

2003/2004 Program Review for the Chemistry Discipline

Topic I. Where are we now?

A. Purpose and Goals

The following quotes may be found on page two of the Riverside Community College catalog 2002-2003.

From RCC Mission Statement: “The district provides transfer programs paralleling the first two years of university offerings, pre-professional, career preparation...leading to the associate of arts degree, the associate of science degree, and a variety of certificates.”

Comment: Chemistry classes are a typical part of the freshman and sophomore level curriculum in university offerings. At RCC we teach high school level chemistry for students who did not take this course in high school; this course is necessary to prepare students for subsequent college-level chemistry courses and it is also necessary for many nursing programs, including the nursing program at RCC. In addition, we offer the typical two-year sequence of chemistry. This sequence is equivalent to the first two years of chemistry taken by science majors at liberal arts colleges and universities and is necessary for some science majors who wish to transfer to university at the junior year level.

From RCC Mission Statement: “In the tradition of general education, the liberal arts and sciences...prepare students for intellectual and cultural awareness, critical and independent thought, and self-reliance.”

Comment: The content of chemistry classes requires critical thinking in mathematical problem solving as well as the ability to assimilate many abstract concepts and theories. Students who study chemistry often find that their abilities are stretched and strengthened due to the challenging material presented.

From RCC Goals: 1995-2005: Tailor programs and services to meet the needs of the students and communities served by the three-campus District.”

Comment: In addition, the Moreno Valley chemistry professors recently (2002) developed a new Biotechnology certificate program for the Moreno Valley campus in keeping with the health sciences emphasis of that campus. The program benefits students who are interested in working for local biotechnology businesses and laboratories. The research and business contacts that were a necessary part of the program creation helped forge new links between the business community and RCC and also provided current information regarding the skills that the local science community requires of its new employees.

From RCC Goals: 1995-2005 “Improve student retention and success by strengthening certificate, degree, and transfer programs and by establishing new programs and course sequences that lead students to opportunities for transfer education and career preparation.”

Comment: Riverside and Moreno Valley chemistry instructors have given support in every facet of the chemistry program at the Norco campus. The encouragement and advice given to the Norco administration and new chemistry instructor (hired in 2000) has been instrumental in enabling the program to prosper; in the past four years, the chemistry program at Norco has doubled its student enrollment and is slowly increasing its course offerings.

From RCC Goals: 1995-2005: “Ensure that the resources of the college support an effective learning process and ensure accountability by measuring and reporting institutional effectiveness.”

Comment: The Chemistry discipline is in the process of creating a plan to assess each of its course offerings. The individual assessments for each course will be distributed on all campuses that offer the course. The discipline has decided to meet monthly for the 2003-2004 school year in order to complete this project.

From RCC Goals: 1995-2005: "Utilize advances in information technologies to improve effectiveness of instruction, services and administration"

Comment: The chemistry discipline has created an RCC Chemistry web site (<http://www.academic.rccd.cc.ca.us/~chemistry/>) to better serve our students. The website includes current course offerings, guidance for determining the correct chemistry course or sequence of courses, as well as instructors' e-mail addresses and class web sites. This website has enabled students to contact instructors and ask questions about course offerings during summer sessions, and over the weekend, and students will receive prompt answers.

Some courses utilize specially developed chemistry software programs to aid student comprehension of abstract concepts discussed in the class.

B. History

CHEMISTRY DISCIPLINE HISTORY – 1999 -2004

In the last 5 years we have instituted some new laboratory techniques and equipment.

In General Chemistry these include:

- a. We have been using the Lab Works software with probes some of the experiments in General Chemistry II. The probes are connected to recycled computers in PS208. Emphasis has been put on utilizing Excel for graphing and calculation for the Laboratory Reports.
- b. Hand held Palm Pilots were used in Chemistry 1A. This program is still being developed.
- c. We now have new voltmeters for the electrochemistry experiments which were donated. They are easier to use and give better results.
- d. We have new spectrosopes which give the emission spectra on a scale.
- e. Mercury thermometers are being replaced by digital readout and alcohol thermometers.
- f. New experiments have been used at the Riverside Campus. These include an Entropy Experiment using Urea, Thin Layer Chromatography of Analgesics using a layer on aluminum, a qualitative experiment based on the formation of precipitates, a qualitative experiment based Flame Emission.

In Chemistry 3 the new experiments include:

- a. Specific heat of a substance
- b. Candy chromatography
- c. Does the Glove Fit -- an Ideal Gas Experiment.
- d. Measurement of Ca^{+2} content in Tap Water

In Organic Chemistry

- a. New Gas Chromatographs have been purchased
- b. New Digital readout instruments for melting point determinations are now used
- c. PS 206 has been remodeled for the organic class.

For Introductory Chemistry:

- a. The Laboratory Manual has been extensively revised to make the experiments safer (including safety warnings and make the experiments more relevant to current topics of general interest.
- b. PS 208 has new fume hoods.
- c. A new experiment "Making the Mayonnaise" has been added.

A new course – Development of Modern of Science has been added and offered as part of the Study Abroad Program and meets IGETC.

New handouts have been written to assist the students in learning.

Chemistry 10 has been revised.

At the Moreno Valley Campus

- The new experiments include the Iodine Clock, Activation Energy, Nuclear Chemistry, Le Chatelier's Experiment, The Titration of an HCl, H₃PO₄ mixture, Precipitation—the Product of Soap Scum, A Qualitative Analysis using Ag⁺, Pb⁺², and Hg₂⁺², A Qualitative Analysis using Fe⁺³, Al⁺³, Cr⁺³, and Ni⁺²
- A new experiment “Making the Mayonnaise” has been added.
- There has been an enhancement of technology, development of applied laboratories, and a paper protein model.

At the Norco Campus

- Computers were purchased. They are used for lab reports, problem solving, and there are some animation programs used.
- An Experiment on Crystal structures was added.
- Word and Excel are used to write Lab Reports for General Chemistry
- Pre-lab are required for Chemistry 1A, 1B, and 2A
- A website is used for all students to download weekly homework information and will be soon used to download in-class worksheets.

C. Programs and Curriculum

I. Programs/Course Sequences

A. 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

II. Development of Curriculum

The core of the Chemistry Discipline Curriculum (Chemistry 1A, 1B, 2A, 2B, 3, 10, 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.

On August 30, 2001 Chemistry 8,9, and 20 were deleted because they no longer filled a need and/or had outdated content. Chemistry 5 was deleted since the course would have required significant costs to revise to up-to-date methods using modern instrumental techniques. The current facilities are also inadequate to support this course in the updated form.

Chemistry 17 was recently 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 faculty feel that the course offerings adequately meet the needs of the College. There are no new courses being developed at present.

III. Enrollment Trends (Data from RCCD Institutional Effectiveness is in Appendix I)

Enrollment in chemistry courses jumped by approximately 150 students district wide in Fall of 2002. Continued demand for more sections of courses has not been fully met due to budgetary restrictions on growth. Growth in sections of Chemistry 2A/2B and Chemistry 1A/1B will be necessary to meet the missions of the Chemistry Discipline and the District.

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%). This could be due to lower student motivation. The discipline will evaluate whether to revise the course to improve student interest/motivation. 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. This indicates that further work with the mathematics discipline will be needed to provide means for students to improve their problem solving skills.

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.

IV. Discipline Trends

A. Knowledge requirements

Knowledge requirements have remained fairly stable over the last five-year period. These requirements are defined by the prerequisites for the courses where chemical knowledge is essential for development of the content.

B. Skill/Competency requirements

Skill/Competency requirements have remained fairly stable over the last five-year period. These requirements are defined by the prerequisites for the courses where mathematical skills essential for quantitative treatment of the content.

C. Instructional methods

Instructional methods have changed over the last five-year period to incorporate advances in technology. Several faculty members have incorporated Power Point presentations into their lectures. The Chemistry Discipline has a web site. Internet sources are used for research by faculty and students. Computer interfaced devices are used in some laboratory experiments. Molecular modeling and problem solving software are used in some courses (where general access to computers is available).

V. 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 (Appendix A.).

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

VI. Expected Learning Outcomes

The Expected Learning Outcomes for each Course are listed under the Learning Objectives on the Course Outlines of Record (Appendix A.) and encompass the content listed under Topics. The Learning Objectives are reviewed periodically by the discipline through lively discussion. For transfer courses, equivalent courses at UC and CSU are reviewed for comparison in order to retain transferability.

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.

D. Student Outcomes Assessment

Prior to the beginning of the Program Review cycle, the Chemistry Discipline did not have any quantitative means of evaluating student outcomes. Anecdotal evidence of student success in programs (i.e. Nursing) and at transfer institutions is the current extent of our information. Over the summer of 2003, plans for development of appropriate assessment tools for Chemistry 2A, 2B, 1A, and 1B were outlined (see following pages for the CHE 2A plan and rubric) and a schedule was determined (below). We will begin with Chemistry 2A because the majority of Chemistry sections across the district are Chemistry 2A.

LEARNING OUTCOME ASSESSMENT SCHEDULE CHEMISTRY DISCIPLINE

OUR LONG TERM GOAL IS FOR EACH COURSE TO BE ASSESSED AT LEAST ONCE EVERY FIVE YEARS ONCE WE HAVE DEVELOPED APPROPRIATE ASSESSMENT TOOLS.

SEMESTER	COURSE
SPRING 2004	PREPARE CHEMISTRY 2A LABORATORY RUBRIC
FALL 2004	COLLECT DATA FOR CHEMISTRY 2A LABORATORY SKILLS
SPRING 2005	PREPARE CHEMISTRY 2A "REVIEW" ASSESSMENT TOOL
FALL 2005	COLLECT DATA FOR CHEMISTRY 2A USING "REVIEW" ASSESSMENT TOOL
SPRING 2006	COLLECT DATA FOR CHEMISTRY 2A USING REVISED LABORATORY AND "REVIEW"
FALL2006	ANALYSIS OF ASSESSMENT PROCESS FOR CHEMISTRY 2A
SPRING 2007	REPEAT CYCLE FOR CHEMISTRY 1A

ASSESSMENT WILL INCLUDE:

1. COLLECTION OF DATA USING THE COURSE ASSESSMENT PLAN.
2. REQUEST FOR STUDENT DATA FOR GENDER, ETHNICITY, AGE, UNIT LOAD, EDUCATIONAL GOALS, ENROLLMENT STATUS, AND HIGHEST PRIOR EDUCATION TO PROMOTE BETTER UNDERSTANDING OF OUR STUDENT POPULATION.
3. DISCIPLINE DISCUSSION OF LEARNING OUTCOMES FOR THE COURSE.
4. ANALYSIS OF RELEVANT TRANSFER DATA AS A MEASURE OF STUDENT SUCCESS.

CHEMISTRY 2A ASSESSMENT PLAN

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.

ASSESSED BY:

Ten multiple choice questions on the “Chemistry 2A Review” assignment selected by the chemistry discipline faculty teaching the course that semester.

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

ASSESSED BY:

Defining and using 10 words in a relevant sentence on the “Chemistry 2A Review” assignment selected by the chemistry discipline faculty teaching the course that semester.

3. Apply the systematic naming system to name inorganic and simple organic compounds.

ASSESSED BY:

Ten naming questions on the “Chemistry 2A Review” assignment selected by the chemistry discipline faculty teaching the course that semester.

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

ASSESSED BY:

Ten multiple choice questions on the “Chemistry 2A Review” assignment selected by the chemistry discipline faculty teaching the course that semester.

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

ASSESSED BY:

Laboratory assignment from the Titration experiment to be assessed using the rubric agreed upon by the chemistry discipline faculty teaching the course that semester.

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

ASSESSED BY:

Laboratory assignment from the Titration experiment to be assessed using the rubric agreed upon by the chemistry discipline faculty teaching the course that semester.

OVERALL PLAN: The chemistry discipline faculty teaching Chemistry 2A during the semester that assessment takes place will:

- 1) Survey the students on gender, ethnicity, age, unit load, educational goals, enrollment status, and highest prior education during the semester in an effort to determine the course student population.
- 2) Assess the Titration experiment reports by the Chemistry 2A students as part of a team of discipline members according to the rubric.
- 3) Proctor and assess the “Chemistry 2A Review” assignments for all of the Chemistry 2A students in the class during the last week of classes (prior to finals). The assignment will be given as a quiz --- individual assignment, proctored, timed.

Sample Rubric for Experiment 14/15: Note that the rubric score is not the student's grade on the lab. It is used for our assessment of student skill development.

Prior to lab: instructors and/or lab tech measure the two buffer solutions used and titrate aspirin (ave. of more than one persons results if possible) to find correct value.

Score	Activity	2	1	0
	Measurement of Relative Acidity of two buffer solution unknowns	both pH's match instructor's readings	both pH values fall within 1 pH unit of instructor's readings	both readings are in error by more than 2 pH units from instructor's readings
	Titration of Aspirin: significant figures and accuracy	All data recorded with correct level of accuracy (to 0.1 mL).	One error in reading/recording volume data.	2 or more errors in data collection/recording.
	Titration of Aspirin: use of units	All units recorded.	1 or 2 units left off.	More than 2 units absent.
	Calculations of mg Aspirin and % Aspirin	Calculations entirely correct.	Error in one calculation.	Error in both calculations.
	Relate pH to concept of acids/bases	Correctly identify all solutions as acidic or basic. Correct answers to questions.	1 or 2 errors in identifications and/or answers.	3 or more errors in identifications and/or answers.

Learning objectives for Chemistry 2A (**relationship to the assessment added in bold type**)

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.
(Calculation of mg aspirin and % aspirin shows student ability to use formulae)
2. Describe and apply a chemical vocabulary of approximately 200 words.
(Laboratory applies chemical terminology: titration, pH, accuracy, acid/base indicator.)
3. Apply the systematic naming system to name inorganic and simple organic compounds.
4. Relate chemical concepts to physical phenomena in the areas of health, the environment, and their everyday lives.
(Laboratory shows how quality control of medications is carried out --- relating to health.)
5. Collect data using accurate qualitative observations and quantitative measurements of length, mass, temperature, and volume.
(Relative acidity is measured using qualitative observation of indicator colors. Quantitative measurement of volume is used for the titrations. Accuracy is communicated by using the correct number of significant figures on volume readings.)
6. Analyze experimental results and relate them to the relevant concept.
(Students compare titration results to the government standard for aspirin. This titration is related to titration problems assigned in the lecture portion of the course. Relationship of pH to acidity/basicity is illustrated. Practical knowledge of the Litmus test.)

E. Collaboration with Other Units

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. The respective chairs of these departments have begun discussing the need for a large science lecture hall on the Riverside Campus.

Coordination also takes place with our allied health programs. The Nursing Department has been planning a new 5-unit chemistry course for nursing students with our discipline as part of a state-wide proposal. The Dental Hygiene program consulted with chemistry discipline members before it began and continues the dialog.

F. Outreach

Outreach activities are included in the self-assessment questionnaire.

G. Resources (See discussion in Topic III.)

H. Overall Assessment of Discipline Performance

Tool: The Self Assessment Questionnaire

The following questionnaire was given to each member of the Chemistry Discipline. The answers are combined here.

1. What kind of collaborative efforts have you made within the discipline?

Members of the discipline have worked together to develop the Chemistry Website, new laboratory experiments for General and Introductory chemistry, textbook selection, curriculum development, and updating course outlines and content review for all courses.

2. What kind of collaborative efforts have you made outside the discipline, that is with other departments on campus, with other colleges or within the community.

Members of the discipline have made presentations for Early Childhood Development/Head Start students, prepared and presented for Math Skills/Science Applications Workshop, worked with the math and science departments on the three campuses to improve math/science overlap, minimize scheduling conflicts and develop new programs such as the "Environmental program" and the Biotechnology program at Moreno Valley. Further, members have worked on the curriculum committee to prepare an in-house Curriculum Handbook and Content Review Forms.

3. Have you participated in outside activities which encouraged the use of chemistry/science? What were the activities?

Our discipline members have worked outside the department to encourage the use of science and chemistry in several ways. One member has run the Annual Chemistry Fair at the San Bernardino County Museum. She has also published in The Journal of Chemical Education. Another has worked to present weekly science classes at the third and fourth grade levels in area elementary schools and also serves as the merit badge counselor in chemistry for the Boy Scouts and tutors high school students in chemistry.

4. What are you doing to develop yourself in the discipline, i.e. classes, seminars, conferences...?

As a discipline we regularly attend American Chemistry Society meetings and seminars. Across the discipline we are going to courses, studying periodicals and online to find material that will enhance our courses. Members have also attended workshops on using new types of technology in the class room.

5. How are you using technology in the classroom.

Many members use Word and Excel in the laboratory portions of their courses as well as Lab-works, a program that allows students to collect lab data and send it directly to the computer. Most of us encourage use of the internet for research and correspond with our students online directly or through email. Many of us are making use of Power-point in our classroom and some are attending classes to develop hybrid courses.

6. What activities do you plan on participating in that will enhance your performance in the classroom in the future?

Several members keep current in reading Chemistry literature in order to share pertinent information with students. Instructors are also working to enhance their lectures using Powerpoint. One person is going to incorporate "Chemistry Connections" material in everyday applications.

7. What are the major weaknesses you see in the discipline at this time and how would you like to see those weaknesses addressed?

It was felt that by meeting monthly the discipline would have better communication on important topics such as textbook selection, teaching innovations, pedagogy, current research... It has been suggested that better email networking might help in this area. It was stated that there was some resistance to change such as changing textbooks and trying new experiments. These issues might also be addressed during the monthly discipline meetings. It was stated that we need more participation on the Curriculum Committee at the Riverside Campus.

2003/2004 Program Review for the Chemistry Discipline

Topic II. Where do we want to be?

Summary:

- A. 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.
- B. Staff
 - a. 3 New Full-time Laboratory Technicians (one conversion to full-time from a part-time at Norco by Fall 2008).
 - b. 3 New Part-time Laboratory Technicians to support evening labs by Fall 2005.
- C. Facilities
 - a. New Science Lab facilities for Riverside.
 - b. New Chemistry Labs capable of supporting CHEM 12 (Organic) at Moreno Valley and Norco.
 - c. Conversion of Physics Lab (HUM 201) back to original use as a chemistry lab at Norco.
 - d. Large Science Lecture Hall on all three campuses to run multi-lab section lectures. Must be suitable for chemical demonstrations.
 - e. All new facilities will need to be appropriately equipped.

Areas of Discipline Improvement:

- A. Communications
 - a. Set-up a routine for communications via e-mail.
 - b. Meet regularly (at least every other month).
- B. Assessment Procedures
 - a. Implementation of the Discipline Assessment Plan.
 - b. Regular Analysis of Data Provided.

2003/2004 Program Review for the Chemistry Discipline

Topic III. What do we need to get there?

Planning for Growth at Riverside Campus:

1. Riverside Facilities

- a. Location and History: the chemistry department occupies the entire second floor of the Physical Science building, which is situated on the science quad on the promontory. There are two lecture rooms, four laboratories, and a service area. The building was completed in 1967 with six laboratories and no lecture facilities. In 1969, lab 202 was converted into a dental technology lab. In the late nineties when Dental Tech moved to Moreno Valley it was converted to a lecture room and assigned to Chemistry. It has been rated for 48 students.

In 1972, lab 203 was converted to a large lecture room rated initially for 105 students. There was a flaw in the design of that room and it was remodeled in 1984. In the late eighties in the midst of management/labor turmoil, it was downsized into a 72-seat room.

Labs 205, 206, 207 are larger labs and accommodate 25 to 34 students. Lab 208 is a smaller lab and can handle only 20 to 24 students. For most of the years it has been the organic chemistry lab. In 1999, after discovering that the hoods were inadequate, Organic moved to lab 206. Subsequently, the hoods were replaced and it is possible to move organic back to lab 208. This has not happened because there are some other issues.

- b. Problems with lecture facilities and possible fixes: The downsizing of lecture 203 has created problems for the department and resulted in inefficient use of personnel. In earlier years, a lecture size of 105 worked well with a lab size of 35. Labs of 35 do not fit as well with lectures of 72. The department has maintained WSCH's of ~650, well over the contractually mandated numbers, but we could do better with a larger lecture room and still cut lab size.

What is needed is a lecture room having the following characteristics:

- 1) Seats 102
- 2) Complete lecture demonstration with hood and plumbing facilities.
- 3) Access to the (or a) stockroom where lecture demo's can be prepared
- 4) Stadium seating
- 5) Ejector seats controlled by the instructor to be used as needed. ;>)

This can be accomplished either by constructing a new building (currently being discussed), adding to the current building, or remodeling existing facilities. There are some who are suggesting a science lecture hall in the center of the science quad. This space needs to be left open. An add-on could be constructed on the north side of the Physical Science building where the office portable is currently located.

Technical Support

The Riverside Chemistry department currently has a proposal for upgrading and increasing the lab service personnel. We have no technical support during the late afternoons and evenings.

Equipment and Supplies

Until recent cutbacks, the supply budget was adequate for the current enrollments. The repair budget is inadequate. When repairs are needed, the administration has had to supplement with necessary funds. In recent years funds for replacement and updating of instrumentation have been sporadic and it has not been possible to make specific plans. Planning for growth is even more problematic.

c. Problems with lab facilities and possible fixes: When this building was constructed, laboratories required the use of delicate balances housed in separate rooms free from drafts. That was the extent of instrumentation. On the other hand computers were things that weird people used and they filled large buildings. Today, the balances are on the bench top and computers are used to interface instrumentation that is commonplace in community college laboratories.

- 1) The stools that the students sit on are in the aisles and constitute a hazard. Luckily, there have been no serious accidents. The solution to this at the Norco campus (cutaways into the lab benches to take the stools out of the aisles) is problematic since it reduces the number of lockers available. It is probable that a safe lab will be in violation of the states numerical guidelines. The square footage per student at UCR is 40% larger than that allocated at RCC.
- 2) The ventilation in the labs makes the use of burners difficult.
- 3) Reagents are kept on reagent carts located at the back of the lab or in the hoods. This practice results in crowds of students congregating at very few locations and moving the reagents to the balances. This is also a hazard. The reagents should be kept on shelves adjacent to the balances for those materials that must be weighed. Others should be on shelves along the work area. Students should remain for the most part in their work area.
- 4) The organic laboratory should be moved back to lab 208. Before this can happen, there will need to be additional hoods on the opposite side of the room and another set in the back. Additional facilities for the instrumentation are also needed.
- 5) Laboratories having computers along side normal utilities (gas and water) are needed.

d. Lab service areas need to be renovated to meet safety and chemical hygiene standards.

- 1) Chemicals are stored in areas frequented by district employees.
- 2) Chemicals are stored far from their point of usage by lab service personnel.
- 3) Additional ventilation in storage areas is required.

Faculty

We have discussed repeatedly the need to replace the five faculty members over 60 who will be retiring within the next three to five years. If there is any growth at this campus, additional faculty will be required. We have difficulties obtaining a large and ready pool of adjunct faculty who are qualified.

Planning for Growth in Chemistry at the RCC Moreno Valley Campus

I. Growth to Support Programs in Health in Human Services

Additional sections of Chemistry 2A/2B are currently required to meet the needs of the Nursing, Dental Hygiene, Physician Assistant, and Biotechnology programs at Moreno Valley. Microbiology (a requirement of these programs) has added Chemistry 2A as a prerequisite.

A. Faculty – Dr. Marsh currently teaches a full schedule with overload. Additional faculty for teaching Chemistry 2A/2B will be needed.

B. Suggested Scheduling: An evening section of Chemistry 2A during Fall Semester and a section during Winter Intersession would best fit the room utilization (SCI 261). Addition of a second laboratory section of Chemistry 2B would meet increasing needs (requires a lecture room that would seat 64 students).

C. Technical support – A part-time Laboratory Technician is needed to support the additional sections in Chemistry and the other sciences. An employee working evenings would support further growth of evening sections.

D. Equipment and Supplies Budget – Additional budget shall be needed to support the sections.

E. Facilities – current laboratory facilities will be adequate to meet the needs for current expansion of Chemistry, if evening and intersession times are utilized. A lecture room will be needed to expand Chemistry 2B to 2 sections.

F. Data needs – How successful are our students in the programs? Is there a correlation to their grade(s) in Chemistry courses?

G. Collaboration with other units – Communication is needed with the involved programs to determine if there could be better alignment between our courses and theirs.

It has become necessary to expand our course offerings in Chemistry 2A/2B. The State budget crisis has prevented necessary expansion to meet the needs of our students district wide.

I. Growth to Support Transfer Students

Students intending to transfer to 4-year institutions for degrees in the sciences (*Biology, *Botany, *Chemistry, *Environmental Science, Geology, Microbiology, Physics, and Zoology) require the Chemistry 1A/1B sequence and some require *Chemistry 12A/12B. Mathematics Programs sometimes require Chemistry 1A/1B.

Students transferring to professional programs applying chemistry (Dental Hygiene at USC, *Pre-Dental, Engineering, *Pre-medicine, *Pharmacy, Physical Therapy for the Master's level) require the Chemistry 1A/1B and some require *Chemistry 12A/12B.

A. Faculty – Dr. Marsh currently teaches a full schedule with overload. One additional faculty for teaching additional sections of Chemistry 1A/1B will be needed. One additional full-time faculty member in chemistry would be needed to support the Chemistry 12A/12B sequence.

B. Suggested Scheduling: Evening sections during Fall Semester and Spring Semester and/or sections during Winter and Summer Intersessions would best fit the room utilization (SCI 261). More sections of Chemistry 1A will be needed before expanding the 1B offerings.

C. Technical support – A part-time Laboratory Technician is needed to support the additional sections in Chemistry and the other sciences. An employee working evenings would support further growth of evening sections. Prior to addition of Chemistry 12, a dedicated Laboratory Technician for the Chemistry program will be needed.

D. Equipment and Supplies Budget – Additional budget shall be needed to support the sections. Chemistry 12A/12B would require a large start-up budget for new equipment, chemicals, computers, and spectrometers.

E. Facilities – More Laboratory and Lecture facilities will be required to expand to more than 1 additional section of Chemistry 1A/1B. Chemistry 12A/12B would require specialized laboratory facilities including a stockroom and instrument room. Certain design improvements will be needed in the new chemistry laboratory facility, which will need to have larger square footage (1400 square feet instead of current 1000 sq. ft.):

1. Adequate Lab Service Areas (current stockroom and storage area are too small) with area for office work (computer, files, desk, etc.).
2. Bigger sinks.
3. Reagent Space adjacent to lab bench.
4. Adequate size lockers to fit equipment.
5. Four feet of fume hood per Chem. 12 student and better overall ventilation. Current ceiling mounted fume hoods are not effective.
6. Access to Computers and a dedicated instrument room.
7. Chemical Storage facility with ventilation.

Over the next five to ten years it will become necessary to expand our course offerings in Chemistry 1A/1B. Currently these courses just fill to capacity (32) with a small waiting list. It would take approximately four sections of Chemistry 1A/1B to feed in an adequate number of Chemistry 12A/12B students. When the number of science student numbers quadruple, we will need to have facilities suitable for teaching Chemistry 12 available. The total number of chemistry students at Moreno Valley campus has increased by 36 students (33% increase) over the last 4 years, for the district 88 students (18% increase).

Planning for Growth at the Norco Campus

Facilities

Since 2000, the students who wish to take chemistry classes have doubled at Norco. Presently we have only one chemistry lab in operation.

Current Hum 204 Chemistry Lab Usage

Monday: 9:10am - 12:40pm
Tuesday 9:10am- 3:35 pm / 4pm - 9:30 pm*
Wednesday 9:10am - 12:40pm / 6 pm - 9:30 pm
Thursday 9:10am- 3:35 pm / 4pm - 9:30 pm*
Friday 9am-12:40 pm / 6 pm - 9:30 pm
Saturday 9am-12:40pm

*This evening class is regularly held in the spring only.

All students in Chemistry 2A must share lockers with students in another section or another class.

In the near future, the Norco chemistry discipline should offer chemistry 1A in the evening AND in the day every semester. We will be able to do this in the fall, but not in the spring. **We need at least one new laboratory that will be used for chemistry 2A/1A/1B classes**, which (except for Chem 1B) fill regularly. Currently there is a chemistry laboratory that is not being used for chemistry because four years ago, there was not enough of a student population taking chemistry courses to require the second chemistry laboratory use. The chemistry lab is currently being used for physics classes.

Suggestion: If space were found for the physics classes, we could, with some modification of the room space, have a second chemistry lab again.

The chemistry lab that is in use currently may not be used for chemistry 2B (Intro to Organic and Biochemistry), Chemistry 12A (Organic Chemistry I) or Chemistry 12B (Organic Chemistry 2) because there is not enough airflow to safely use organic solvents. **As the campus becomes a college, we will be unable to offer the typical college courses that all community colleges offer unless we acquire new, appropriately equipped laboratory space.**

Suggestion 2: I have discussed the lack of facilities with the Dean of Instruction. One option that I suggested is that the rooms opposite Hum 204 and 201 be revamped so that an organic chemistry laboratory could be built as well as a small instrumentation room and an expanded chemistry preparation room. I think that it would be a waste of our current resources to build new chemistry labs in a separate location from the current chemistry labs.

In terms of vision for the discipline, we should also consider an analytical chemistry lab for a potential chem tech program.

Equipment

- Additional analytical balances
- Additional spectrophotometers
- Vernier Lab probes for use with calculators and/or computers
- Additional computers
- Additional glassware for lab lockers
- Depending on whether the organic laboratories are built, there will be considerable glassware and instrument needs for this class.

Personnel and Course Offerings

* Indicates courses that are needed but not currently offered.

We should offer the following courses each spring / fall semester:

Chem 2A -day (double section) / evening (double section) / weekend (single section)

Chemistry 2B* - alternate day and evening (single section)

Chem 1A - day (single section) / evening (single section) - *currently only one section offered per semester.

Chem 1B* -day (single section) Currently offered every other semester.

We should offer the following courses each summer / winter semester

Chem 2A - day (single section)

At this point Norco employs one full time chemistry instructor and in the fall, 2 part-time chemistry instructors ; in the spring 3 part-time chemistry instructors; in the summer and winter each 1 part-time chemistry instructor.

We need one additional full-time chemistry instructor at the Norco campus.

2003/2004 Program Review for the Chemistry Discipline

Topic IV. What evidence do we need to track our progress?

The following data provided annually would allow the Chemistry Discipline to track our progress:

- Success rates for transfer students in:
 - Upper division chemistry courses
 - Upper division biology and physics courses
 - Science majors
 - Engineering majors
 - Pre-Dental, Pre-Pharmacy, and Pre-Med majors
 - Physical Therapy majors
- Success rates for students in programs at RCC:
 - Nursing
 - Dental Hygiene
 - Physician Assistant
 - Paramedic
 - Biotechnology
- Reasons students discontinue enrollment after the first week of courses (to address retention issues).