Cañada College

Physical Sciences Program Review

Astronomy

Chemistry

Earth Sciences

Physics

April 10, 2012

Physics:
Martin PARTLAN
Dean:
Janet STRINGER

Chemistry:
Jeanette MEDINA
Robert TRICCA

Contents

1 The Planning Group

The physical science program review planning group consisted of

Janette Medina	Chemistry
Robert Tricca	Chemistry
Martin Partlan	Physics
Janet Stringer	Dean

2 The Writing Team and Contact Person

Writing Team:	Janette Medina Robert Tricca Martin Partlan
Contact Person:	Martin Partlan

3 Program Information

The Physical Sciences Program at Cañada consists of the following departments:

- Astronomy-GE courses Introduction to Astronomy and Astronomy Lab
- Chemistry-Complete lower division transfer and GE courses
- Earth Sciences-GE courses in Oceanography, geology and meteorology
- Physics- Complete lower division transfer courses

3.1 A. Program Personnel

Full Time Faculty & Dean

Name	Subject
Martin Partlan Ph.D.	Physics
Chuck Iversion	Physics, Math, Computer Science
Jeanette Medina Ph.D.	Chemistry
Robert Tricca Ph.D.	Chemistry
Susan Mahoney	Will be starting in fall 2012 - Earth Science
Janet Stringer M.D. Ph.D.	Dean

Adjunct Faculty

Name	Subject
Jean Digel Ph.D.	Physics & Astronomy
Polin Yadak	Physics
Anita Fors	Physics
Violeta Grigorescu	Physics
Akilles Speliotopoulos Ph.D.	Physics
Gabriel Prochter	Astronomy
Lucas Cantin Ph.D.	Chemistry
Allan Wilcox Ph.D.	Chemistry
James Schweppe Ph.D.	Chemistry
Mohinder Bhatia	Chemistry
Bridget James	Earth Science
Kimberly Kirchoff Stein	Earth Science
James Kuwabara	Earth Science

Classified Staff

Name	Position
Roslind Young	Physical Sciences Lab Technician

3.2 B. Program Mission and Vision

The Physical Sciences Department endeavors to prepare students for successful transfer to four-year institutions, to provide the prerequisite foundation in physical sciences for further work in engineering and the sciences, to foster critical thinking and active learning, and to fulfill the needs and interests of students by having a well rounded curriculum of lecture and laboratories.

3.3 C. Expected Program Student Learning Outcomes

The Physical Science Program Learning Outcomes are:

- The Scientific Method - Students completing this program will be able to use the scientific method and appreciate its importance to the development of scientific thought

  Means of assessment:

  - An observational research project
    Success criterion - 75% of students who complete the observational research project will correctly identify, collect and analyze relevant data

- Effective Communication and Documentation of Work - Students completing this program will demonstrate the ability to document and communicate their work effectively

  Means of Assessment:

  - Portfolio - Students will submit a portfolio of laboratory work conducted throughout the semester
    Success criterion - The average grade of students who completed the portfolio is 70% or above

  Or:

  - Laboratory reports - Success criterion - Students who completed all laboratory reports scored an average grade of 75% or higher

- Critical Thinking and Analysis of Physical Systems - Students completing this program will demonstrate critical thinking and the ability to analyze physical systems in terms of scientific concepts

  Means of Assessment:

  - Embedded questions on the final exam Success criterion - 70% of students answer the selected question(s) correctly

These program SLO's are supported by the course level SLO's shown in subsections below.

4 Curricular Offerings (current state of curriculum and Student Learning Outcomes and Assessment Cycle)

4.1 A. Attach the following TracDat and CurricUNET data in the appendix:

The following tables contain the physical science courses, the latest Course Outline of Record (COR) date and the date of the completion of the most recent SLOAC cycle.

Physics and Astronomy

Course	Name	Latest COR Date	SLOAC Date
PHYS 405	Rad tech Physics	5/8/2009	1/15/2010
PHYS 210	General Physics I	5/11/2009	
PHYS 211	General Physics I Calculus Supplement	5/11/2009	
PHYS 220	General Physics II	5/11/2009	
PHYS 221	General Physics II Calculus Supplement	5/11/2009	
PHYS 250	General Physics I w/Calculus	5/11/2009	
PHYS 260	General Physics II w/Calculus	5/11/2009	3/9/2011
PHYS 270	General Physics III w/Calculus	5/11/2009	
ASTR 100	Introduction to Astronomy	2/24/2012	1/11/2012
ASTR 101	Introduction to Astronomy	2/24/2012	1/11/2012

Chemistry

Course	Name	Latest COR Date	SLOAC Date
CHEM 112	Chemistry in Action - Not currently offered	9/13/2011	
CHEM 192	Elementary Chemistry	5/19/2010	12/20/2008
CHEM 210	General Chemistry I	9/13/2011	11/15/2010
CHEM 220	General Chemistry II	9/13/2011	5/23/2010
CHEM 234	Organic Chemistry I	9/13/2011	12/20/2010
CHEM 234H	Organic Chemistry I - Honors	9/13/2011	
CHEM 235	Organic Chemistry II	9/13/2011	5/19/2010
CHEM 235H	Organic Chemistry II - Honors	9/13/2011	
CHEM 237	Organic Chemistry Lab I	9/13/2011	11/30/2010
CHEM 237H	Organic Chemistry Lab I - Honors	9/13/2011	
CHEM 238	Organic Chemistry Lab II	9/13/2011	5/20/2011
CHEM 238H	Organic Chemistry Lab II - Honors	9/13/2011	
CHEM 410	Chem For Health Sciences	9/13/2011	12/16/2011
CHEM 410	Chem For Health Sciences - Hybrid	9/13/2011	

Earth Sciences

Course	Name	Latest COR Date	SLOAC Date
OCEN 100	Oceanography	2/24/2012	12/16/2011
OCEN 101	Oceanography Lab/Field Study	2/24/2012	
GEOL 100	Introduction to Geology	5/20/2010	12/16/2011
GEOL 101	Geology Laboratory	5/19/2010	12/16/2011
METE 100	Meteorology -Weather Processes	5/19/2010	

4.2 B. Identify Patterns of Curriculum Offerings

Course offerings are shown the the table.

Course	Fall	Spring	Summer	Notes
Astronomy				
ASTR 100	2	2	0	Hybrid
ASTR 101	2	2	0	Hybrid
Chemistry				
CHEM 192	2	2	1	
CHEM 210	3	3	1	
CHEM 220	1	2	1	
CHEM 234	1	0	0	
CHEM 234H	1	0	0	Honors
CHEM 235	0	1	0	
CHEM 235H	0	1	0	Honors
CHEM 237	1	0	0	
CHEM 238	0	1	0	
CHEM 410	2	2	1	Hybrid
Earth Science				This schedule was largely fixed by adjunct load limits and will change with the new earth science FT instructor. For fall we have scheduled both GEOL 101 and OCEN 101. We also have a new ENVS course, which will be part of Earth Science.
GEOL 100	1	1	0	
GEOL 101	1	0	0	
OCEN 100	2	2	1	On-Line
OCEN 101	0	1	0	
METE 100	1	1	0	On-Line
Physics				
PHYS 405	1	0	0	
PHYS 210	3	0	0	
PHYS 211	1	0	0	
PHYS 220	0	3	0	
PHYS 221	0	1	0	
PHYS 250	2	2	0	
PHYS 260	1	1	1	
PHYS 270	0	1	0	

5 Program Level Data

5.1 A. Data Packets and Analysis from the Office of Planning, Research & Student Success and any other relevant data

B. Analyze evidence of Program performance. Explain how other information may impact Program (examples include: business and employment needs, new technology, new transfer requirements)

There have not been a significant number of physical science degrees awarded in the past six years. Therefore, data for the past six years from the program is presented by department in the following sections. As well, findings and performance are discussed by department.

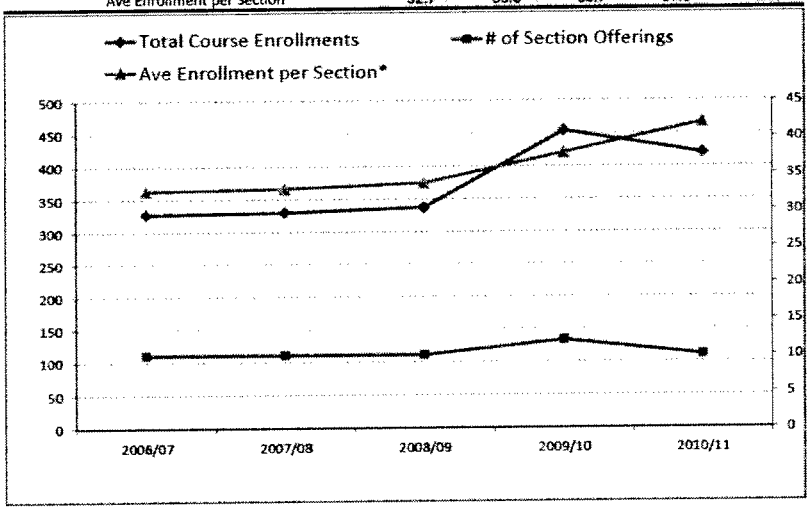
The following data is presented:

- Department Course Enrollments
- Department Student Performance
- Department Efficiency
- Department Student Status
- Department Student Demographics

5.1.1 *The Astronomy Program*

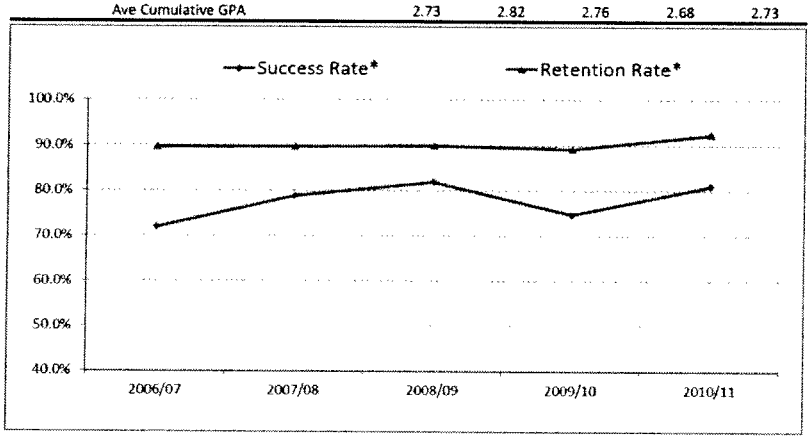
Astronomy Course Enrollments

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
ASTR	Student Headcount	218	229	240	338	305
	Total Course Enrollments	327	330	337	454	420
	# of Course Offerings	6	6	6	6	6
	# of Section Offerings	10	10	10	12	10
	Ave Enrollment per Section*	32.7	33.0	33.7	37.8	42.0



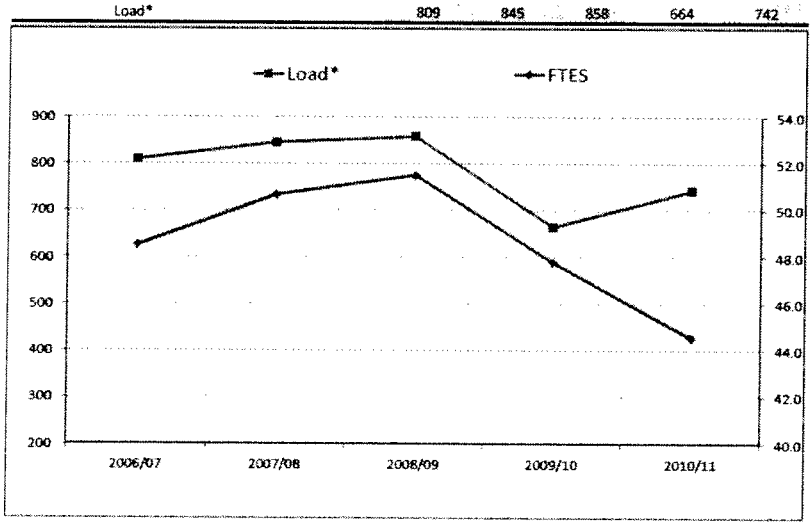
Astronomy Student Performance

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
ASTR	Success Rate*	71.9%	78.8%	81.9%	74.7%	81.0%
	Retention Rate*	89.6%	89.7%	89.9%	89.2%	92.4%
	Ave Units Attempted this Academic Year	10.99	10.67	9.62	9.62	9.74
	Ave Units Earned this Academic Year	8.77	8.49	7.8	6.87	7.69
	Ave Academic Year GPA	2.57	2.7	2.72	2.66	2.62
	Ave Cumulative GPA	2.73	2.82	2.76	2.68	2.73



Astronomy Department Efficiency

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
ASTR	WSCH	1455	1520	1545	1433	1336
	FTES	48.5	50.7	51.5	47.8	44.5
	FTE	1.8	1.8	1.8	2.16	1.8
	Load*	809	845	858	664	742



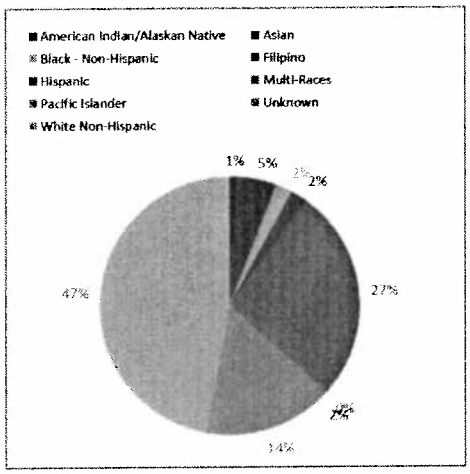
Astronomy Student Status

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
ASTR	First-Time Student	24	19	24	19	30
	Continuing Student	155	143	161	231	212
	Returning Student	21	25	26	34	23
	Concurrent Enrollment	18	42	29	54	40
	Percent First Time	11%	8%	10%	6%	10%
	Percent Continuing	71%	62%	67%	68%	70%
	Percent Returning	10%	11%	11%	10%	8%
	Percent Concurrent	8%	18%	12%	16%	13%

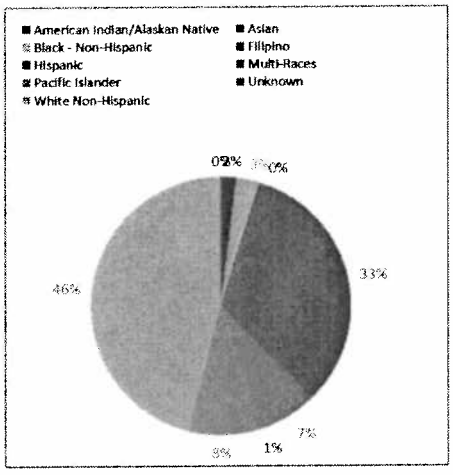
Astronomy Student Demographics

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
ASTR	Female	111	110	120	152	138
	Male	105	113	114	178	162
	18 & 19 Yrs Old	59	62	60	91	89
	20 - 24 Yrs old	105	94	106	134	124
	25 - 29 Yrs old	13	19	24	31	25
	30 - 39 Yrs Old	13	7	11	16	11
	40+ Yrs old	13	9	11	13	25
	% Female	51%	48%	50%	45%	45%
	% Male	48%	49%	48%	53%	53%
	% 18 & 19 Yrs Old	27%	27%	25%	27%	29%
	% 20 - 24 Yrs old	48%	41%	44%	40%	41%
	% 25 - 29 Yrs old	6%	8%	10%	9%	8%
	% 30 - 39 Yrs Old	6%	3%	5%	5%	4%
	% 40+ Yrs old	6%	4%	5%	4%	8%

2008/09



2010/11



Findings:

- The makeup of the student population is relatively unchanging

Findings:

Generally, 2 sections of ASTR 100 and 101 are offered each semester. For ASTR 100, one section is offered during the day and the second one is offered at night. Both sections of ASTR 101 are offered at night. There are no plans to change this schedule. We have added a day section of ASTR 101 for the fall 2011 as an experiment.

Astronomy courses tend to be full or overfull, with high retention. ASTR 100 generally has 40-60 students and the lab (ASTR 101) has 30-35. These courses fulfill science credit for transfer and many students complete these courses with this in mind. Astronomical equipment is always in short supply (e.g. CCD cameras for telescopes), but the existing equipment is sufficient for completing the stated goals of both classes. We have purchased a new 14 telescope with digital camera and a separate solar telescope for viewing the sun.

In the spring 2009, we offered a pilot of a learning community combining ASTR 101 (the lab) with MATH 120. The feedback from faculty and students in this class has been positive, but there are still ongoing discussions about the need for this type of class. The original plan was to offer this class each spring semester, but we decided to skip the spring 2011 semester to continue these discussions.

5.1.2 *Astronomy SLO's*

The following list contains all of the astronomy student learning outcomes,

- ASTR 100
    1. Students will be able to correctly predict the location of the Sun in the sky at different times and dates and to relate that to the tilt of the Earth and the cause of the seasons
    2. Students will know the difference between the inner and outer planets and the cause for these differences
    3. Students will be able to correctly identify different classes of stars based their position in an HR diagram
- ASTR 101
    1. Students will demonstrate an understanding of the size and scale of the solar system
    2. Students will be able to accurately collect and analyze scientific data
    3. Students will be able to identify changes in source temperature based on spectral shifts

5.1.3 *Astronomy Department Performance*

From the 2011 Annual Program Plan

1. We would like to increase the number of sections of ASTR 100 by adding 1 additional section during the day each semester. In addition, we would like to expand the introductory course to 2 independent semesters and, once these are approved for transfer, offer one of each every semester. The enrollments in the ASTR 100 have remained quite high and we expect that there is sufficient interest to support 2 classes. There does seem to be increased demand for the GE science classes in the spring semester, so spring 2012 we will add a second day section of ASTR 100.
2. We would like to continue to connect math and astronomy/physics to show students the applicability of math to the real world.

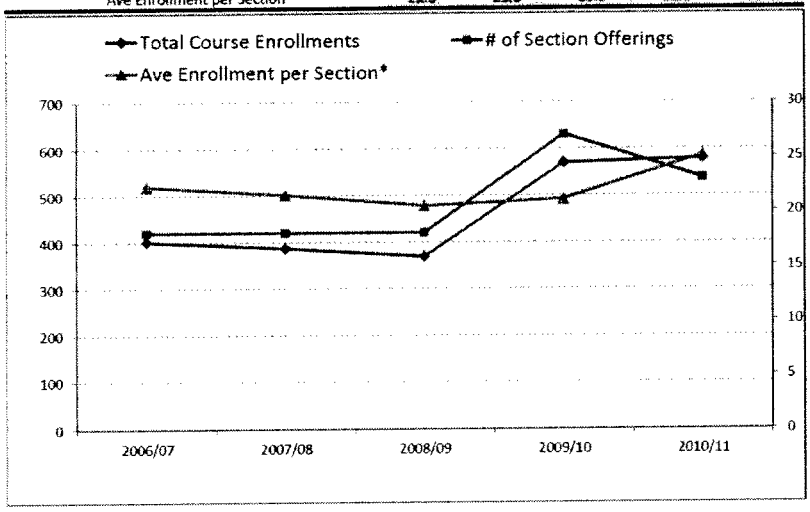
5.1.4 *Astronomy Department Action Plan*

Continue with the previously stated plan.

5.1.5 *The Chemistry Program*

Chemistry Course Enrollments

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
CHEM	Student Headcount	291	294	293	459	457
	Total Course Enrollments	401	387	369	569	578
	# of Course Offerings	15	15	14	17	14
	# of Section Offerings	18	18	18	27	23
	Ave Enrollment per Section*	22.3	21.5	20.5	21.1	25.1

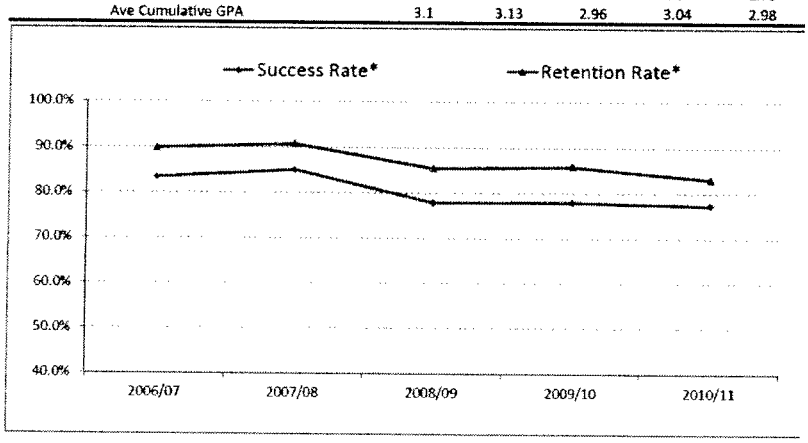


Findings:

- The student head count leveled off while the number of sections was reduced. This was done by offering double lecture sections (60 students) that are then separated into two laboratory sections (30 students each as required by the square footage of the laboratory rooms)
- The average enrollment per section increased in 2010-2011 showing increased department efficiency

Chemistry Student Performance

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
CHEM	Success Rate*	83.3%	85.0%	77.8%	77.9%	77.3%
	Retention Rate*	89.8%	90.7%	85.4%	85.8%	83.0%
	Ave Units Attempted this Academic Year	9.09	9.48	10.74	9.36	9.3
	Ave Units Earned this Academic Year	7.71	7.96	8.2	7.46	7.16
	Ave Academic Year GPA	2.94	2.97	2.66	2.84	2.79
	Ave Cumulative GPA	3.1	3.13	2.96	3.04	2.98

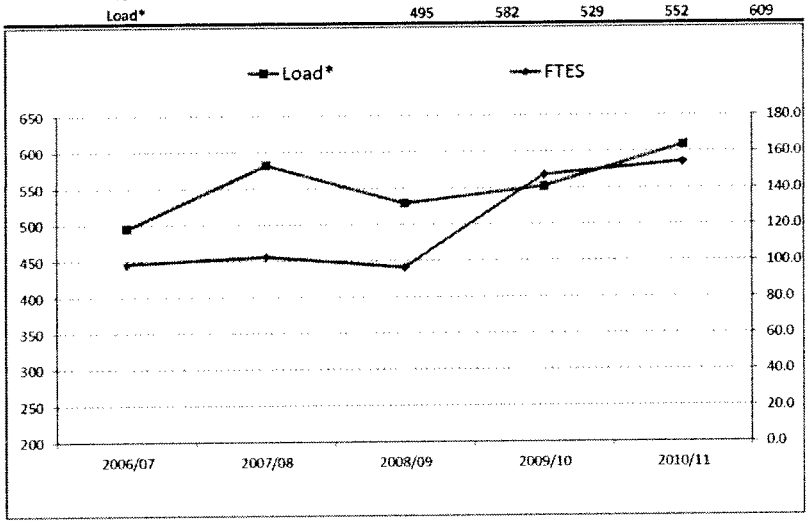


Findings:

- The success rate dropped from its peak at 85% in 2007-2008 to over 77% in the last three academic years
- The department's success rate was always higher that the college's success rate during this time period
- The retention rate reached a peak at 90.7%. It has been between 85.8% and 83% since Fall 2008
- The department's retention rate during this time period has been either comparable or higher than that of the college's
- The cumulative GPA ranged from 2.98 to 3.1. A higher GPA compared to the college's GPA range from 2.57 to 2.75 in the same time period

Chemistry Department Efficiency

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
CHEM	WSCH	2950	3072	2890	4417	4626
	FTES	98.3	102.4	96.3	147.2	154.2
	FTE	5.96	5.28	5.47	8	7.6
	Load*	495	582	529	552	609



Findings:

- Department efficiency dropped in 2008-2009 but has continuously increased during the last two academic years
- The Department's efficiency in 2010-2011 is comparable to that of the college (Chemistry-609; College- 602)
- There has been a steady growth in Load and FTES from 2008/2009

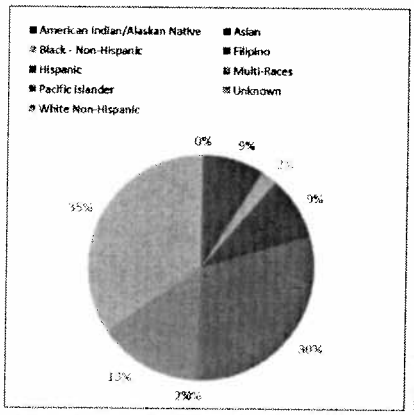
Chemistry Student Status

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
CHEM	First-Time Student	38	39	38	103	90
	Continuing Student	186	186	215	259	269
	Returning Student	35	27	29	69	61
	Concurrent Enrollment	32	42	11	28	37
	Percent First Time	13%	13%	13%	22%	20%
	Percent Continuing	64%	63%	73%	56%	59%
	Percent Returning	12%	9%	10%	15%	13%
	Percent Concurrent	11%	14%	4%	6%	8%

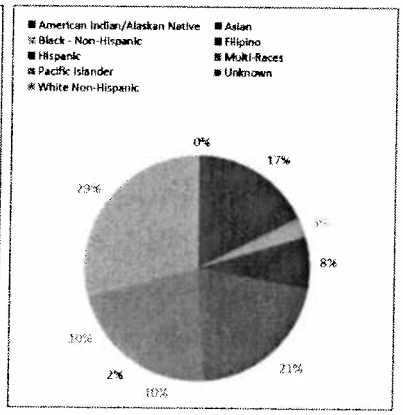
Chemistry Student Demographics

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
CHEM	Female	173	170	173	273	255
	Male	114	115	110	173	190
	18 & 19 Yrs Old	39	33	55	115	81
	20 - 24 Yrs old	106	106	99	153	183
	25 - 29 Yrs old	49	44	64	80	82
	30 - 39 Yrs Old	45	40	51	45	42
	40+ Yrs old	19	26	15	33	31
	% Female	59%	58%	59%	59%	56%
	% Male	39%	39%	38%	38%	42%
	% 18 & 19 Yrs Old	13%	11%	19%	25%	18%
	% 20 - 24 Yrs old	36%	36%	34%	33%	40%
	% 25 - 29 Yrs old	17%	15%	22%	17%	18%
	% 30 - 39 Yrs Old	15%	14%	17%	10%	9%
	% 40+ Yrs old	7%	9%	5%	7%	7%

2008/09



2010/11



Findings:

- The percentage of First-Time student has increased while the percentage of Continuing students has decreased. This might be a reflection of the significant number of students who take just one or two Chemistry classes as pre-requisite to enter Medical, Pharmacy or Dental School
- The percentage of White non-Hispanic and Hispanic has decreased while the percentage of Asians has increased. This can be a reflection of students looking for alternative colleges to take Organic Chemistry as a requirement to professional schools
- The gender trend has held approximately constant being roughly 60% female to 40% male
- The age trend has also held approximately constant being the larger group in the 20-24-years category
- Perhaps more aggressive outreach efforts need to be placed into the high schools in the local service area

5.1.6 *Chemistry Student Learning Outcomes*

Cycles have been completed and teaching strategies or other modifications have been implemented and reported in tracdat (http://sanmateo.tracdat.com). New instructional resources for students have been developed or acquired.

Findings:

1. SLOs have helped identify areas of concern in each course. For example, significant figures in CHEM 192, CHEM 210 and CHEM 410; acid-base equilibrium in CHEM 220; stereochemistry in CHEM 234, etc

2. New teaching strategies and/or modification of course delivery as well as design of additional student instructional resources has taken place in all courses. Unfortunately, the results seem to vary from semester to semester. This has made assessment of the effectiveness of course modifications challenging

5.1.7 *Chemistry Department Performance*

From 2004-2005 Physical Sciences Comprehensive Program Review (Chemistry)

Action Plan	Action	Result
Decline of CHEM 112 enrollments	2008 course modification but enrollments did not pick up	Course was not offered
Stimulate enrollment increase in CHEM 210	Increase the number of sections added to accommodate more than the maximum 30 students allowed per lab section	One single section and one double section of CHEM 210 were needed to accommodate the increase in enrollment from 30 to 85
Stimulate enrollment increase in CHEM 220	Offer CHEM 220 in Fall and Spring as opposed that only Spring	Enrollment increase justified the addition of a single section (30 students) in Fall; a double section (60 students) in Spring and a Summer session (30 students)
Modify MWF lecture/ TTh lab schedule for 5 unit classes (CHEM 210, 220)	Two-day block schedule was implemented	Enrollment responded favorably to this schedule change

From 2010-2011 Chemistry Annual Program Plan

Three year (2010-13) Action Plan	Action	Result
Explore modular approach to teach Chemical Laboratory Technology certificate and AS degree	Contacted industry personnel and students	Students are not appreciative of the significance of chemical instrumentation courses when in community college. Industries are not interested in sending their employees to community college for training
Change the name of the Chemical Laboratory Technology degree	Tabled due to the results of the item above	N/A
Establish collaboration with the Workforce Development Department	Contacted Kay O'Neil and Rajesh Lathigara	Started communication with farm workers in Half Moon Bay
Research available general education classes	Requested published materials, Reviewed possible experiments	Ongoing.
Work with existing chemical instruments	Both Professors Tricca and Medina have spent time learning the instruments, selecting appropriate experiments for students and designing independent research projects	Students have received relevant chemical instrumentation instruction. Five students are beginning to work on independent projects
Create a one-unit Math supplement for Chemistry	Contacted San Jose City College to learn about their Chemistry-Math Learning Community	No results to report yet
Work on laboratory room maintenance and safety management	Created a laboratory maintenance form, Conduct safety department meetings once a semester, Created a weekly laboratory cleaning schedule for laboratory rooms	Laboratory rooms are cleaner and safer for instruction. We still need further professional training on the appropriate storage, handling and disposal of chemical waste
Continue community and service area outreach efforts	Laboratory activities and facilities tours for high school and middle school students	High school students became aware of Cañada College as a possible higher education alternative. High school students have signed up for summer programs on campus and concurrent enrollment
Request a 48% Physical Sciences Laboratory Technician	Position justification submitted and presented in 2010-11 and 2011-12	Position has not been granted yet

5.1.8 *Chemistry Department Action Plan*

Action	Timeline	Assessment
Incorporate instrumentation in general and organic chemistry laboratory experiments	Fall 2012 - Spring 2015 - A different instrument and/ or course will be targeted each semester. Starting with UV-Vis in 2012	Number of experiments added to the existing laboratory curriculum and student success performing the experiments. Data will be analyzed yearly to determine interventions, if needed
Develop an undergraduate research program	Different projects each semester - ongoing	Presentation of projects at the Cañada honors symposium. Data will be analyzed yearly to determine new projects
Establish Industry partnerships	Ongoing depending on available projects in industry. Currently pursuing two industries.	Industry satisfaction surveys. Data will be analyzed yearly to determine interventions, if needed.

5.1.9 *Chemistry SLO's*

The following list contains all of the chemistry student learning outcomes,

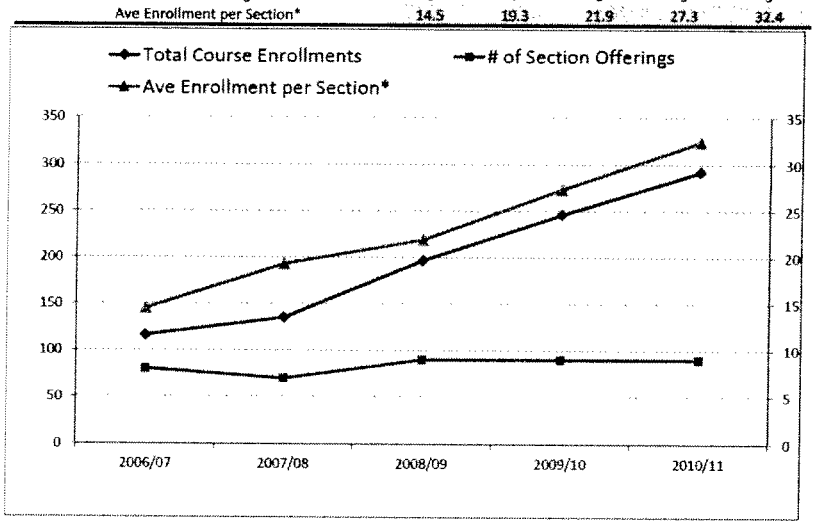
- Chemistry in Action, CHEM 112 (course was not offered in the reporting period)
  1. Apply the scientific method.
  2. Develop appreciation of the chemistry field.
  3. Use chemical nomenclature.
  4. Analyze information on the periodic table.
  5. Apply chemistry concepts to everyday life.
  6. Identify organic compounds, polymers, drugs, carbohydrates, fats, and proteins.
  7. Describe chemical reactions in the environment.
  8. Analyze the mode of action of selected household products.
- Elementary Chemistry, CHEM 192
  1. The student will understand the three states of matter as well as the difference between a pure substance and a mixture.
  2. The student will understand the concept of density.
  3. The student will be able to complete, balance, and apply chemical equations.
- General Chemistry I, CHEM 210
  1. Recognize states of matter, classes of matter, and properties of matter and discuss units of measurements of mass, length and volume.
  2. Identify and name atoms, elements, ions, molecules, ionic compounds and molecular compounds.
  3. Recognize chemical reactions and discuss moles and molar mass of elements and compounds
  4. Write laboratory reports, applying the scientific method.
  5. Calculate moles and/ or number of molecules (or atoms) of a substance from grams and the formula or molar mass of the substance.
  6. Determine the limiting reactant and the amount of excess reactant(s) remaining after the reaction from stoichiometry.
  7. SLO 7: Perform conversions between units using the metric system, the English system, or between both.
  8. Write the balanced complete molecular, ionic and net ionic equations for any precipitation reaction and acid-base.
  9. Use VSEPR theory to predict the three-dimensional shape of any molecule (or polyatomic ion) when given the formula.
  10. Apply the gas laws to solve for initial or final conditions after changes in temperature, volume, pressure or number of moles.
- General Chemistry II, CHEM 220
  1. Discuss chemical equilibrium and apply the concept to acid-base reactions and buffer solutions.
  2. Apply Ka, Kb, pKa, pKb, and pH concepts on complex equilibrium calculations
  3. Describe the behavior of buffers.
  4. Describe enthalpy, entropy and free energy as it applies to spontaneous processes.
  5. Construct simple voltaic cells and perform calculations involving reduction potentials.
- Organic Chemistry I, CHEM 234
  1. Illustrate reaction mechanisms by using the curved arrow notation.
  2. Predict molecular structure based on molecular orbital hybridization.
  3. Apply the IUPAC system to name several classes of organic compounds.
- Organic Chemistry II, CHEM 235
  1. Justify the relative acid strength of a variety of organic acids using inductive and resonance effects.
  2. Predict the relative basicity of a series of amine based on molecular structure.
  3. Apply a variety of synthetic methods to identify the most appropriate synthetic route to obtain given organic molecules.

- Organic Chemistry Laboratory I, CHEM 237
    1. Use appropriate procedures to safe handling and disposal of organic materials.
    2. Predict the solubility of organic compounds in organic and inorganic solvents based on their molecular structure.
    3. Collect and interpret infrared spectra.
- Organic Chemistry Laboratory II, CHEM 238
    1. Identify functional groups on infrared spectra.
    2. Carry a variety of organic chemistry reactions such as nucleophilic aromatic substitution reactions, aldol condensation reactions, ester saponification reactions, etc.
    3. Formulate a separation and purification scheme for a given multicomponent mixture of organic compounds.
- Chemistry for Allied Health Sciences, CHEM 410
    1. Identify and name elements, ionic compounds and covalent compounds and differentiate between symbols and formulas.
    2. Describe the effect of altering the pH of the environment on a weak acid or weak base.
    3. Identify functional groups on large complex biochemical molecules.
    4. Communicate the basic reactivity of the functional groups on biochemical molecules.
    5. Gather and assess information about the chemical properties of pharmaceutical agents.
- Honors Colloquium in Chemistry, CHEM 680H
    1. Select appropriate discussion topics in drug discovery.
    2. Conduct literature research from printed and on-line resources.
    3. Critically evaluate information from literature research employing a chemistry focus.
- Independent Study, CHEM 695
    1. Critically evaluate information from literature research employing a chemistry focus.
    2. Design a scientifically sound and experimental testable procedure.
    3. Apply the scientific method to experimentally evaluate a hypothesis.
    4. Analyze experimental data and make appropriate modifications to the experimental design.
    5. Write and or present a report based on experimental procedure, data analysis and conclusions.
- Introduction to Chemical Laboratory Technology, CHTM 310
    1. Interpret information gathered from reference handbooks and technical manuals.
    2. Graph and analyze data collected experimentally.
    3. Select the appropriate safety and environmental health regulations applicable to the chemical laboratory.
- Introduction to Chemical Laboratory Instrumentation, CHMT 340
    1. Prepare standard solutions and create UV-Vis calibration curves.
    2. Identify functional groups present in a given compound based on comparison of experimental IR spectra to literature reference libraries.
    3. Select appropriate experimental chromatographic conditions to separate a mixture of analytes using a gas chromatograph, GC.

5.1.10 *The Earth Science Program*

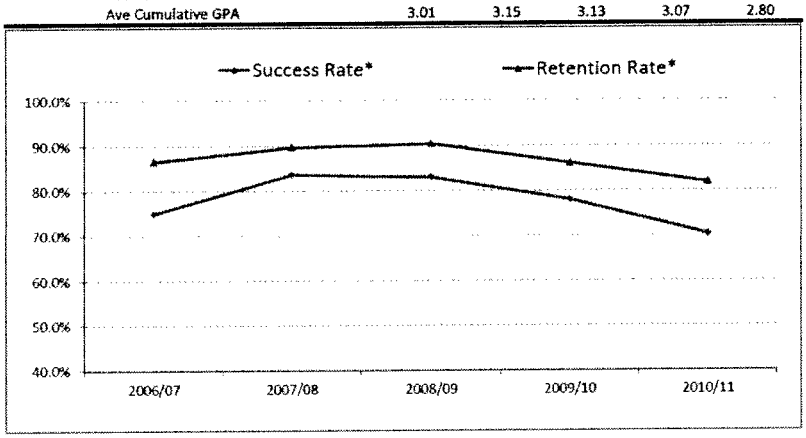
Earth Science Course Enrollments

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
Earth Science	Student Headcount	115	134	177	206	256
	Total Course Enrollments	116	135	197	246	292
	# of Course Offerings	5	5	6	6	7
	# of Section Offerings	8	7	9	9	9
	Ave Enrollment per Section*	14.5	19.3	21.9	27.3	32.4



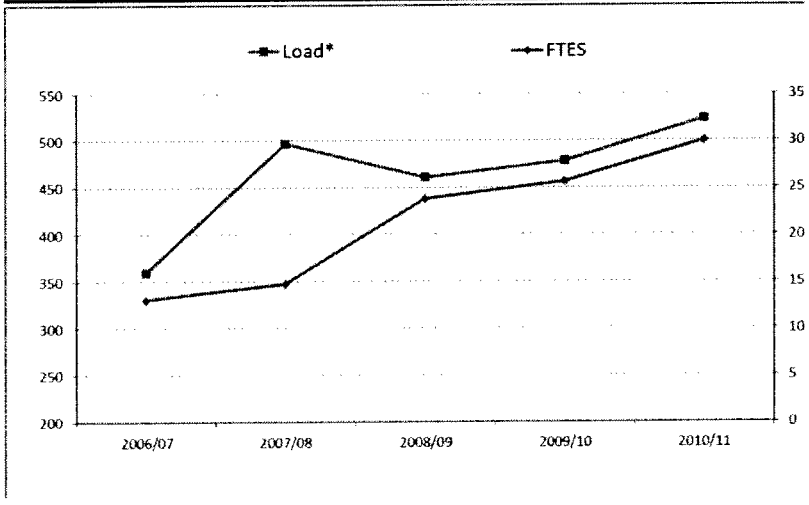
Earth Science Student Performance

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
Earth Science	Success Rate*	75.0%	83.6%	83.0%	77.9%	70.3%
	Retention Rate*	86.5%	89.6%	90.4%	86.1%	81.8%
	Ave Units Attempted this Academic Year	7.00	4.74	5.52	5.80	7.94
	Ave Units Earned this Academic Year	5.14	3.54	4.10	4.04	5.41
	Ave Academic Year GPA	2.86	1.37	1.98	2.15	2.60
	Ave Cumulative GPA	3.01	3.15	3.13	3.07	2.80



Earth Science Department Efficiency

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
Earth Science	WSCH	392	442	714	770	900
	FTES	13	15	24	26	30
	FTE	1	1	2	2	2
	Load*	360	497	461	478	523



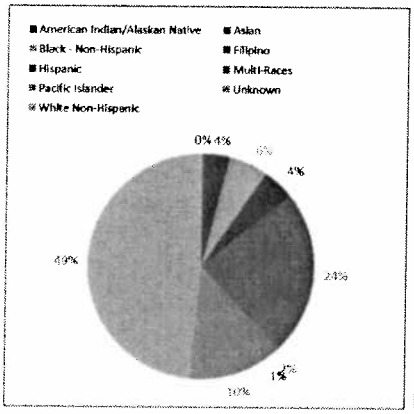
Earth Science Student Status

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
Earth Science	First-Time Student	20	15	24	25	21
	Continuing Student	73	94	116	144	201
	Returning Student	15	13	18	21	28
	Concurrent Enrollment	7	12	19	16	6
	Percent First Time	17%	11%	14%	12%	8%
	Percent Continuing	63%	70%	66%	70%	79%
	Percent Returning	13%	10%	10%	10%	11%
	Percent Concurrent	6%	9%	11%	8%	2%

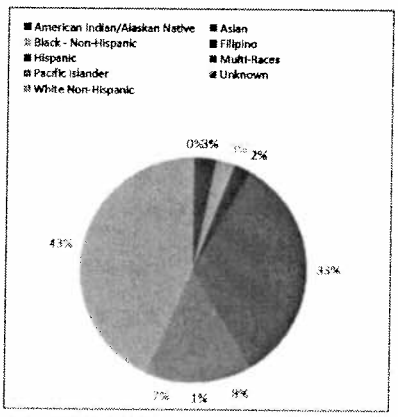
Earth Science Demographics

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
Earth Science	Female	77	70	92	120	127
	Male	37	61	83	83	126
	18 & 19 Yrs Old	28	49	51	46	57
	20 - 24 Yrs old	41	52	82	97	123
	25 - 29 Yrs old	9	5	17	24	27
	30 - 39 Yrs Old	16	7	8	13	27
	40+ Yrs old	14	9	6	11	15
	% Female	67%	52%	52%	58%	50%
	% Male	32%	46%	47%	40%	49%
	% 18 & 19 Yrs Old	24%	37%	29%	22%	22%
	% 20 - 24 Yrs old	36%	39%	46%	47%	48%
	% 25 - 29 Yrs old	8%	4%	10%	12%	11%
	% 30 - 39 Yrs Old	14%	5%	5%	6%	11%
	% 40+ Yrs old	12%	7%	3%	5%	6%

2008/09



2010/11



Findings:

- The makeup of the student population is relatively unchanging. However, there has been a shift from 2/3 female in 2006/7 to approximately equal numbers of male and female students in 2011

5.1.11 *Earth Science SLO's*

The following list contains all of the earth science student learning outcomes,

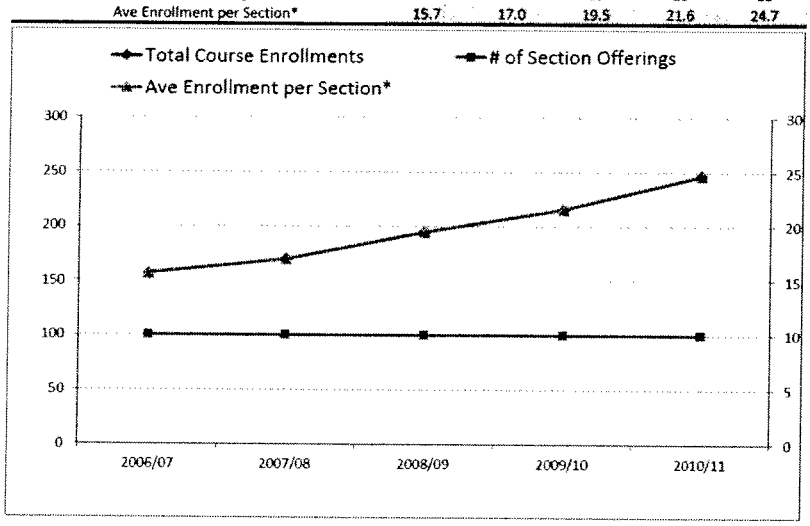
- GEOL 100
    1. Students will demonstrate an understanding of the application of the Scientific Method in the development of the Theory of Plate Tectonics
    2. Students will use the Theory of Plate Tectonics to explain the cause of geologic phenomena such as earthquakes, volcanoes, and mountain building
    3. Students will apply the concept of the hydrologic cycle to explain the evolution of the present landscape through the work of moving water, landslides, glaciers, and wind
    4. Students will demonstrate an understanding of the formation of common rocks and minerals, their relationship to geologic phenomena, and how they change as their environment changes
    5. Students will use standard geologic principles to determine the geologic history of a simple geologic cross-section
- GEOL 101
    1. Using an identification key, hand lens, hardness samples, and acid, students will be able to identify and determine the probable mode of origin of common rocks and minerals
    2. Students will be able to use topographic and geologic maps to solve geologic problems
    3. Students will be able to collect, integrate, and evaluate basic geologic information in the context of contemporary geologic issues
    4. Students will be able to use the scientific method to analyze and interpret data
    5. Students will use geologic knowledge to explain the tectonic setting and geologic resources of California
- OCEN 100
    1. Students will use basic ideas of chemistry to describe the formation of salts and the differences between the major and minor components of seawater
    2. Students will use an understanding of plate tectonics to explain the formation and evolution of the ocean basins. Students will demonstrate an understanding of the interaction between the atmosphere and ocean and its implications to the formation of winds, currents, and waves
    3. Students will demonstrate an understanding of the application of the Scientific Method to the development of the Theory of Plate Tectonics
    4. Students will apply the concepts of food webs, adaptation, and communities to the marine ecosystem
    5. Students will investigate at least one threat to the health of the oceans and its inhabitants
- OCEN 101
    1. Students will demonstrate an understanding of plate tectonics and its role in the formation and evolution of the ocean basins. Student will also be able to analyze sediments using standard oceanographic tools and effectively communicate their results
    2. Using standard chemical apparatus, students will be able to determine the salinity of seawater samples and apply this knowledge to an understanding of the chemistry of the world's oceans
    3. Students will be able to integrate and interpret oceanographic data to investigate real world issues relating to currents, waves, and tides
    4. Students will demonstrate an understanding of food webs, adaptation, and ecosystems through analysis of living organisms and marine biological data
- ENVS 115
    1. Identify and describe major global, regional, and local environmental issues
    2. Analyze the scientific basis of major environmental issues and identify and evaluate potential solutions
    3. Show relationships between human actions and environmental issues and examine the impacts of environmental issues on human populations
    4. Use scientific methodologies, including the construction and utilization of scientific models
    5. Correctly use information sources related to environmental issues
- METE 100
    1. Use the methods of science and knowledge derived from current scientific inquiry to question existing explanations
    2. Demonstrate ways in which science influences and is influenced by complex societies, including political and moral issues
    3. Recognize methods of science, in which quantitative, analytical reasoning techniques are used
    4. Understand the basic concepts and vocabulary essential to the study of the Earth and its atmosphere
    5. Use their understanding of meteorological processes to make informed decisions as a property owner and as an active participant in the democratic process

5.1.12 *The Physics Program*

Among the previous goals were increasing appreciation and comprehension of physical phenomena, physical laws and the scientific method. This will, of course, be perennial goal.

Physics Course Enrollments

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
PHYS	Student Headcount	124	132	158	172	194
	Total Course Enrollments	157	170	195	216	247
	# of Course Offerings	8	9	9	9	9
	# of Section Offerings	10	10	10	10	10
	Ave Enrollment per Section*	15.7	17.0	19.5	21.6	24.7

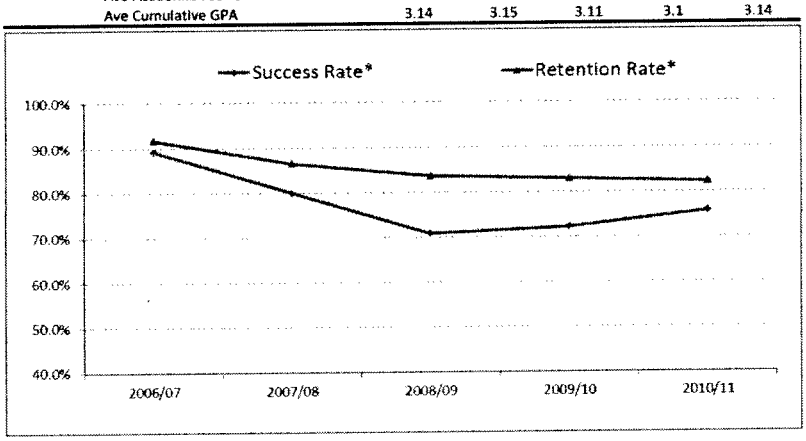


Findings:

- The physics course enrollments are approaching their maximum. The limit for all physics courses (except PHYS 405) is 24 because they are laboratory courses. PHYS 405 is not limited but the demand for tis course comes only from the Radiation Technologist program which is limited to about 20

Physics Student Performance

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
PHYS	Success Rate*	89.2%	80.0%	70.8%	72.2%	75.7%
	Retention Rate*	91.7%	86.5%	83.6%	82.9%	82.2%
	Ave Units Attempted this Academic Year	9.06	10.44	9.85	9.81	10.16
	Ave Units Earned this Academic Year	8.21	9.1	8.09	7.75	8.46
	Ave Academic Year GPA	2.89	2.96	2.69	2.55	2.79
	Ave Cumulative GPA	3.14	3.15	3.11	3.1	3.14

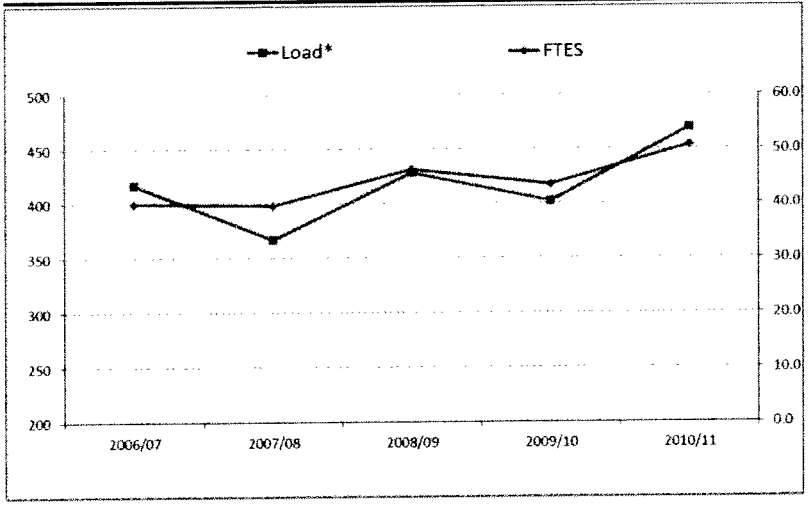


Findings:

- Student performance is seen to decline slightly over the past six years. The cause is not known. Certainly more effort has been put in to tutoring. The decrease may represent an increase in under prepared students.

Physics Department Efficiency

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
PHYS	WSCH	1200	1190	1387	1304	1518
	FTES	40.0	39.7	46.2	43.5	50.6
	FTE	2.88	3.24	3.24	3.24	3.24
	Load*	417	367	428	402	469



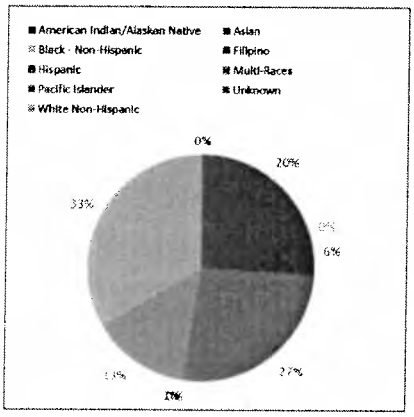
Physics Student Status

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
PHYS	First-Time Student	21	9	15	26	20
	Continuing Student	90	104	117	125	142
	Returning Student	11	17	19	19	18
	Concurrent Enrollment	2	2	7	2	14
	Percent First Time	17%	7%	9%	15%	10%
	Percent Continuing	73%	79%	74%	73%	73%
	Percent Returning	9%	13%	12%	11%	9%
	Percent Concurrent	2%	2%	4%	1%	7%

Physics Student Demographics

Department	Metric	Academic Year 2006/07	2007/08	2008/09	2009/10	2010/11
PHYS	Female	49	48	55	68	74
	Male	73	82	99	96	112
	18 & 19 Yrs Old	15	11	36	34	33
	20 - 24 Yrs old	56	68	67	70	88
	25 - 29 Yrs old	25	23	20	39	33
	30 - 39 Yrs Old	14	23	21	18	16
	40+ Yrs old	11	5	9	6	8
	% Female	40%	36%	35%	40%	38%
	% Male	59%	62%	63%	56%	58%
	% 18 & 19 Yrs Old	12%	8%	23%	20%	17%
	% 20 - 24 Yrs old	45%	52%	42%	41%	45%
	% 25 - 29 Yrs old	20%	17%	13%	23%	17%
	% 30 - 39 Yrs Old	11%	17%	13%	10%	8%
	% 40+ Yrs old	9%	4%	6%	3%	4%

2008/09



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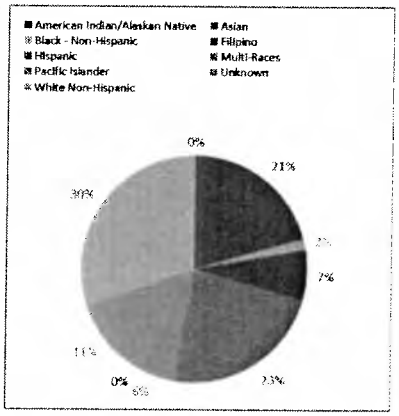
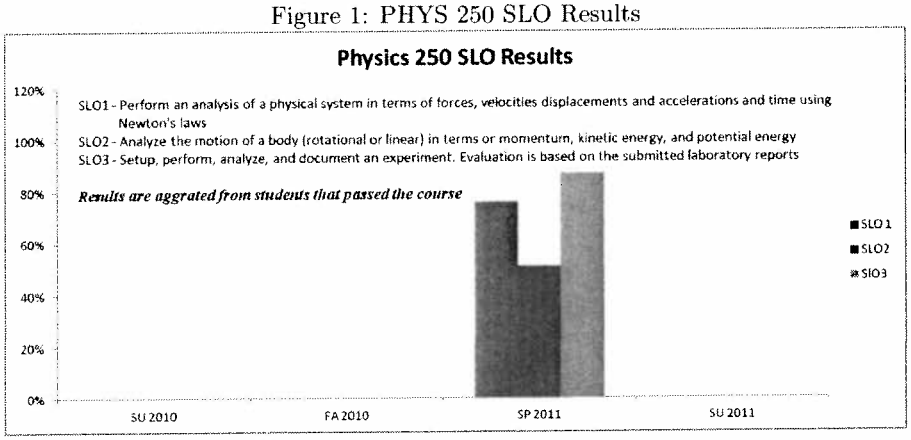


Findings:

- The makeup of the student population is relatively unchanging

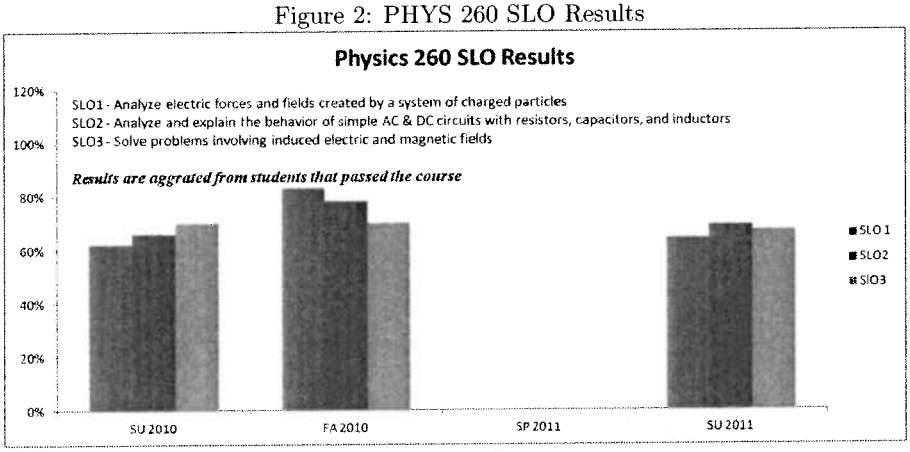
5.1.13 *Physics Student Learning Outcomes Assessment*

Figure 1: PHYS 250 SLO Results



The results of the Physics 250 SLO's are somewhat interesting. The students clearly learn how to analyze a system in terms of Newton's laws. However, they have a much harder time learning how to use the concepts of energy conservation, momentum and potential energy to solve problems. As far as SLO3 goes, the students seem to be able to learn how to setup document perform and analyze an experiment.

Figure 2: PHYS 260 SLO Results



The PHYS 260 SLO's measured over 3 semesters demonstrate a fair amount of variation between the semesters. On average the student learning outcomes are only minimally archived.

5.1.14 *Physics SLO's*

The following list contains all of the physics student learning outcomes, Data for student learning outcomes has been collected is 2009.

- Physics 250
  - SLO 1: Perform an analysis of a physical system in terms of forces, velocities displacements and accelerations and time using Newton's laws
  - SLO 2: Analyze the motion of a body (rotational or linear) in terms or momentum, kinetic energy, and potential energy
  - SLO 3: Setup, perform, analyze, and document an experiment. Evaluation is based on the submitted laboratory reports
- Physics 260
  - SLO 1 :Analyze electric forces and fields created by a system of charged particles
  - SLO 2 : Analyze and explain the behavior of simple AC and DC circuits with resistors, capacitors, and inductors
  - SLO 3 : Solve problems involving induced electric and magnetic fields
- Physics 270
  - SLO 1 :Perform an analysis of isobaric, isochoric, isothermal and adiabatic processes in their relation to work, heat transfer, and changes in internal energy
  - SLO 2 : Analyze the reflection and refraction of light in terms of geometrical optics in different media
  - SLO 3 : Explain the principle assumptions of Special Relativity and able to perform calculations involving relativistic kinematics
  - SLO 4 : Describe the photo-electric effect, the Compton effect, quantization of energy and the Bohr model of the atom
- Physics 210
  - SLO 1 :Perform an analysis of a physical system in terms of forces, velocities displacements and accelerations and time using Newton's laws
  - SLO 2 :Analyze the motion of a body (rotational or linear) in terms or momentum, kinetic energy, and potential energy
  - SLO 3 : Perform an analysis of isobaric, isochoric, isothermal and adiabatic processes in their relation to work, heat transfer, and changes in internal energy
- Physics 220
  - SLO 1 :Analyze and explain the behavior of simple DC circuits with resistors, capacitors, and batteries
  - SLO 2 : Analyze the reflection and refraction of light in terms of geometrical optics in different media
  - SLO 3 : Describe the photo-electric effect, the Compton effect, quantization of energy and the Bohr model of the atom
- Physics 211
  - SLO 1 :Describe and Calculate kinematical variables as derivatives and integrals
  - SLO 2 :Use integrals to calculate work by a varying force
  - SLO 3 :Use differential equations to analyze simple, damped and driven oscillations
- Physics 221
  - SLO 1 :Use surface integrals and Gauss' law to obtain the electric field for symmetric charge distributions
  - SLO 2 :Use line integrals and Ampere's law to obtain magnetic fields
  - SLO 3 :Use differential equations to analyze RLC circuits
- Physics 405
  - SLO 1 :Identify and distinguish electromagnetic radiations in terms of properties of frequency, wavelength, and energy
  - SLO 2 :State the principles of electromagnetic induction and apply them to the x-ray circuit
  - SLO 3 :Identify the factors that affect the x-ray emission spectrum and explain what effect these factors have on the emission spectrum

5.1.15 *Physics Department Performance*

From the 2010 Annual Program Plan:
Due to burgeoning enrollments, the department is near capacity. The department budget precludes adding more sections. However, what needs to addressed is how to better serve the students. Hybrid courses where the lecture material is online and the students only show up one day a week for lab-discussion section will probably be very attractive to some students. This would be an effective way to increase our capacity to handle students if we had the budget for the faculty.
Update
We have developed 'Friday Only' classes, where the students only show up on Friday and do 3 hrs of lab and 3 hrs of lecture. This presents an organizational challenge for both students and faculty. The students must engage with the material during the week and the faculty must have six hours of material ready every Friday. The use of on-line media does make it possible to engage the students during the week. For example they engage with on-line homework and take an on-line quiz on Wednesday, keeping them engaged with the material.

We have also added evening PHYS 210 and 220 classes in fall and spring respectively. We have also developed the calculus supplement PHYS 211 and 221 for the algebra based physics courses.

5.1.16 *Physics Department Action Plan*

Over the next several years the Physics department plans to complete the following:

- Complete course and program level SLO's
- Improve student learning outcomes
- Develop a Conceptual Physics course

6 Action Plan

The Physical Sciences Program action plan is based on current data and previous years annual program plan for each department. The departmental annual program plans may be found on the Cañada IPC SharePoint site.

- Increase recruitment, retention, success and transfer by collaborating with the office of outreach; MESA and the Learning Center to provide mini workshops in our classrooms about the programs and services to assist students
- Encourage greater participation of adjunct faculty in interdisciplinary discussions by meeting once a semester to discuss academic, curricular, professional development and course administration issues
- Complete the Program Student Learning Outcomes Cycle

The individual department Action Plans are discussed in the respective sections:

- Astronomy section 5.1.4
- Chemistry section 5.1.8
- Earth Science - Will be developed when the new full time faculty arrives in the Fall 2012
- Physics section 5.1.16

7 Resource Identification

7.1 A. Faculty and Staff hiring requests

Astronomy
We need a full time astronomy faculty to lead the astronomy program at Cañada. The most recent hiring justification for this position can be found in the Appendix

Chemistry
We anticipate the need for an additional chemistry fulltime faculty to accommodate for the increased enrollment in Chemistry 210; the increased number of Chemistry 220 sections; the anticipated enrollment increase in Organic Chemistry; and the need for qualified personnel to work with students wishing to enroll in Independent Study Research projects using chemical instrumentation.

Physical Sciences Program
A second Physical Sciences Laboratory Technician/Coordinator is needed to support laboratory instruction in Astronomy, Chemistry, Earth Sciences and Physics. A request for a 48% Physical Sciences Laboratory Technician has been submitted in academic years 2010-2011 and 2011-2012. The most recent hiring justification for this position can be found in the Appendix

7.2 B. Professional Development Needs

Physics & Astronomy

1. Astronomy adjunct, Jeanne Digel, has completed STOT training and has been developing on-line material for these courses

2. Would like to send a faculty member to the annual meeting of the American Association of Physics Teachers

Chemistry
Activities that the chemistry faculty and staff have participated in:

1. SLO training
2. Undergraduate research conference
3. Atomic Absorption and Infrared spectroscopy training
4. HPLC online workshop
5. AAC&C Global Positioning conference

All members of the chemistry department need training in hazardous materials handling and disposal. Conversations with the San Mateo County Environmental Health Department indicate that they could provide the training or the local Fire Department could provide some training. We could probably arrange a training session during a Flex Day to encourage adjunct faculty to participate. All members of the chemistry department using instrumentation need training on the instruments we currently own. Most of the instruments were purchased from Perkin Elmer. They provided basic instruction and user's manuals but we need dedicated time on each instrument. Perkin Elmer will also come to campus for a customized training. The price per training is around $1,000. As we move into the possibility of teaching chemistry courses in hybrid form, faculty professional development to move in this direction. Ricardo Flores will be contacted for customized training according to individual and department needs. In addition, a wealth of courses on all the aspects of teaching online is available at onefortraining.com. Individual courses or webinars cost about $55. This can supplement instruction given by Ricardo Flores once we have determined the direction the chemistry department will take.

7.3 C. Classroom & Instructional Equipment requests

- Astronomy
- Physics:
  - A set of laptop computers for room 16-05
  - A screen for room 16-05 so instead of the white board we can use the screen for power point presentations
  - Sets of demonstration equipment to be used in teaching Physics 210 and 220, and in teaching Physics 250, 260 and 270
- Earth Sciences needs will not be known until the new fulltime faculty join us in August of 2012

- Chemistry instructional equipment:

Item	Reason for the request	Vendor	Cost each	Qty	Total cost
Digital Thermometer	In an effort to go completely Mercury and Alcohol Thermometer free we need one digital thermometer per student in lab	Fisher Scientific	40.00	75	$3000
Milliscale Multi-meter with leads	We need these for electrochemistry experiments conducted in chemistry 220 to test self-built electrochemical cells	Test Equipment Depot	150.00	20	$3000
UV Lamps w/ viewing box	For analysis of Thin Layer Chromatography plates used in organic chemistry experiments and independent study research	Cole-Palmer	495	2	$990
Hoffman Electrolysis apparatus	For Demonstrating the Hydrolysis of water in Chemistry 192, 210, 410 and the chemistry for non-majors course to be developed. It teaches acid-base chemistry, gas forming reactions, stoichiometry and electrochemistry	Wards	225	1	$225
Chromera HPLC software	A HPLC system was donated by a local industry undergoing downsizing. The license software to operate the unit was not transferable	Perkin Elmer	5,000	1	$5,000
Gas Chromatograph Thermal conductivity detector (includes installation)	For Independent study research projects in general and organic chemistry	Agilent	4,000	1	$4,000
Digital Video Recorder	To film laboratory demo videos	Best Buy	150	1	$150
Computer Cart with 32 computers*	To use with Vernier interface in general and organic chemistry experiments involving calorimetry, intermolecular forces of attraction, acid-base titrations, etc (willing to take an outdated but functional cart and computers)	Computerland		32	$47406.80
Laptop Computer for Dr. Medina	Present computer has been repaired 3 times in the last 3 years	TBD	TBD	1	TBD

7.4 D. Office of Planning, Research & Student Success requests

1. Identify transfer students by individual disciplines
2. Collect success data of transfer students
3. Work on criteria to identify a cohort of students that could provide accurate data on program performance. For example, exclude students who just take one class to transfer. Accurate transfer information is needed to justify curricular development, program intervention, and grant writing

7.5 E. Facilities requests

The Physical Sciences Program has experienced significant growth in the last five years. Interdisciplinary approach to independent study research and the Honors program are also expected to bring interested students to the Program. We are currently reaching maximum laboratory capacity. This limits the ability to offer additional laboratory sections. A new science building where all the disciplines in the Physical Sciences are housed will encourage interdisciplinary collaboration. The chemistry department has limited bench space to properly utilize their existing analytical instrumentation inventory. Given that the Geology Department relocated to building 16. We are requesting the renovation of room 18-317 to become an instrument room for laboratory work and independent study research work. The cost estimate below was obtained from Swinerton. Also chemistry will like to request electronic readers for the second set of doors in each laboratory room.

Chemistry facilities request

Item	Location	Reason For Request	Total Cost
Remodel	18-317	We have out grown our current facilities. This new instrument room would allow for continued growth of our undergraduate research program	125,000 from Swinerton team
Keypad card reader	18-305	We have secondary doors to both labs currently no connected to a card reader	Waiting for facilities
Keypad card reader	18-311	We have secondary doors to both labs currently no connected to a card reader	Waiting for facilities

CAÑADA COLLEGE

PROGRAM REVIEW
INSTITUTIONAL RESPONSE SHEET

Program Name: Physical Sciences: Astronomy, Chemistry, Earth Sciences, Physics

Thank you for your time and effort in preparing this Program Review. Your Executive Summary, with recommendations, has been sent to the College Planning Council.

#1. Division Dean Signature
Comments:

#2. Curriculum Committee Chair Signature
Comments:

#3. College Vice President Signature
Comments:

Appendix 1

Physical Sciences Laboratory Technician Hiring Justification

CAÑADA COLLEGE

Chemistry Department

Physical Sciences Laboratory Technician

Part-time (48%) Position Request

Submitted by

Jeanette Medina

Robert Tricca

Roslind Young

February 1, 2012

Background:

The Physical Sciences Laboratory Technician (PSLT) is responsible for the laboratory component of all Physical Science classes taught at the College. Most disciplines require minimal involvement such as the procurement of materials and supplies; or the occasional preparation of material science samples. The Chemistry discipline however, is very demanding in terms of daily laboratory set up, routine equipment maintenance and constant hazardous waste management. The PSLT's office is located in the Chemistry stockroom. The continuous Chemistry enrollment growth (table 1), including evening classes, is making it challenging for the Laboratory Technician to keep up with all of the duties of this position and to be available to assist instructors while laboratories are in session.

Table 1. Chemistry Department Enrollment Patterns

Metric	2007-2008	2008-2009	2009-2010	2010-2011
Total Course Enrollment	387	389	569	578
Number of Course Offerings	15	14	17	14

Taken from "Inside Cañada" Program Review Information Packets

The PSLT is responsible to set up day and evening chemistry laboratories as well as to coordinate the use of the Chemistry Department's facilities, laboratory drawers, glassware and equipment by all of the chemistry laboratories held during the day and evening. Ideally, the PSLT should be available during all laboratory sessions to assist instructors in providing quality instruction and laboratory safety.

We have two laboratory rooms in the Chemistry Department. They are being used as indicated in table 2 below. The total number of hours the PSLT must be available to assist instructors is 33. This does not take into consideration that on Monday through Thursday mornings there are two back-to-back labs taking place. These 33 hours do not take into account cleaning in between laboratories, solutions preparation, maintaining inventory, ordering, record keeping, or all other clerical duties of the position.

Chemistry laboratory rooms 18-305 and 18-311 usage in Spring 2012

Day and Time	18-305	18-311

M/W 8:10 – 11:00	Chemistry 210 section AA	Chemistry 210 section AC
M/W 11:10 – 12:25		Chemistry 192
M/W 2:10 – 5:00	Chemistry 210 section AA	
T/Th 8:10 – 11:00	Chemistry 220 section AA	Chemistry 238
T/Th 2:10 – 5:00	Chemistry 220 section AB	Chemistry 410 AB (2:10 – 3:30)
Tuesday 6:00 – 9:00		Chemistry 410 AA
Wednesday 6:00 – 9:00	Chemistry 192	

In an attempt to keep up with the day-to-day laboratory cleaning and the routine preparation of solutions, the Department requested student assistants. However, the help these students give has proven to be useful but unreliable. They have variable work schedules to adjust their study and tests schedules. The busiest lab week always seems to coincide with midterms. This results in absolutely no help from the student assistants during that week. Consequently, student assistants cannot be given time sensitive or long-term projects to work on. Summer used to be a possible down time to work on the hygiene plan, the chemical inventory, the routine maintenance of instruments, the hazardous material management, etc. However, we have experienced an increased in the number of laboratory sections offered in Summer. These tasks might continue to be second priority. If the part-time Laboratory Technician position is granted, the chosen individual could then assume all the evening duties and responsibilities as well as selected functions of the ones listed below. In addition, the Chemistry Department would like to redesign the Chemical Laboratory Technology laboratory courses and create a new general education chemistry course. The new experiments need to be tried out before presented to the students. Having a second Laboratory Technician will assist us in advancing our plans for course redesigning and creation.

Chemistry stockroom functions of the PSLT

Local Agencies:

1. Comply with the San Mateo County Environmental Health Department hazardous materials storage and disposal procedures and regulations.
2. Maintain an updated MSDS file and chemical hygiene plan.

District:

1. Organize the disposal of solid, halogenated, non-halogenated and broken glass waste according to District procedures.
2. Design, maintain and update a chemical hygiene plan in collaboration with District personnel and Chemistry Faculty.

College:

1. Originate and follow-up on facilities requests that pertain to laboratory rooms general maintenance.
2. Originate IT requests to install software or communicate problems associated with the stockroom student laptops; the laboratory printers and the equipment desktops.

3. Third floor of building 18 emergency evacuation captain.
4. Research vendors to order laboratory supplies and chemicals.
5. Prepare requisition orders according the set business office protocols.

Department

1. Coordinate with day and evening fulltime and adjunct faculty to determine appropriate experiments based on safety and availability of materials.
2. Set up experiments for day and evening laboratories
3. Perform routine chemical instrumentation (FTIR, GC, GC-MS, NMR, UV-Vis) maintenance.
4. Contact technical support and trouble shoot chemical instrumentation.
5. Maintain small equipment such as Vernier probes, spectrophotometers, pH meters, hot plates, etc.
6. Design and maintain a chemical inventory
7. Direct and supervise the work of student assistants.
8. Approve timesheets

Daily Tasks:

1. Prepare solutions for laboratories.
2. Prepare unknowns.
3. Clean glassware
4. Inventory and store acids, bases, corrosives, oxidizers and flammables in proper storage units
5. Re-shelve glassware and chemicals
6. Restock glassware, chemicals and other supplies.
7. Remove waste from the laboratory rooms
8. General cleaning of the laboratory rooms working stations.

In summary, adding a Physical Sciences Laboratory Technician (48%) position will help the current PSLT meet the diverse functions of this position listed under "Chemistry Stockroom PSLT functions". The day and evening daily tasks already consume 33 hours per week. This leaves very little time for one person to also complete all of the other tasks on a routine bases in the expected 37.5 hours per week.

The benefits of adding a part-time position are tangible:

1. Updated curriculum; clean, safe, organized, well-stocked and well-maintained laboratory rooms during the day and evening will help the Chemistry Department maintain compliance with all District, Local and State safety policies and procedures. In addition, it will help the Department provide a quality laboratory experience to all students. Chemistry and Chemical Laboratory Technology majors; Biological Science and Physical Science majors (Biology, Health Science, Engineering, Physics); students completing chemistry requirements for Radiologic Technology and Nursing programs; undeclared students on their

way to make a career choice; students who come to us for personal enrichment; Honors students and Independent Research students.

2. Having fully operational research quality instrumentation year round will help the Chemistry Department attract industry collaborations and partnerships. The ability of conducting research that is of value to industry could bring to the Department research projects for our students including those enrolled in the Chemical Laboratory Technology Program. It could potentially generate revenue and create Department sustainability. It would also bring visibility to the quality of instruction at the College which, in turn, could generate additional enrollment growth.

Thank you for your consideration of this request,

Jeanette Medina	Robert Tricca	Roslind Young
Chemistry Faculty	Chemistry Faculty	Physical Sciences Lab Tech

Appendix 2

RECOMMENDATION FOR ONE FULL-TIME PHYSICS-ASTRONOMY FACULTY POSITION

Introduction

The physics and Astronomy department at Cañada currently consists of the following faculty:

- Martin Partlan, Full time faculty, physics, currently on 40% release time for Academic Senate.
- Chuck Iverson, Full time faculty, physics, math and computer science.
- Jeanne Digal, Adjunct Faculty, Astronomy
- Akilles D Speliotopoulos, Adjunct Faculty, Physics
- Gabriel Prochter, Adjunct Faculty, Astronomy

The department currently has no full time astronomy faculty. Since Astronomy courses are a popular GE science option and contribute greatly to the LOAD, we should have a dedicated faculty member for that program. This faculty member will also be qualified to teach the physics courses which will add some flexibility to the scheduling of physics courses. Also, with the possibility of getting a new science building in the future it would be advantageous to have an astronomer to help with the design of the observatory and astronomy lab space.

A. Department/Discipline/Program Criteria

1. Identify current Comprehensive Program Review (in cycle) and current Annual Program Plan documents with position need and justification in the annual plan.

a. The program review was completed in 2006 at which time a full time astronomy position was requested. Since that review we have lost one full-time member to retirement.

2. Identify specialized knowledge (area expertise) or training needed for the discipline/program.

a. No.

3. Identify extraordinary program development and/or needs (for example: are there laboratory oversight, industry connections, student mentoring, etc.).

a. Yes, with the possibility of getting a new science building in the future it would be advantageous to have an astronomer to help with the design of the observatory and astronomy lab space.

4. Describe PT/FT faculty needs for the discipline/program.

As can be seen from the data tables, in the 2009-10 year, Physics and Astronomy combined are serving 16 courses and 22 sections with above average enrollments per section. This can be interpreted as a 1.88 FTE astronomy and a 2.88 FTE Physics

corresponding to a **Physics/Astronomy FTE =4.76** currently being served by **1 FT** faculty and the rest PT.

5. Describe any future economic, community or governmental initiatives/mandates this proposal is addressing?

a. None.

6. Describe any budgetary implications of the proposal.

a. The added cost of FT faculty would partially be offset by the reduction in PT faculty.

B. College Mission and Goals Criteria
1. Explain how the request supports the goals of the college strategic plan. Make sure to specifically address the four top strategic initiatives: Institutionalize Evidence-based Decision making; Improve Student Success in Transfer Programs; Strengthen Workforce Programs; . Improve Basic Skills Success, Persistence & Retention.

a. The data show that there is a increasing head count in both physics and astronomy. The data also show that we are serving the 4.76 FTE with 1FT faculty. Hence the need for another full time faculty member is clear from the data.

b. The Astronomy courses are a popular GE science option for Canada's transfer student population. These courses could also serve as a cross over course for recruiting non-science majors into STEM majors.

c. A fulltime Astronomy faculty position is needed so that our program can continue to fulfill the mission of the College: "...to ensure that students from diverse backgrounds achieve their educational goals by providing quality instruction in transfer and general education courses..." (Mission statement taken from the current College catalog).

2. What unmet needs will this position address (student, district, community)?

a. The possibility of making observational astronomy accessible to the general public.

3. How will this position enhance retention or produce college wide growth?

a. This position will produce growth by providing popular general education science courses. This position can also serve as a recruiting tool to introduce students to the STEM fields. A dedicated full time faculty member is needed to work with students in the Astronomy subject area and to develop a high quality observational Astronomy lab.

4. Describe how the position supports a pathway to student educational goal completion (certificate and/or degree) or GE transfer certification.

a. The Astronomy courses are a popular GE science option for Canada's transfer student population. These courses could also serve as a cross over course for recruiting non-science majors into STEM majors.

b. By being able to offer more sections of GE science classes.

C. Historical data criteria supporting request.
1. Discuss Department/Discipline/Program enrollment and student service trends the proposal addresses

See data packet

CAÑADA COLLEGE
EVALUATION OF THE
COMPREHENSIVE PROGRAM REVIEW PROCESS

To improve the Program Review process your help and suggestions are instrumental. We ask that all parties responsible for preparation of this review have input into the evaluation. After completion of the Program Review process, please take a few moments to complete and return this evaluation to the chair of the Curriculum Committee.

Program Name: Physical Sciences

Estimate the total number of hours to complete your Program Review: 70 hours

Was the time frame for completion of Program Review adequate? If not, explain. With a one semester notice, the time frame to complete the Review is reasonable.

Was the instrument clear and understandable? Was it easy to use? If not, explain and offer suggestions for improvement.
The instrument is clear but might need adjustments to accommodate complex Programs such as the Physical Sciences.

Were the questions relevant? If not, please explain and offer specific suggestions.
Yes.

Did you find the Program Review process to have value? If not, please explain and offer suggestions.
Yes. It is valuable to help us keep focused on the Mission of the Program and allows for greater interaction among the faculty and staff.

Was the data you received from administration complete and presented in a clear format? Would you like additional data?
The data was clear. Below are suggestion for additional data:

- **Identify transfer students by individual disciplines**
- **Collect success data of transfer students**
- **Work on criteria to identify a cohort of students that could provide accurate data on program performance. For example, exclude students who just take one class to transfer. Accurate transfer information is needed to justify curricular development, program intervention, and grant writing**

Please offer any comments that could improve and/or streamline Program Review!

PHYSICAL SCIENCES

CAÑADA COLLEGE
COMPREHENSIVE PROGRAM REVIEW EXECUTIVE SUMMARY
(2 page maximum)

Short Summary of Findings

Type your summary here:

- **The Program has reached maximum capacity to accommodate laboratory instruction limiting the possibility of adding more sections.**
- **Semester-to-semester changes of student population makes it challenging to gather relevant SLO assessment information to guide meaningful teaching strategy modifications.**
- **Because of the multiplicity of lab sections being offered every semester and the continuous updating of laboratory curriculum, the need for a Physical Sciences Laboratory coordinator is evident.**

Three Strengths of the Program

1. **Innovative ways to support students' success such as Learning Communities and the MESA program.**

2. **A comprehensive set of course offerings**

3. **Highly collaborative Program**

Three Suggestions for Improvement

1. **Encourage greater participation of adjunct faculty in interdisciplinary discussions by meeting once a semester to discuss academic, curricular, professional development and course administration issues.**

2. **Increase recruitment, retention, success and transfer by collaborating with the office of outreach; MESA and the Learning Center to provide mini workshops in our classrooms about the programs and services to assist students.**

3. **Complete the Program Student Learning Outcome Cycle.**