

Long Beach City College - Program Review

Program Review 2015-16 - Physical Sciences and Geology AS-T

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PR 2A - Enrollment Data:

The chart below summarizes the enrollment data and trends gleaned from Physical Science/Geography department data packet. Note that Geography joined the Physical Science Department in the middle of the review cycle. Geography is not part of the Physical Science program, as Geography has its own AAT program. The Geography AAT program will write its own separate review within the next few years.

The bold-faced trends will be discussed further.

Enrollment (yearly)	2012-13	2013-14	2014-15	3-year trend		
Astronomy		1279	1355	1470	up 15%	
Chemistry		910	1198	1659	up 82%	
Environmental Science	659		684	685	up 4%	near flat
Geography	*1384*	1293	1355	(-3%)		near flat
Geology	601		632	614	up 2%	near flat
Physical Geography	1369		960	897	(-34%)	
Physics	351	392	551	up 57%		

*Geography not part of PhysScience Dept in 12-13, still in Social Science Dept. – but included in all totals.

Geography AAT will write its own review in near future.

Academic year totals	6553	6514	7231	up 10%
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Overall the Physical Science/Geography department has enjoyed good enrollment growth in the past three years. The increased popularity of STEM majors, recent inclusion of particular physical science classes as requirements for other popular majors, and recency clauses in applications for graduate and professional programs all have contributed to this enrollment growth. For example, CHEM 3 will become a requirement for the Registered Nursing (ADN) degree in fall 2016. Pharmacy, medical and physical therapy schools demand students retake physics and chemistry courses if a student's classes were taken over seven years ago. These new requirements in popular majors combined with all students who intend on transferring needing at least one physical science course seem likely to keep the department's enrollment growing for years to come.

Chemistry (+82%) and Physics (+57%) both had outstanding growth in the past three years. Three factors appear to have contributed to this boom. Increased funding to the College allowed larger numbers of sections to be offered. The department concentrated on creative scheduling of classes with large wait lists to expand access. Growing numbers of students are majoring in engineering and health-related fields, yielding increased enrollments. A conscious effort was made by the Physical Science Department to get rid of bad instructors and hire good instructors (both adjunct and full time). In regard to hiring good instructors, the department moved to hire as many full time instructors as possible/as allowed in the past two years. For example, Astronomy has shown a nice enrollment bump (+15%) with the hiring of new full time Astronomy and Physics faculty members. From the department's perspective, only full time faculty will improve pedagogical quality and lead instruction in new directions. Evidence of this will be discussed in the student achievement and staffing sections.

Physical Geography enrollment has fallen by a third in the past three years, which on the face of it seems pretty bad. It is well to remember that in 2012 and '13 the college was going through program discontinuance, with additional faculty of low seniority targeted for headcount reduction. Physical Geography was particularly and peculiarly targeted; instructors therefore taught all double sections to prove their worth in FTES. With program discontinuance over and Physical Geography remaining in the department, Physical Geography faculty devoted themselves to creating new curriculum (PGEOG 2, PGEOG 1L) and obtaining grants (weather station, "Shared Science" Equity Grant), which necessitated moving to single sections.

During the program discontinuance and college restructuring of 2012-13, Geography was moved from the Social Science Department to the Physical Science Department. While Geography enrollment is down very slightly (-3%), the number of face-to-face sections in the discipline has fallen 15% while the number of online sections has doubled. Geography courses still transfer as social science, leaving in person Geography sections to compete for students against the huge numbers of Psychology, Sociology, and Anthropology sections, offered at all times and all days. The face-to-face Geography sections must be scheduled at just the right times to attract students; online Geography classes have no such timing problems.

Geology AST - Overall the geology program has experienced nearly consistent enrollment over the past three years. Course offerings did not change during the last three years. In the upcoming semesters the geology program will be adding two

additional courses (Environmental Geology and Oceanography) which should lead to increased enrollment. In addition, we are considering the addition of several field courses in the near future.

PR 2B - Achievement Data:

ACHIEVEMENT

While the program review prompts appear to direct discussion to student achievement alone, there are many factors and conditions which must be set and functioning before the first student walks in the door ready to learn. Consider hiring excellent new full time faculty, adjunct instructors and lab technicians, obtaining \$80K+ in modern lab equipment, creating new curriculum and transfer degrees and expanding access to Physical Science courses and labs at the Pacific Coast Campus all to be areas in which the Physical Science Department has achieve remarkable things. Simply put, four long time department members retired in 2012-13, leaving five Physical Science faculty to hire/review huge numbers of adjunct instructors and beg in front of the Hiring Priorities Committee in 2013-14. But by 2014-15 seven fabulous new faculty had been welcomed into the department where they are making a huge, positive impact. This is a real achievement for the department. This was necessary before the students could walk in the door.

The chart below summarizes the student achievement data in terms of retention and success gleaned from Physical Science/Geography department data packet. The bold-faced trends will be discussed further.

Student Achievement	2012-13	2013-14	2014-15
Astronomy	82 finish/56 pass**	84/53	85/63
Chemistry	85/75	85/70	82/69
Environmental Science	86/62	83/61	86/69
Geography	84/58*	84/56	84/57
Geology	88/71	88/72	88/72
Physical Geography	83/59	85/67	86/68
Physics	64/42	71/55	82/67

*Geography not part of PhysScience Dept in 12-13, still in Social Science Dept.

** College wide retention rate = 84%, college wide success rate = 64%

Good full time faculty hugely impact student success; Astronomy and Physics data clearly show this. In 2013-14, Astronomy was taught solely by adjunct instructors (8 different instructors!). Student success fell a bit and was well below the college wide success rate. The following year, two new full time faculty taught most of the Astronomy sections and student success shot up. In Physics, all new, very good adjunct instructors were hired in '13-'14 bringing in new instructional methods. In '14-'15, a new full time Physics instructor introduced inquiry-based methods of instruction which further boosted student success above the college wide rate for the first time in years.

Student retention and success rates in Geology have been above the college wide rates for several years. Geology faculty attribute this achievement to a switch from traditional pedagogical techniques to an inquiry based approach, a switch made several years ago. Chemistry faculty are exploring new modes of instruction (such as ALEKS, online Connect Plus homework, supplemental problems and lecture on video) to improve student success. The increase in Chemistry enrollment has left full time faculty stretched thin, even with several new faculty. Online instruction or online homework may help.

PR 2C - HR (Staffing) Data:

HUMAN RESOURCES

The chart below summarizes the academic and classified staffing of the Physical Science/Geography department, mainly gleaned from load sheets and class schedules.

Academic Staffing	2012-13	2013-14	2014-15
Astronomy	2 FT & 2PT	0 FT& 8PT	2 FT & 2PT
Chemistry	3 FT & 5PT	2 FT & 12PT	5 FT & 9PT
Environmental Science	1 FT & 3PT	1 FT & 3PT	1 FT & 3PT
Geography	2 FT & 3PT*	2 FT & 4PT	2 FT & 4PT
Geology	2 FT & 2PT	1 FT & 4PT	2 FT & 1PT
Physical Geography	1 FT & 1PT	1 FT & 2PT	1 FT & 3PT
Physics	1 FT & 2PT	1 FT & 4PT	2 FT & 2PT

*Geography not part of PhysSci Dept in 12-13, still in Social Sci

Academic yr totals	12 FT & 18 PT	8FT & 37 PT	15 FT & 24 PT
Classified yr totals	2 FT lab tech.	2 FT lab tech.	2 FT & 40% lab tech.

The connection between student success and strong enrollment to a healthy proportion of full time faculty members in the department has already been discussed in the Enrollment and Achievement sections. In 2013-14, the few full time department

members spent an enormous amount of time hiring, mentoring and reviewing the huge numbers of adjunct instructors hired that year. That same year, those few full time faculty spent even more time on hiring committees. Department members felt this hiring work burden and the high proportion of adjunct faculty in 2013-14 halted any instructional innovation that year.

Classified staff members contribute enormously to the Physical Science department. The physics stockroom lab technician not only sets up and finds supplies for all physics experiments, but also keeps all the laser printers in the department functioning and troubleshoots planetarium projector problems. The chemistry stockroom lab technician has become busier and busier with the 80+% increase in chemistry enrollment coupled with new responsibilities for \$80K+ in chemistry equipment. The 40% lab technician (who splits her time between Life Science and Physical Science at PCC) has enabled the department to set up and run chemistry labs at the Pacific Coast campus. During the recession, the full time lab technicians saw their positions cut to 10 months. This created many, many problems with purchasing supplies, setting up field trips for Geology, and running summer classes. The return of the full time lab technicians to 12-month positions has enabled growth in enrollment and expansion of lab courses on both campuses.

Geology AST - The geology program has traditionally been serviced by two full-time faculty and one or two part-time faculty. One of the full-time faculty members retired at the end of the 2012-13 academic year, which left only one full-time faculty member for the 2013-14 academic year. In order to maintain the number of sections offered, two additional part-time faculty were hired to cover the sections taught by the retired faculty member. A new full-time faculty member was hired at the end of the 2013-14 year and began teaching during the Fall 2014 semester. One additional part-time faculty member will be hired in the future to cover some of the courses as new geology courses are added to the program.

PR 3A - SLO - summary of collected program data:

The Physical Science program is continuing to assess our program using five questions on the scientific method and final exam scores. During spring 2015, a Google document was created to facilitate easier collection and analysis of this data by the department. The following results were collected for courses taught in spring 2015, from 12 full time faculty and 5 part-time faculty.

Program SLO 1: Differentiate between unsupported opinions and verifiable scientific facts. Five scientific method questions are used to address this SLO. Students exceeded the current criteria of 50% correct answers. 1482 responses were collected, and 80% or more students in each subject area answered correctly on each question. The department's highest percentage (95%) of correct answers was seen on a hypothesis-related question. The department's lowest percentage correct (85%) covered scientific theories.

Program SLO 2: Demonstrate a basic scientific understanding of a specific field of science. Direct assessment of this SLO is accomplished by using the final exam scores for each course. Students exceeded the current criteria of 50% passing the final exam. 1524 responses were collected, and an average of 73% or more of students in each discipline passed the final exam with a grade of C or better. The department average was 81% passing the final exam.

Geology Program

The Geology program (AST) is continuing to assess the program using five questions on the scientific method (same as Physical Sciences department) and final exam scores. During spring 2015, a Google document was created to facilitate easier collection and analysis of this data by the Physical Science department. The following results were collected for courses taught in spring 2015 by the two full-time Geology faculty.

Five scientific method questions are used to address Program SLO 1 (Differentiate between unsupported opinions and verifiable scientific fact supported by observations, experiments, and scientific theory). Students exceeded the current criteria of 50% correct answers. One hundred thirty one (131) responses were collected, and 80% or more students answered each question correctly. The program's highest percentage (94%) of correct answers was seen on a hypothesis-related question. The program's lowest percentage correct (87%) covered hypotheses.

Direct assessment of Program SLO 2 (Demonstrate a basic scientific understanding of the field of geology by applying basic geologic concepts verbally and in writing) was accomplished by using the final exam scores for each course. Students exceeded the current criteria of 50% passing the final exam. One hundred forty (140) responses were collected, and 77% of students passed the final exam with a grade of C or better.

PR 3B - SLO - uses in program improvement :

Our two program level SLOs are being assessed well using common department-wide scientific method questions and final exam grades in each course. We have been pleased with our students' performance, and will continue to collect the same program-wide data each semester to monitor for any changes in scores. Despite rapid enrollment growth in some of our course

areas (chemistry, physics, astronomy), student achievement is consistently high. We will continue to collect and archive data using Google docs and will monitor the data over time to see if increasing enrollment has an impact on results.

Assessment plans for each set of course SLOs were written in a standard format and stored on a department Moodle site during the 2014-2015 school year. A faculty coordinator for each course is continuing to coordinate, collect, and analyze assessment data to ensure high quality instruction.

Geology Program

The two program level SLOs for geology are currently being assessed by using common department-wide (Physical Sciences) scientific method questions and final exam scores in each course. We are pleased with our student's performance and plan to continue to collect program-wide data each semester to monitor any score changes. We will continue to collect and archive data using the department's Google docs.

The full-time geology faculty have recently standardized the course level SLO questions for the introductory geology courses (Geology 1, 2 and 2L). The standardized course level SLO questions were implemented during the fall 2015 semester. Data collected using these questions in the future will be archived in Physical Sciences' Moodle site.

PR 3C - SLO - action/ change based on results:

Physical Sciences Program

- Action: Continue our streamlined data collection using Google docs to efficiently construct a longer term picture of our students' success. This was begun in 2015. Encourage part-time faculty participation.
- Action: Survey the physical science faculty for additional questions to ask/answer using SLO data and adjust data collection and analysis accordingly. Continue to look for trends in reasons students in certain disciplines or sections do or do not succeed. Continue to improve our teaching skills through professional development.
- Action: Change SLO1 criteria to a department average of 75% or more correct on each scientific method question. This revision of criteria is a reasonable baseline based on 2015 results, and more easily measured than previous criteria (50% students show 50% success on exam).
- Action: Change SLO2 criteria to a discipline average of 60% or more passing the final exam with a C or better. This revision of criteria is a reasonable baseline based on 2015 results, and more easily measured than previous criteria (50% students show 50% success on exam).
- Action: Evaluate the use of "basic understanding" wording in SLO2. Department has decided that our courses are relatively basic science, yet we may change to "foundational understanding". Continue using final exams as a high quality summative assessment of students' learning at the end of courses and the program.

Geology Program

- Action: Continue our streamlined data collection using Google docs to efficiently construct a longer term picture of our students' success. This was begun in 2015. Encourage part-time faculty participation.
- Action: The full-time faculty that make up the Geology Program developed a set of standardized course level SLO questions to use as an assessment tool in the introductory geology courses (Geology 1, 2 and 2L). These questions will be implemented in the fall 2015 semester to assess both course level and program level SLOs. We will continue to look for trends in the data to determine which concepts students are struggling with.
- Action: Survey the physical science faculty for additional questions to ask/answer using SLO data and adjust data collection and analysis accordingly. Continue to look for trends in reasons students in certain disciplines or sections do or do not succeed. Continue to improve our teaching skills through professional development.
- Action: Change SLO1 criteria to a program average of 60% or more correct on each scientific method question. This revision of criteria is a reasonable baseline based on 2015 results, and more easily measured than previous criteria (50% students show 50% success on exam).
- Action: Change SLO2 criteria to a program average of 60% or more passing the final exam with a C or better. This revision of criteria is a reasonable baseline based on 2015 results, and more easily measured than previous criteria (50% students show 50% success on exam).
- Action: The Geology Program faculty have decided to continue using final exams as a high quality summative assessment of students' learning at the end of courses and the program, but will also use results from the course level SLO questions to assess SLO2 criteria.

PR 4A - Projects/ Strategies-development & change:

The projects/strategies of hiring more full time instructors have resulting in a 25% increase in student success in Physics and other program disciplines. The actual program project was to reduce student waitlists. Waitlists have thus been reduced remarkably, though they still exist even with a greatly expanded class schedule. The department also planned to upgrade or replace most of the old equipment that was regularly used in physics experiments. The program may still request to hire one or two new faculty over the next 2 years to deal with equity issues at the PCC campus and cover the high-demand ASTR 1 classes. One change to program projects was a shift to include and improve the PCC campus lab in the drive to improve equity across the campuses. Other than that, the Physical Science program's projects in department plans did not change in the 3 years covered by this review. The recession and state finances did not allow for faculty hiring or acquisition of equipment until the present, therefore the program kept the same aims and made the same requests over and over and over. While the program will keep the "update labs" project, new projects will be considered on the fall FLEX planning day.

The geology program and strategies are aligned and reported with the Physical Science program and strategies.

PR 4B - Projects/ Strategies - results:

The Physical Science program's projects are listed below in boldface, year by year. Strategies are below the projects, written in italics. Results are listed below the strategies, written after an arrow ?.

2012-13: reduce student wait lists

Strategy: Requested full time 2 Astronomy/Physics faculty & technician for planetarium.

-->got 1 Astronomy position of faculty member moving over from Financial Aid Dept. Waitlists in Astronomy were drastically reduced, but both full time Astronomy instructors agreed to teach ridiculously huge overloads to achieve this result. Other discipline waitlists were still huge. Most of the physics classes are now taught by full time physics instructors who devote more time to help students succeed in physics. We have also replaced some of the old equipment in physics laboratories with new and better equipment. These efforts have clearly enhanced the success of students in physics as shown by the data in 2B.

Project: Provide the most modern laboratory and learning environment for our physical science students

Strategy: Increase instructional supplies budget

--> No real increase was granted. The department was down to the very last ream of paper and had no replacement glassware in the chemistry labs by the end of spring semester.

Strategy: Requested planetarium maintenance contract.

--> Received money for a maintenance contract in repairs budget (~\$2K); routine slight malfunctions in the planetarium projection system were quickly corrected.

Project: Increase the number of degrees awarded

Strategy: Complete the requirements for the AS-T degree for Geology. Introduce AS-T degrees for Chemistry and Physics once the panel sets the requirements for the degrees. Encourage students to apply for the existing Associate in Science degree.

--> TMC written for GEOL AST. No action on other AST's, as curriculum requirements not set at the state level.

2013-14: Project: Offer more sections of our classes with large numbers of wait listed students

Strategy: Requested 4 replacement faculty for retiring faculty in Geology, Chemistry, Astronomy/Physics

--> The program was granted seven new full time faculty hires to start in '14-'15. This hiring enabled the fall '14 schedule of classes to be greatly expanded, thus decreasing waitlists.

Project: Provide the most modern laboratory and learning environment for our physical science students

Strategy: Increase instructional supplies budget

-->The department received a very slight increase over '12-'13, which led to shortages in paper, chemicals, glassware and other consumable equipment.

Strategy: Still for distilling water

-->Funded and purchased, installed summer'13 – through fall-14.

Strategy: Ice machine

--> Funded and purchased, installed summer'13. Along with the still, this enabled the chemistry lab classes to run much more smoothly.

Project: Increase the number of degrees awarded

Strategy: Completed the requirements for the AS-T degree for Geology. Introduce AS-T degrees for Chemistry and Physics once the panel sets the requirements for these degrees. Faculty will encourage students to apply for the existing Associate in Science degree through presenting employment data, personal stories and describing the value of the AS-T degree in transfer. Handing out the forms in certain classes to apply for the degree may facilitate the process.

--> AST in GEOL approved by Chancellor's office year+ later, AST's in PHYS & CHEM tabled due to few majors and problems with CSULB acceptance of courses.

2014-15: Project: Reduce student wait lists and improve equity by increasing access across both campuses.

Strategy: Requested 1 replacement faculty for leaving faculty Astronomy/Physics

--> Granted 2 full time Physics/Astronomy faculty hires to start in '15-'16. The department was granted two hires when one of the new Astronomy hires from the previous year resigned abruptly. The two instructors hired had their primary assignment in Physics. Physics had continues strong enrollment growth, so some Astronomy sections were removed from the schedule.

Project: Provide the most modern laboratory and learning environment for our physical science students

Strategy: Instructional supplies requested for PCC-EE213.

--> Got instructional supply increases tied to enrollment growth, 85% increase in CHEM, 15+% increase in PHYS resulted in a near doubling of the department's instructional supply budget. Much of this increase was used to outfit PCC-EE213 for chemistry labs, thus

Strategy: Requested laser printers, SI, GC detector, FT-IR, rock samples, many items for Physics

--> All equipment obtained, though most at the very end of the fiscal year creating massive headaches for the technicians, AA's and faculty. SI came through LAR's equity grant.

Strategy: Requested Omnicode locks, 2-way radios, solar telescope & telescope accessories

--> Not funded through capital outlay.

Project: Increase the number of degrees awarded

Strategy: Write new curriculum (CHEM4/PHYS4) to help complete the TMC for Elementary Education AST

--> CHEM4/PHYS4 were approved through Curriculum Committee and by Chancellor's office. Reading Dept still needs to finish their paperwork for the TMC.

PR 4C - Projects/ Strategies - future plans:

Physical Science program disciplines plan to adopt new textbooks as prudent. Disciplines with labs will modernize equipment and create new experiments to keep the curriculum thrilling. All program disciplines will explore adopting new teaching strategies and techniques to improve student performance. All of these strategies aim to keep students engaged in learning a program discipline which should increase student success and a foundational mastery of a Physical Science discipline (SLO#2 and to a lesser extend SLO#1).

The data collected from SLO's clearly shows that student success in Physics/Astronomy has improved much over the last two years. We plan to refine our assessment of student learning outcomes and implement strategies that will definitely enhance student understanding of the concepts and principles of physics.

Geology specific program SLOs were finalized in Spring 2015, and we are currently beginning to collect data. In subsequent program reviews we will be able to assess how our program specific SLOs are being met.

PR 5 - Dept - how does it fit into big picture?:

In accord with the college and school's mission to promote student learning, success and equity, the Physical Science program teaches courses which provide an understanding of physical science concepts, thus enabling students to transfer to four-year institutions and enabling students to gain an evidenced-based understanding of contemporary scientific issues. The primary objective of the Physical Science program is to provide transfer level courses in the various areas of physical science - Astronomy, Chemistry, Environmental Science, Geology, Physical Geography, and Physics. Physical Science program SLO #2 aims to assess the degree to which students master a body of knowledge in one of these specific disciplines. The program aims to use the latest teaching strategies and tools and laboratory equipment as we are able to obtain and incorporate into program courses. The mission of the Physical Science program aligns with and supports the student success goal of the educational master plan, that "Long Beach City College will improve the rates at which students gain the foundational skills necessary to complete college level work and to achieve their educational and career goals". The overwhelming majority of students in program courses aim to transfer to 4-year institutions and all IGETC transfer programs require at least one Physical Science course.

The Physical Science program supports the equity goal of the educational master plan, "Long Beach City College will provide equitable access and support to its diverse students and will improve the educational progress and achievement especially for students under-represented in those outcomes" and the PCC master plan, specifically to develop a "pattern of course offerings, the scheduling of which should include mornings, afternoons, evenings, and weekends; thereby ensuring accessibility to transfer pathways". All IGETC transfer programs require at least one Physical Science class and lab science course is required for transfer to the UC or CSU system. On both campuses, the Physical Science program aims to continuously improve lab

course curriculum and modernize equipment (project #2 in the department plan).

The Physical Science program has introduced and continuously increased the number and variety of course offerings, particularly lab course offerings at the Pacific Coast Campus, thus ensuring that PCC students are able to fulfill science transfer requirements on their home campus. Beginning with Geology 1 in 2012-13 and expanding to day and evening Chemistry 2 sections, the Physical Science program plans further expansion of Physical Science lab courses taught at PCC to include Physical Geography Lab (PGEOG1L).

The Physical Science program also supports several recent initiatives of the College. For example, to assist the completion of the Transfer Model Curriculum for the Elementary Education ADT, program faculty wrote two new courses (CHEM 4 and PHYS 4, Survey of Physics and Chemistry) which would fulfill the lab science component of the TMC. The courses passed LBCC's curriculum process and have been granted approval by the Chancellor's office. Writing these courses not only aided in the college's initiative to increase ADT's offered, but also supported the local college and universities' "100K in 10" effort in teacher education. The Physical Science program also participates in the college's efforts in the Long Beach College Promise partnership, working in one of the eight key pathways identified in the past year.

In sum, the Physical Science program supports the fundamental college goal of providing required classes for transfer to 4-year institutions. The program participates in and supports other departments' participation in several college initiatives. At a time when LBCC's enrollment is shrinking, the Physical Science program's enrollment is growing, helping the college approach FTES targets. Program faculty feel that the hiring of full time faculty enabled this expansion of enrollment, participation in college initiatives, and improvements in student success in the program's disciplines.

Project/ Strategy and Resource Needed
