **Faculty**

a. 6 New Full-Time faculty hires across the District by Fall 2007.

b. Some of the new hires will be replacing retirements at Riverside Campus.

- **No New Faculty hires were made across the District. Riverside Campus has decreased from 7 full time faculty to 4.** Replacements for retirees are a critical need.

II. Staff

c. 3 New Full-time Laboratory Technicians (one conversion to full-time from a part-time at Norco by Fall 2008).

d. 3 New Part-time Laboratory Technicians to support evening labs by Fall 2005.

- **Staff needs have been met. Reclassification of the position is a Discipline goal.**

III. Facilities

e. New Science Lab facilities for Riverside.

- **New Labs projected for 2010.**

f. New Chemistry Labs capable of supporting CHEM 12 (Organic) at Moreno Valley and Norco.

- **No new labs scheduled to be built in the next 3 years.**

g. At Norco, it should be noted that the one functioning chemistry lab is perfectly adequate for introductory chemistry 2A, but is not really suitable for general chemistry (Chemistry 1A and Chemistry 1B). The "unsuitability" is due to the inadequate hood system. Some very common general chemistry laboratory experiments require the use of strong acids and bases, and sometimes these solutions require heating. The chemistry program at Norco is unable to do any experiments of these types (and of course, they are the most interesting and fun!) because the fumes are overwhelming. [Dr. Freitas once had to evacuate the lab and cancel the day's experiment, because this limitation was discovered the "hard way": doing a routine experiment that was published in the RCC general chemistry lab manual.] The laboratory program at Norco is absolutely safe because it has been designed around the limitations of the laboratory, but the laboratory program as a result, is occasionally repetitive and not as interesting or fun as it should be.

h. Conversion of Physics Lab (HUM 201) back to original use as a chemistry lab at Norco.

Not currently in the plan.

i. Large Science Lecture Hall (at least 64 students) on all three campuses to run multi-lab section lectures. Must be suitable for chemical demonstrations.

- **Planned for Phase III at Norco and Phase III at Moreno Valley.**

j. All new facilities will need to be appropriately equipped.

k. Supply budgets need to be increased to reflect increased number of lab sections being offered and the increased costs of supplies due to increased transportation costs.

IV. Curricular Projects

l. Revision of CHE 10 (for applications)

- No work has been done on this course, not offered at MVC.

m. Revision of CHE 2A, 1A/1B Lab Manual

- Chemistry 2A: New Laboratory Experiments, Drills, and Quizzes have been developed by Dr. Marsh at MVC with the gradual goal of phasing out the current lab manual in the future. The focus of the revision is to enhance student measurement, solution preparation, and graphing skills in order to better prepare them for tasks in the Health professions.

- New Laboratory Experiments and revisions of old ones have been incorporated in the CHE 1A/1B and CHE 1AH/1BH Lab manuals. Development of laboratories which require higher levels of critical thinking have been an integral part of the Honor's courses. Experiments have been revised or changed as well to incorporate cost savings since the chemical supply budget is not adequate to fully meet our needs.

n. Hybrid Course Development (CHE 2A and 3)

- No work has been done on this at MVC.

V. ***Areas of Discipline Improvement:***

o. Communications

- Set-up a routine for communications via e-mail.
  - **Communications have been maintained at least monthly during Fall and Spring semesters.**
- Meet regularly (at least every other month).
  - **The Discipline has had regular meetings for the last 3 years.**

p. Assessment Procedures

- Implementation of the Discipline Assessment Plan.
- Regular Analysis of Data Provided.
  - **The Assessment plan has been developed and revised to make it more meaningful by connecting it to improvement in instruction. See 2007/2008 SLO Schedule and Summary in Part E.**

C. Data Analysis and Environmental Scan

Enrollment Trends

Enrollment and Fill ratio date since Summer 2006

Table 1: Active students in chemistry courses (Data from Section Statistics Chairs Retreat.xls)

Active students in courses								
		Term						
Loc	Course	06SUM	06FAL	07WIN	07SPR	07SUM	07FAL	08WIN
MOV	CHE-1A		25				29	
	CHE-1B				29			
	CHE-2A	64	92	48	83	60	126	51
	CHE-2B				51			
Total MOV (Chem)		64	117	48	163	60	155	51
NOR	CHE-10				26			
	CHE-1A		23		25		29	
	CHE-1B				13			
	CHE-2A	51	129	48	122	61	164	64
Total NOR (Chem)		51	152	48	186	61	193	64
RIV	CHE-10		16					
	CHE-12A		42	28			40	26
	CHE-12B				36			
	CHE-17		5					
	CHE-1A	29	67	33	101	21	55	1
	CHE-1B	36	40		36	34	31	
	CHE-2A	65	259	61	280	62	189	59
	CHE-2B	21	63		47	23	66	30
	CHE-3		62		48		33	
Total RIV (Chem)		151	554	122	548	140	414	116

Table 2: Fill ratios in chemistry courses (Data from Section Statistics Chairs Retreat.xls)

Fill ratios								
		Term						
Loc	Course	06SUM	06FAL	07WIN	07SPR	07SUM	07FAL	08WIN
MOV	CHE-1A		0.78				0.91	
	CHE-1B				0.91			
	CHE-2A	1.01	0.96	0.75	0.86	0.94	0.99	0.80
	CHE-2B				0.80			
Ave MOV (Chem)		1.01	0.87	0.75	0.86	0.94	0.95	0.80
NOR	CHE-10				0.51			
	CHE-1A		0.72		0.78		0.91	
	CHE-1B				0.41			
	CHE-2A	0.80	0.81	0.75	0.76	0.96	0.86	1.00
Ave NOR (Chem)		0.80	0.76	0.75	0.62	0.96	0.88	1.00
RIV	CHE-10		0.53					
	CHE-12A		0.88	1.17			0.84	1.08
	CHE-12B				0.75			
	CHE-17		0.10					
	CHE-1A	0.97	0.56	1.10	0.86	0.70	0.76	0.03
	CHE-1B	1.20	1.00		0.75	1.70	0.78	
	CHE-2A	1.08	0.90	0.68	0.94	1.03	0.96	0.98
	CHE-2B	1.05	0.88		0.65	0.96	0.92	1.00
	CHE-3		0.62		0.67		0.69	
Ave RIV (Chem)		1.08	0.68	0.98	0.77	1.10	0.82	0.77

Enrollment in chemistry courses has increased District since fall of 2003. Continued demand for more sections of courses has not been fully met due to limitations on Faculty and facilities. At Moreno Valley Campus, where facilities allowed for expansion there was a 100% increase in annual Student Capacity for Chemistry 2A over a 4 year period (with very high %fill). Growth in sections of Chemistry 2A/2B and Chemistry 1A/1B will be necessary to meet the missions of the Chemistry Discipline and all three Colleges of the District.

At the Riverside campus student enrollment went down in the fall of 2007 due to the fact that of 3 full time faculty members, who retired, only one was replaced with a one-year temporary faculty. The high fill ratios at all campuses reflect that chemistry operates close or at capacity and every semester the long waitlists of students trying to add classes is frustrating for students as well as for faculty.

Success rates do not appear to have any consistent, significant correlation with ethnicity, gender, or age group. There appears to be some correlation between higher educational status and greater success rate, as would be expected.

Goals to Improve Student Learning

a. **Increase Student Access** – Our Discipline's goal is to increase our Faculty and Lab Facilities to increase student access. Chemistry 2A is severely impacted in its enrollments. During the Fall semester it is typical for there to be 96 students on the waiting list for the 96 lecture seats available. This course is a gateway leading to Chemistry 1AB, 2B, and Microbiology. It is required for many programs across the District. Chemistry 2B had 34 students on the waiting list for a 64 student lecture, so it is also impacted. Chemistry 1A/1B and Chemistry 1AH/1BH are both filled to capacity. For the first time this year the Honor's course CHE 1BH had a wait list. With the current budget situation, we are not able to expand to serve more students, but when budget allows we will still need additional Full-Time Faculty, Lab Facilities, and Supply/Equipment Budgets for growth.

b. **Increase Course Retention –** While retention in our transfer courses remains high, there has been low retention with some Part-Time faculty. In an effort to hire and retain high quality Part-Time faculty, Dr. Marsh has been participating in a Mentoring program.

c. **Increase Successful Course Completion** - Success rates for Chemistry courses vary depending on the type of course offering. Chemistry 10, which is a general education course for non-science majors, has lower success rates (48%), probably due to lower student motivation. The discipline will revise the course by linking the content to application topics relevant to other programs in the District to improve student interest and motivation. A possibility to improve the success rate of Chem 10 would be to introduce a math requirement or math test for students taking this class. In comparison, success rates for Introductory and General Chemistry courses are in the 70% range. Discussion among discipline members indicates that students need substantial support in problem solving skills to improve their success. STEM Center's program SI Leaders has provided students with additional instructional support and has been very popular with students. Strategies for students to improve their problem solving skills are being examined as part of our Assessment process.

d. **Increase Student Term-to-Term Persistence –** This issue remains to be analyzed.

e. **Improve Student Learning Outcomes –** The Discipline has reviewed and revised the SLO's on our courses over the past 3 years. We discuss our course outlines of record annually.

f. **Improve the Quality of the Student Experience** – Honors courses for Chemistry 1A and 1B have been developed and approved by the Curriculum Committee and the Honors Program. The CHE 1AH/1BH courses have been offered since Fall 2008. New facilities will soon be available at Riverside campus. Chemistry Laboratories and Lecture materials are constantly being revised incorporating updated information, for example at Norco:

    - Taking advantage of a Supplemental Instructional Tutor in Chemistry 1A for the first time (Fall 2007) and in Chemistry 2A for the first time (Fall 2007). The first impressions of SI have been very encouraging. The additional tutors have helped some students to improve their grade or in a few cases allowed them to pass the

class. The perception of the instructor is that some students would have failed the class without the extra help.

- Developed a chemistry course website that is 508-compliant (accessible to the handicapped) (January 2006)

- Starting Poster Sessions in Chemistry 1A (Fall 2006)

- One instructor is incorporating a new theme (Global Warming) into all of her chemistry classes.

- Developing or modifying the current Chemistry 1A laboratory experiments (on-going since 2004).

g. **Develop a Comprehensive Enrollment Management Program –** Efficiencies for the Discipline across the District are high. We continue to cooperate in offering our low enrollment courses at only one Campus per term. Availability of Large Lecture facilities (at least 64 students) suitable for chemistry lectures will allow us to remain efficient.

D. Programs

A. Programs/Course Sequences

1. Transfer Preparation for Science, Engineering, Medicine, and Pharmacy Majors:

- Preparation Course: Chemistry 2A or 3

- General Chemistry Sequence: 1A and 1B (Transfers to CSU and UC systems)

- Organic Chemistry Sequence: 12A and 12 B (Transfers to CSU and UC systems)

The majority of students who take the General and Organic Chemistry sequences intend to transfer to a four-year degree program, mostly to UC or CSU or Loma Linda University.

B. Preparation for Certificate Programs

(i.e. Nursing, Paramedic, Biotechnology, Dental Hygiene, Physical Therapy, Inhalation Therapy) Introductory Chemistry Sequence: Chemistry 2A and in some cases Chemistry 2B

C. General Education Breadth Requirements

- Science Without a Laboratory: Chemistry 10

- IGETC and CSU historical background (D6): Chemistry 17

- Science With a Laboratory: Chemistry 2A, 2B, 3, 1A, 1B, 12A, 12B

D. Development of Curriculum

- The core of the Chemistry Discipline Curriculum (Chemistry 1A, 1B, 2A, 2B, 3, 12A, and 12B) has remained fairly constant. This is because they meet needs for transfer degree articulation, vocational/occupational certificates, and degree requirements for RCC and other institutions.

- Chemistry 17 was added to develop a different approach to a general education breadth requirement for Physical Sciences. This interdisciplinary course provides a format for non-scientists to understand the roles of the physical sciences and related technologies in the framework of history.

- At this point in time the discipline feels that Chemistry 10 should undergo revision to focus the content on different topic areas to better meet the needs of the three Colleges. Example, applications that Chemistry 10 could use as a focus include Fire Technology, the Arts, and the Environment. There are no new courses being developed at the present.

- Chemistry 1AH/1BH has been approved by the curriculum committee and will probably be offered during Fall 2008. Status of Curriculum in Appendix A.

E. Prerequisites, Co-requisites, and Advisories

- The Courses requiring prerequisites are Chemistry 1A, 1B, 2A, 2B, 3, 12A, and 12B. These prerequisites are consistent with courses that articulate at CSU and/or UC and so are validated by periodic content review.

- Chemistry 17 has an advisory of qualification for English 1A. Effective written expression is required for the descriptive written assignments required by this course.

E. Student Learning Outcomes Assessment

Discipline SLO's

CHEMISTRY DISCIPLINE STUDENT LEARNING OUTCOMES

Upon successful completion of a course in the Chemistry Discipline, students should be able to:

1. Apply chemical concepts and vocabulary to a variety of fields of knowledge including health and the environment.

2. Relate the nature of chemical bonding and types of chemical reactions to the properties of materials.

3. For courses with a math prerequisite, solve multi-step problems (using formulae and unit-analysis) relating to elements and compounds, chemical reactions and stoichiometry, and mixtures.

4. For Laboratory courses, collect and analyze data from chemical experiments, including graphing, calculations and qualitative understanding of how data relates to the concept studied. Construct and manipulate equipment to secure reasonably accurate measurements.

5. Apply the scientific method to chemical concepts of atoms and elements, chemical bonding and molecular geometry, chemical reactions and stoichiometry, properties of the states of matter, phase changes and solutions.

Other skills and competencies developed through the chemistry courses include:

1. Logical thinking and critical analysis through data analysis and interpretation of trends and patterns. Scientific methodology incorporates these skills.

2. Oral/Written Communications through team projects and written assignments.

3. Quantitative Reasoning through collection of measurements and calculations.

4. Social/Team-building through collaborative assignments in lecture and/or laboratory.

5. Informational Competency through research projects.

6. Technological Competency through use of instrumentation and computers.

7. Motor Skills through manipulation of equipment in laboratory courses.

The Chemistry Discipline has been in the process of Learning Outcome Assessment since Fall 2003. At that time a preliminary schedule and goal was set forth. Since that time we have altered our plan

in order to try to produce processes that are better linked to improvement of teaching and learning. We are also currently dividing up the task into several "pilot" projects so that we can determine which assessments yield the most usable data for improvement of instruction and SLO's.

As the discipline has worked to understand the assessment process, our focus has changed from just getting something "done" to developing a process that would produce meaningful improvements in instruction. Our initial laboratory assessment gave some information about the laboratory skills that were not learned adequately by our students and gave us the opportunity to mentor our adjuncts (whose performance was found to be weaker than that of the full-time faculty).

2007/2008 LEARNING OUTCOME ASSESSMENT SCHEDULE and SUMMARY CHEMISTRY DISCIPLINE

OUR LONG TERM GOAL IS TO DEVELOP APPROPRIATE ASSESSMENT TOOLS THAT ALLOW US TO DETERMINE WHICH SKILLS ARE NOT LEARNED BY THE STUDENTS AND TO TEST WHICH CHANGES IN INSTRUCTION IMPROVE THE LEARNING OUTCOMES

SEMESTER	COURSE
SPRING 2004	PREPARED CHEMISTRY 2A LABORATORY RUBRIC
FALL 2004 **Suggested Action Plan:** Full-time faculty at each campus volunteered to mentor part-time faculty to improve performance in this area. Greater emphasis on these skills was given in lab.	COLLECTED DATA FOR CHEMISTRY 2A LABORATORY SKILLS: Determined that use of units and significant figures were not adequate and that performance for adjunct faculty in these areas was poorer than that for full-time faculty.
SPRING 2005	PREPARED CHEMISTRY 2A "REVIEW" ASSESSMENT TOOL: With much discussion a multiple choice assessment tool was developed to be used as a review for the final exam. Since different faculty teach the course outline topics to different depth, there was some dissatisfaction with the rigor of the result.

FALL 2005	COLLECTED DATA FOR CHEMISTRY 2A USING "REVIEW" ASSESSMENT TOOL AT PILOT SIGHTS: The general consensus was that this tool didn't really tell us anything about our students learning that we didn't already know from their exams. We decided that a different approach was essential.
SPRING 2006 **Suggested Action Plan:** Faculty who were missing some SLO's were given feedback on how to improve and a revision to the SLO's was made based on a group consensus that they were not complete.	COMPARED THE EXAMS OF DIFFERENT FACULTY USING A GRID: Exams were assessed and compared using a grid to determine if they tested for the SLO's for the course content. In most cases we felt the SLO's were all assessed on the exams, but there were some omissions.
FALL 2006 **Suggested Action Plan:** Individuals or small groups should "test" assessment strategies that they feel are valuable and report back at the next discipline meeting with results and plans.	**REVIEW OF ASSESSMENT PROCESS WITH GUEST SPEAKER AREND FLICK.**
SPRING 2007 Further Planning took place at our Discipline meeting on 2-9-07 **All: 1) Chemistry 12 instructor feedback on exit skills to Chemistry 1 instructors: discussed on 2-9-07** 2) Follow-up goal: Dialog with other Departments and Programs that have Chemistry courses as prerequisites.	**Pilots Proposed:** **All:** 1) Analysis of the use of Student Posters as a means of assessing student's ability to apply their knowledge of Chemistry. (Sample Posters used). **Marsh**: 1) Student self-report their GESLO progress (preliminary data available for discussion). **Marsh/Frietas/Amrich**: 1) Chemistry 1B common kinetics problem on the final exam. (Testing: effectiveness of problem solving skills as applied to chemical kinetics) 2) Common multi-part final exam question for Chemistry 2A to determine which topics areas are taught least effectively.

FALL 2007 1) Pilot Program results were discussed at the Discipline meeting on 8-31-07. 2) **Marsh**: After meeting with Donna Lesser of the Dental Hygiene program, materials were provided to better illustrate the application of Chemistry to the field and an Assessment was developed (Dental Anesthesia Calculations).	**Pilots Proposed:** **Junker:** 1) ACS test for Chemistry 2A. Will this standardized test provide meaningful data? **All:** Analysis and comparison of Chemistry 1A final exams (with names removed) for the link between grade and demonstration of meeting SLO's. Also SLO's with weak success rates will be noted for improvement of instruction methods. **Follow-up to the Project to improve instruction:** Based on the pilot project for Chem 2A we have discussed methods to improve instruction in: (a) calculation of solute to prepare a solution (M) and (b) drawing correct Lewis dot structures for covalent and binary ionic compounds. Then we will reassess using a common question on our final exams.

STUDENT LEARNING OUTCOMES ASSESSMENT OVER THE NEXT 4 YEARS

As a result of Data and Analysis from the current pilot projects (found in Appendix B) we have had a discipline discussion of methods to improve instruction. Considering that the round table discussion was perceived as a success, we are planning to repeat this format within the discipline between other courses for example Chem 2A and Chem 2B, but hope that a similar format could be useful between different disciplines such as Chemistry and Biology or Math and Chemistry.

Some Data and analysis is also found in Appendix A of the Moreno Valley Annual Program review (pg. 24-28) dated March 2007.

Preliminary analysis of data (shown in Appendix C) shows how success in courses in the Chemistry sequence leading to Chemistry 12A tends to lead to greater success in Chemistry 12A (and beyond to 12B). The grade in the previous course is the best predictor for success in the next course in the sequence. We will continue to work with Institutional Research to show how successful students in our Chemistry course perform in their succeeding courses that apply the knowledge.

The discipline is still working on finding a process which will provide us with valuable information about how successfully our courses are taught. Up to this point some of our efforts in assessment have produced results which have not been very useful to the chemistry faculty. Our goal is to pilot different methods to determine which ones yield the best results to aid in improvement of instruction. One success was the round table discussion about the preparedness of students entering

Organic Chemistry. It turned out that many students have insufficient knowledge to apply some of the concepts taught in Chemistry 1A and 1B to the content in Chem 12A. For example: Students have difficulties using Lewis Structures and predicting molecular geometries based on VSEPR. Students also have difficulties to distinguish between Broensted and Lewis Acids and Bases.

SLO ASSESSMENT PLANS RELATION TO STRATEGIC INITIATIVES

Our assessment of Chemistry 2A titration lab showed we are successful in building lab skills. Superior lab skills may improve successful course completion and persistence by the students. This success should carry over into future science lab courses. We also found need for improvement in the instructions in the lab manual. In order to make the manual more student friendly we have begun revising the manual. Our rubric indicated the part-time faculty were less effective teaching significant figures and units. The comparison of final exams also showed some gaps in the topics being covered by the part-time faculty. As a result we have begun mentoring our new part-time faculty hoping to improve the quality of the student experience increasing the student success and retention rates.

F. Collaboration with Other Units Including Instructional, Student Services or Administrative Units (Internal)

The primary departments/disciplines that the Chemistry Discipline has worked with are physics, life sciences, and mathematics. We have worked on organizing and minimizing conflicts within class schedules and curricular patterns mainly. Coordination also takes place with our allied health programs.

On the Riverside Campus Chem 1A and Chem 1B were taught with the support of an SI (Supplemental Instructor). This extra help for the students was provided through Teachers Preparation.

- Riverside School for the Arts – Development of CHE 2A for Art students (Marsh)
- Forensics Department – Development of CHE 2A course for Forensics (Marsh)
- Ben Clark – Development of CHE 10 and CHE 2A course for Public Safety (Marsh)
- Dental Hygiene – Applied Problems for CHE students. (Marsh)
- Copernicus Project – participation in the Annual Conference. (Bernier)
- Mentoring two new Norco biology hires as a member of their hiring committee. (Freitas)
- Chemistry shares equipment with both the physics and biology disciplines (magnets, spectrophotometers, balances etc.) (Freitas)

- Conversations with physics, biology and math professors regarding common themes and ways to better accommodate students going from one science class to another class. (All)

The Discipline would be able to pursue more collaborative projects if we had more Full Time Tenured or on tenure-track Faculty.

G. Outreach Activities

Moreno Valley

- "Science Saturdays" at the Imagine That Bookstore (Canyon Crest). Dr. Marsh (sometimes with RCC Chemistry Students receiving extra credit) has read science stories and supervised hands-on science activities for children at the bookstore.

- Chemistry Students Outreach to Local Schools. For extra credit students have the option to give a presentation and activity (making glue slime) prepared by Dr. Marsh to a class at a school. Responses from the teachers at the schools have been very positive.

- Collaboration with chemistry faculty at Crafton Hills College on teaching methods and materials.

- Science activities at ECD center at MV campus

Riverside

- Coordination and discussion with chemistry faculty from other Community Colleges, such as Mount San Antonio Community College.

Norco

- Collaboration with chemistry faculty at San Bernardino Valley College with finding qualified adjunct faculty.

- Collaboration with chemistry faculty at San Bernardino Valley College and at Los Angeles City College with teaching materials.

H. Long Term Major Resource Planning

The resources are found on the Annual Program Reviews. Our main justification for faculty, facilities, and increased supply budgets is to be able to increase our course offerings which are impacted and very efficient. Our CHE 2A course is necessary for many of the Colleges Programs.

I. Summary

1. Based on the fact that all three campuses are located in an area of substantial population growth in the years to come, the chemistry discipline needs to offer more courses, so that we will be able to cover the coming demand for chemistry classes. This, however, will only be possible if we can hire more full time faculty. At the moment, we are limited as how many courses we can offer on all three campuses by the teaching staff.

    - The goal for the district should be to hire at least 5 new full time faculties in the coming years.

    - At the Riverside campus growth is also limited by the number of Labs we have. Especially in Chem 2A, were we have the greatest demand, we cannot offer more courses, because we are limited by the Lab space. This situation should improve after completion of the planned new Science building.

2. The discipline needs a clear commitment from the district to hire additional full time faculty.

3. The discipline believes that the best way to measure successful implementation and execution of our goals is to analyze student success rates in chemistry and in the subsequent courses. This data should be available from Institutional Research.

J. Recommendations to the Program Review Committee

(none at this time)

APPENDIX

Appendix A: Curriculum Status

Undergoing review this spring (last revised 5/04):
CHE 3, 10, 12A, 12B, 17
The only substantial revisions expected by the discipline at this point are for CHE 10.

Last reviewed/revised between 8/06 and 11/06:
CHE 1A, 1AH, 1B, 1BH, 2A, 2B

Appendix B: SLO Assessment

Chemistry 2A Assessment Project – Cumulative Final Exam (common question)

Purpose:
To determine which SLO topics are being successfully learned and retained for the final exam.

Assessment:
Number of students giving a completely correct answer to the question (no partial credit).

Norco Campus (Spring 2007)

Topics	Instructor 1	%Total
a. IUPAC Name	20	44
b. Balance equation	36	80
c. Lewis Dot Structure (ionic) (covalent) All correct	18 31 15	40 69 33
d. Acid type with Hydrolysis (strong) correct hydrolysis reaction correct	 35 17	 78 38
e. Use solubility rules	24	53
f. Calculation for solution preparation (M) (use Molar mass) (use Molarity) All correct	 16 12 8	 36 27 18

g. Subatomic particles for a monoatomic ion		
p+	37	82
n	26	58
e-	10	22
all correct	7	16
TOTAL STUDENTS	45	

Analysis of Results

STUDENT LEARNING OBJECTIVES FOR CHEMISTRY 2A

Upon successful completion of the course the student should be able to:

1. ***Solve basic level problems*** (using formulae and unit analysis) relating to unit conversions, ***stoichiometry***, gas law equations, ***concentrations of solutions***, pH, and nuclear chemistry.

   NOT SUCCESSFUL: *Only 18% of the students were able to correctly calculate the amount of solute to add to prepare a solution. (Topic f.)*

   SUCCESSFUL: *80% of students could balance a chemical equation, a necessary skill for stoichiometry. (Topic b.)*

2. Describe and **apply a chemical vocabulary** of approximately 200 words. *(Topics d. and g.)*

   SUCCESSFUL: *78% of the students could correctly identify a strong acid (this is a memorized fact)*

   NOT SUCCESSFUL: *Only 53% of students could predict whether a specific compound would be soluble in water. [this is a topic for which you need to read a table and apply the information in it.] (Topic e.)*

3. ***Apply the systematic naming system to name inorganic*** and simple organic ***compounds. Apply Lewis Theory to ionic and covalent bonding.***

   SUCCESSFUL: *Only 33% of the students were successful in drawing correct Lewis Dot Structures. The main error was drawing a covalent structure for an ionic compound. Past discussion by the Discipline indicate more focus needs to be made on ways for students to understand the structure of compounds. This was a particular surprise given the emphasis on this topic in class and in lab. (Topic c.)*
   NOT SUCCESSFUL: *Most students (56%) were not able to name aluminum hydroxide when given the formula. These students mostly confused the types of naming systems and did not correctly apply the appropriate naming system. (Topic a.)*

Writing a chemical equation that describes a particular process (hydrolysis reaction, topic d) is an important aspect of chemistry which combines vocabulary, stoichiometry and Lewis theory. If students understood the basic idea of how substances are dissolved into water, the main problem in writing this equation was noting the ionic charge on the products. 38% of the students answered this question correctly; 31% of the students would have received credit for this problem if they had included the charges on the ions. The students don't understand the symbolic reason for writing charges: when it is appropriate to write them in, when they must be left out.

4. Relate chemical concepts to physical phenomena in the areas of health, the environment, and their everyday lives.

   - *Not assessed by this instrument.*

5. Collect data using accurate qualitative observations and quantitative measurements of length, mass, temperature, and volume.

   - *Not assessed by this instrument.*

6. Analyze experimental results and relate them to the relevant concept.

   - *Not assessed by this instrument.*

Further analysis
In looking at the number of students who were unable to a) give the correct number of electrons in an ion, b) correctly draw an ionic Lewis structure, c) correctly write a hydrolysis equation, and d) correctly name an ionic compound it is clear that students do not understand the basic concept of the ion and why it is important to differentiate between ionic compounds and covalent compounds. The concepts of ions and electrical charges are a very difficult idea to transmit without some physics background, which most of the students do not have. (One instructor asks the students informally in class whether they have taken physics classes, and the majority (>85%) have not). More work is needed (perhaps in lab) to develop the ideas of the differences between ionic and covalent compounds, and what is meaningful about a seemingly unimportant superscript notation.

Chemistry 2A Assessment Project – Cumulative Final Exam (common question)

Purpose:
To determine which SLO topics are being successfully learned and retained for the final exam.

Assessment:
Number of students giving a completely correct answer to the question (no partial credit).

Moreno Valley Campus (Spring 2007)

Topics	Instructor 1	Instructor 2	Total	%Total
a. IUPAC Name	25	32	57	72
b. Balance equation	23	35	58	73
c. Lewis Dot Structure	7	7	14	18
d. Acid type with Hydrolysis	5	33	38	48
e. Use solubility rules	19	40	59	75
f. Calculation for solution preparation (M)	3	8	11	14
g. Subatomic particles for a monoatomic ion	3	33	36	46
TOTAL STUDENTS	31	48	79	

Analysis of Results

STUDENT LEARNING OBJECTIVES FOR CHEMISTRY 2A

Upon successful completion of the course the student should be able to:

1. ***Solve basic level problems*** (using formulae and unit analysis) relating to unit conversions, ***stoichiometry***, gas law equations, ***concentrations of solutions***, pH, and nuclear chemistry.

   SUCCESSFUL: *73% of students could balance a chemical equation, a necessary skill for stoichiometry. (Topic b.)*

   NOT SUCCESSFUL: *Only 14% of the students were able to correctly calculate the amount of solute to add to prepare a solution. Further focus needs to be made by the Chemistry Discipline on development of student problem solving skills. We need to work collaboratively with the Math Discipline to improve student math skills. (Topic f.)*

2. Describe and **apply a chemical vocabulary** of approximately 200 words.

   VARIED SUCCESS: *One Instructor's class had 69% success in: (d.) identifying HCl as a strong acid and writing an appropriate hydrolysis equation for it and (g.) applying the vocabulary linked with atomic structure to determine the number of subatomic particles in an ion. The other instructor had about 10% success, mainly due to student lack of realization that an ion will have a different number of electrons and proton for topic g. This suggests that discussing methods of instruction for these topics with the Instructor 1 would be useful. (Topics d. and g.)*

   SUCCESSFUL: *75% of students could predict whether a specific compound would be soluble in water. (Topic e.)*

3. ***Apply the systematic naming system to name inorganic*** and simple organic ***compounds. Apply Lewis Theory to ionic and covalent bonding.***

   SUCCESSFUL: *Most students (72%) were able to name aluminum hydroxide when given the formula. (Topic a.)*

   NOT SUCCESSFUL: *Only 18% of the students were successful in drawing correct Lewis Dot Structures. The main error was drawing a covalent structure for an ionic compound. Past discussion by the Discipline indicate more focus needs to be made on ways for students to understand the structure of compounds. (Topic c.)*

4. Relate chemical concepts to physical phenomena in the areas of health, the environment, and their everyday lives.

   - *Not assessed by this instrument.*

5. Collect data using accurate qualitative observations and quantitative measurements of length, mass, temperature, and volume.

   - *Not assessed by this instrument.*

6. Analyze experimental results and relate them to the relevant concept.

   - *Not assessed by this instrument.*

Appendix C:

Data on Success in Chemistry 12A/B Relationship to Success in Prerequisite Chemistry Courses. {Based on Student Data with "blind" ID}

CHE 2A	CHE 3	CHE 1A	CHE 1B	CHE 12 A	CHE 12B
11 A 2 B 1 C	6 A 2 B	31 A 5 B 1 C	35 A 5 B	**50 A's**	23 A 5 B 2 W
12 A 10 B 3 C 1 D	9 A 6 B 3 C 1 W	20 A 30 B 10 C	22 A 29 B 13 C	**75 B's**	8 A 14 B 12 C 2 D 1 F 2 W
7 A 3 B 3 C	3 A 7 B 2 C	7 A 22 B 13 C	6 A 24 B 16 C	**52 C's**	 6 B 10 C 1 D 5 F 5 W
 3 B	 4 B 3 C	 4 B 12 C	1 A 3 B 15 C	**24 D's**	Not applicable since students did not pass CHE 2A, the prerequisite.
 1 B 3 C	No data	1 A 1 B 3 C	 1 B 4 C	**6 F's**	Not applicable since students did not pass CHE 2A, the prerequisite.