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Program Review - 2015-2016

Science - Biological Sciences

Module: Division Purpose

Question: Describe the purpose of the Discipline/Program/Service.

Answer:

The Division's course offerings and programs equip students with the knowledge and skills they need to understand the world around them and prepare them for a variety of careers by earning certificates and degrees, or transferring to 4-year colleges and universities. In particular, courses in the Biological Sciences prepare students to fulfill a GE requirement in natural science, life science or biological science (IGETCE); to enter allied health programs -- nursing, dental hygiene; to transfer to a 4-year college as a biology major; and for entering into professional schools -- medical, dental, pharmaceutical, and physician assistant.

Question: Describe how the stated purpose aligns with the college mission statement.

Answer:

In alignment with the College's vision and mission the Division strives to educate and prepare students to realize their dreams through the completion of a variety of science based professional programs or pursuing and furthering their trainings and education at degree granting institutions.

Module: Enrollment Trends

Question: Describe the trends in Enrollment and FTES. Given the data, what are the implications for your division? If relevant, discuss each discipline separately.

Answer: Over the period of 2010 to 2014, Fall semester enrollments were relatively stable in the Biological sciences.

In Fall 2014, 2,163 students were enrolled in the Science Division with 1,114 students were census enrolled within the Life/Biological sciences. This represents 52% of all enrolled Science students and 4% of enrolled students at West. This enrollment level was similar to the previous years.

Highest enrollment levels were seen in Biology courses (3A, 3B, 6 & 7). For these courses enrollment levels from 2010 to 2013 were relatively constant. Enrollment in 2014 increased slightly as compared to 2013. Average student enrollment in Biology courses was 58% of the total number of biological science students enrolled in the Division (644 of 1114 students). The average traditional class size in Biology was 45.1 with an average class size of 59 students in the one hybrid class offered by the Division - Biology 3A. These class sizes were the largest in the Division and are due to the popularity of Biology 3 as an introductory science class with lab. Between Biology 3, 6 and 7, fourteen sections were offered. The in-class success rate of 63% was lower than that of the hybrid format which was 68%. However, it is important to realize that Biology 3 success rates are calculated with the major's level Biology 6 and 7 success rates. Therefore, it is difficult to ascertain the success rates of non-majors and majors Biology students. More students remained enrolled in Biology when taking a hybrid class - with 85% retention rates being measured in hybrid biology vs. 79%. The higher success rate of our hybrid Biology 3 class vs. conventional classroom structure has remained consistent over the last 4 years and may be proof that a more flexible teaching methodology is conducive to success among some of our students.

For Microbiology 20, enrollment increased slightly since 2010. On average 14% of life science students

enroll in Micro 20. The average class size has dropped from a high of 41.5 in 2012 to 28.2 in 2014, despite no change in the number of sections offered. While retention and success rates (80% and 73%) are some of the highest in the Division, like all Life Science classes, there has been a steady decrease in these parameters since its high in 2011. As with Anatomy and Physiology, these values could be improved upon by modernizing and upgrading equipment, allowing our professors to teach more advanced and relevant micro topics that have become important in today's health field.

Fall 2014 Anatomy 1 enrollment was 16% of enrolled biological science students. 85% of those students completed the semester with 77% of the students completing successfully. This represents a significant increase from 2013 (67% retention and 52% success) and may reflect the improvement of the course through additional study materials purchased from last year's program review. Section counts in 2014 remained the same as 2013 (6 sections). A slight decrease in average class size was recorded from 2013 to 2014 (34.2 to 30.3). However, 30.3 students per section is a significant number of students and could be decreased further by increasing section numbers. This overcrowding could be a reason why student enrollment has decreased over the last year as students choose other colleges with smaller class sizes. Alternatively, students may be choosing other colleges with more modern teaching methodologies such as virtual teaching tools and hybrid classes.

Fall 2013 Physiology enrollment decreased slightly from 11.5% in 2013 to 11.0% in 2014. 4 sections of physiology were offered per semester last year, a number that has remained consistent over the last 3 years. The average class size in 2014 was 29.8 which was a decrease from the average of 35.2 students that has been measured over the last 4 years. Retention levels and success levels has decreased from 2013 to 2014. Overall the retention and success of our physiology students has decreased consistently over the last 5 years. As with anatomy, this may reflect a lack of modern, more relevant teaching tools and could be improved through a modernization of our equipment. Physiology retention and success levels could also be improved upon the introduction of hybrid classes that allow students to access lectures on-line and then attend oncampus discussions and labs.

The FTES followed the same pattern as enrollment

Question: Given the data, describe the trend in section counts and average class size.

Answer: The trend in section count has remained relatively constant since 2010. While slight decreases in section count were measured in 2011 and 2012, section counts have increased to 30 which is the same section count in the fall of 2014.

The average biological science class size in 2010 was 40.9. Class sizes have decreased each year with the average class size in 2014 at 33.6. Of the four Biological sciences discipline, Biology had the highest average class size trend in 2014, averaging 46.0 students.

In 2014, an overwhelming majority of students took our courses using traditional classroom instruction, with 27 of the total 30 sections. 1 of the 30 sections was a hybrid class and 2 out of the 30 was ACT. The hybrid class offered in 2014 had an average class size of 59, a 64% increase when compared to the average traditional classroom size.

Module: Students and Student Success

Question: Based on the demographic trends in enrollment, what are the implications for your Discipline/Program/Service?

Answer: The data primarily reflects the demographics of the college's student population: Females consistently at ~70% of our enrolled students.

44% of our students fall between the 20-24 year age range. 46% of our students are 25 years and older. These age ranges reflect two cohorts of students, younger students enrolled in order to complete pre-reqs to transfer to the UC and CSU systems and older students who are considering a career change and are taking our courses to prepare themselves for profession schools such as nursing.

65% of enrolled biological science students are black and latino, with latinos at 41% and African-Americans at 24%. These demographic trends had remained relatively steady from 2010 to 2014.

This means that the Biological sciences enrolls significant numbers of two historically under-represented groups in the sciences. As such, biological sciences represents an area where the expansion of college support through Resource Requests would directly impact the success of these historically low-achieving students in the sciences.

Question: Given the data, describe the trends in Success Rates and Retention Rates. What are the implications for the Discipline/Program/Service?

Answer: Retention rates in the Biological Sciences remained steady at ~76%-83% between 2010 and 2013. In 2014, it averaged 79%. This is slightly lower than the College retention rate of 82%

In comparison, the success rates are lower than the retention rate. In 2014, retention rates in traditional classrooms were 83%, with success rates at 63%. The success rate for all instructional methods in the Biological Sciences in 2014 was 65% which was slightly higher than the college's level of 62%. The lower success rate vs. retention suggests that students performing below their own expectations opted to drop the class. Providing tutoring services may prove to be an effective strategy to improve student success and retention within a class. An influx of more modern teaching materials may also improve student success.

However, the success rate of 65% in 2014 represents an increase from the 59% rate measured last year. We believe this increase is due to stringent verification and enforcement of pre-requisites for the upper level biology courses (e.g. Biology 6, Biology 7, Microbiology 20). This enforcement has ensured that our students are correctly enrolled and has increased their chances of success in these courses.

We also anticipate that our Division success rates will improve over the upcoming academic year as a direct result of two Resource Requests associated with last year's Program Review: the expansion of the anatomy curriculum through the acquisition of a cadaver and the creation of a Science Division Study Center. The SDSC will be especially be critical in improving our student's success rates in that it will provide students with an area of study outside of class hours that contains many of the materials they use in the class, (e.g. models, microscopes), in addition to supplementary materials (e.g. computers, virtual software systems) that will help the students cement the concepts given to them in class. We anticipate that the SDSC will also improve the success rates of the Physical and Earth Science divisions in that these supplementary materials will enable their students to duplicate complex experiments virtually, allowing them to study key concepts outside of classes and labs.

Finally, another avenue for student success within the Division may lie in the creation of alternative forms of instruction such as hybrid courses. Currently, our division offers 1 hybrid course - Biology 3A. This course historically has had a significantly higher retention rate vs. classroom instruction and has also had higher success rates. In 2013, the success rate of hybrid Biology 3 was 70% in comparison to 59% classroom instruction. In 2014, 85% of the students completed Hybrid Biology 3A - a rate that is comparable to the college hybrid retention level of 81%. With classroom retention rates being measured in the biological science division at 79% in 2014, it is obvious that a hybrid format is very successful in keeping students engaged in the learning process. For those students not prepared for upper level courses, increasing the number of hybrid sections for introductory courses like Biology 3 might also improve student success by allowing them to prepare for upper level science courses in a more flexible format.

As a result, Unit Goal 1 in this Program Review includes the development of more Hybrid sections for Biology 3A and new Hybrid sections for other Biological Science courses such as Physiology and Biology 7. Such hybrid courses may allow our division to not only increase its enrollment numbers but allow us to maintain our higher retention rates while increasing our success rates by allowing students more flexibility in how they learn.

Question: Compare the successful course completion rates of the Discipline(s) in the Division over time and with the college average.
If the rate of any of the Discipline(s) is lower than the college average, what factors contribute to the low rate (s)? What strategies, current or planned, address this?
If the rate is higher than the college average, what factors contribute to the higher rates?

Answer: The division's is ~64% as compared to ~63% of the college. There is parity here; we are meeting the standard.

Question: Compare the equity gap in the successful course completion rate(s) in the Discipline(s) over time and with the equity gap of the college over-all.
If the equity gap is higher than the college average, what factors contribute to the large gap? What strategies, current or planned, will address this?
If the equity gap is lower, what factors contribute to the smaller gap?

Answer: They are comparable at about 60/40.

Question: Given the data, describe the trends in Degrees and Certificates awarded. What are the implications for your Discipline/Program/Service?
What does the Division do to encourage Certificate and Degree completion?

Answer: Over the period of 2011 to 2014, there were 3 AA degrees awarded in Biology. The low number of AA degrees in Biology reflects the fact that most Biological Science students enroll to acquire specific pre-requisites in order to continue on to professional schools (like Physical Therapists assistant, Occupational Therapy) or to transfer as juniors to the UC or CSU systems. However, over that same period of time, 167 AAs in Liberal Arts and Sciences, Health Professions and 36 AAs in Liberal Arts and Sciences, Math Science & Computer Science were awarded. These Liberal Arts and Science degrees include the same biological and life science classes as those required of our AA Biology students. In total, 206 students taking our core Science classes were awarded AA degrees in the last 4 academic years.

As an avenue to increase student success and completion rates within our Division, this Program Review describes the eventual creation of a Laboratory Science Technician Certificate. The Battelle Report of 2014 identified a significant gap between the Life Science and Biotechnology work forces and the number of adequately-trained people filling positions within these work forces. It specifically identified California Community Colleges as a means of providing properly trained workers to these work forces. One of the recommendations of the Report was the creation of industry-recognized badges/micro-credentials that are a true measure of a student's abilities. One recent proposal is the creation of Certificate Programs within community colleges to provide industry with such credentials.

Within our region, only Mt. San Jacinto, Mt. San Antonio and Pasadena City College offer well-established Biotechnology Certificate Programs. However, many colleges within the LACCD are beginning to implement their own programs. West LA will continue in its development of a Biotech program by establishing a more formal Certificate program. As such, Unit Goal 2 of this Program Review describes the creation of a basic skills course and the eventual development of a Laboratory Science Technician certificate. This CTE certificate would be part of our Biotech program and would attract many new students to the campus.

Module: Staffing Trends

Question: Describe the trends in FTEF. What are the implications for your program?

Answer: Overall, the FTEF trends for 2014 have remained consistent with that of previous year.

Question: Are staffing levels adequate to fulfill the purpose of the Discipline/Program/Service? Explain.

Answer: No

With the improving economy, West LA College has been given the mandate to grow. Increasing the number of courses and student enrollment translates into increased state funding. In response to this call, the Biological Division is offering two new courses in the spring of 2016 - Biology 10 and Biology 110. Biology 10 is a field biology course that will introduce students to the intersection of biology with environmental science and is a lower division UC/CSU transferable course. Biology 110 - Molecular Genetics is also a UC/CSU transferable course that has been identified as a critical pre-requisite for students applying to Dental and Medical schools. In addition to these two new courses, the Division has plans to increase its offerings in the 2016 academic year. Specifically, Biology 185 will be offered in the winter semester and will give students hands-on training and experience in Tissue Culture. Biology 285 will be offered again in the summer of 2016. The Division is also planning on increasing the number of sections

offered for its more popular courses, Anatomy 1, Physiology 1 and Microbiology 20.

Within the Physical Sciences Division, the spring semester will see the addition of Biochemistry 221 to its curriculum. While the Biology and Chemistry Divisions outlines clear road-maps for those students wishing to train in these disciplines and gives them the opportunity to obtain the required pre-requisites for continuing on in higher education, until recently an important part of that road-map was missing - Biochemistry. This will no longer be the case with the offering of Biochemistry 221 this spring.

Finally, Unit Goal 3 in this year's Program Review is to improve the Biological Science Division's multi-disciplinary approach to the Science Curriculum. Science is no longer a well-segregated discipline. With increasing technology, comes increasing interactions among the major Science fields (i.e. Biology, Chemistry, Physics). Fields such as Biochemistry are long-standing and well established fields of study. Within the last decade, additional multi-disciplinary fields such as Environmental Science, Biophysics and Bio-engineering have become very popular. As a result, the Biological Science Division needs to keep pace with such changes in the science curriculum if it wishes to continue to adequately prepare students for transfer to upper level academic institutions and professional schools. The establishment of Biochemistry 221 and Field Biology/Biology 10 are key first steps in accomplishing this Unit Goal. However, the creation of additional courses like Biophysics and Bio-engineering would strengthen our curriculum as a whole.

With Biology 110 and Biology 10 being taught by existing faculty, this means that they may not be able to teach courses they have historically taught over past academic years. This will necessitate the transfer of these courses to adjunct instructors, skewing the Division's full-time to adjunct ratio. To prevent this, the Division wishes to hire a new full-time Biology/Bio-sciences faculty member. This Bio-sciences faculty member would be able to teach the Major's level Biology 6 course, allowing our Division to offer additional sections of this very popular transfer-level course. This faculty member would also be qualified to teach introductory Biology 3, again allowing our Division to offer more sections of this foundation-building science course. These additional sections could be offered as Hybrid sections (see Unit Goal 1). This Bio-sciences professor could also be asked to team-teach a multi-disciplinary course such as Biophysics with Physics faculty (as described in Unit Goal 3) or Environmental Science. As such, this new hire would work closely with the proposed new hires in Physical Sciences and Earth Sciences to strengthen the Science Division as a whole.

Finally, a new Bio-sciences faculty member would also be critical in the creation and implementation of our proposed Biotechnology program. While described in more detail in the Curriculum section of this Program Review, an early step to the creation of this program would be the creation of a Basic Skills course that could be offered as part of a Biotech Certificate or a Biotech AA degree. This Basic Skills course could easily be taught (in part or as a whole) by our new Bio-sciences faculty member.

In addition to a new Bio-science faculty member, the addition of new courses being offered this spring (Biology 10, Biology 110 and Biochemistry 221) places an increased burden on our support staff. Specifically, running these three new courses will require an increase in the lab technician FTE. Currently, we have two technicians with a combined FTE of 1.6 (1.0 and 0.6). Supporting the new Biology and Biochemistry classes will necessitate the increase of this FTE to a minimum of 2.0. Having two full-time technicians (each with a 1.0 FTE) will ensure that all Biological Sciences faculty conducting labs are fully supported both in the day-time and evening hours.

The addition of new courses will increase the Biological Sciences enrollment levels and place an additional administrative burden on the Chair of the Science Division and the faculty. An office assistant would greatly decrease this burden. The Biological Sciences Division has grown to 5 full-time faculty members this past year and employs 12 adjunct instructors. In addition, the Physical and Earth Sciences Division add another 14 full and part-time instructors. This means that the Science Division has an instruction staff of 31 and a complete staff of 35 with technicians. The Science Division in 2014 had 2,163 students or 8% of the total enrollment at West. Currently, the Science Division staff does not have any office support. As such, an office aide would dramatically improve the efficiency of this Division by assuming many of the day to day administrative details and functioning as a vital link between the community, the students and the staff.

Question: Please/reassigned time. Describe the Reassigned and Release time assigned to faculty in the division. Include the faculty name, amount of release/reassigned time, length of time the assignment will last (one semester, one year, if it's renewable, etc.), and the purpose of the r

Answer: The only faculty who has reassigned and release time of 0.7 FTE is the Chair of the Science Division, Dr. Abraha Bahta.

Module: Functions and Services, Academic Divisions

Question: List the functions and services provided by the Office / Program / Service.

Answer: The Biological Sciences course offerings and programs that:

- (1) Satisfy the natural science or biological science general education/GE requirements for an AA degree
- (2) Satisfy the natural science or biological science general education/GE requirements for entry into professional and vocational programs such as medicine, dentistry, pharmacy, dental hygiene, physician's assistant, occupational/physical therapy and nursing
- (3) Satisfy the requirements for AA degrees in biology and chemistry - both in their respective majors and as Liberal Arts and Sciences Majors
- (4) Satisfy the transfer requirements for transfer to the UC or CSU systems as a Life Science major.

In addition to the listed services above, the Division wishes to expand its function services to include Biotech courses that could be applied to our AS and AA programs. These courses could also be used for students wishing to obtain an ADT or to transfer to the UC system. The Division also wishes to add courses that would make up a CTE program for the training of middle skills workers in the Biotech, Pharma and Basic Science Research fields.

Question: What are the emerging trends in technology that affect the program?

Answer: Biological Sciences based programs are central to all other science programs as every facet of life is biologic.

Many of our students are preparing to enter clinical programs such as nursing, respiratory therapy, physical therapy, and other professional programs, including those in medicine, dentistry, pharmacy. Demand in these fields is anticipated to increase in the foreseeable future. As the demand for these health science professionals increases, it is evident that the Biological Sciences discipline will need to develop more innovative approaches to attract and train those students wishing to enter these fields. In response to this, one of the Unit Goals of this Program Review is the development of the Division's Virtual teaching methodology. Today, students readily and easily incorporate virtual software programs and smart phone/tablets into their everyday learning experience. To remain relevant and impact these students, our Division needs to recognize the power of these virtual tools and incorporate them into our teaching methodologies.

In addition to entering the health sciences field, many of our students are interested in STEM training. An increasing segment of the labor market today requires advanced training in STEM. The biosciences industry is emerging as a key economic driver. Both non-hospital and total bioscience employment trends have increased steadily over that last decade. Within LA County, there are over 2,900 Life Science and Biotechnology companies, employing over 45,000 workers. The Culver City/Inglewood area has 4 major biotech companies, with 12 additional ones located in Santa Monica and 20 more within a 30 minute drive of West's campus. Local educational institutes are the primary source of employees for these companies, with community colleges being targeted as the most promising future source.

The Battelle report identified LA County as generating the most number of college graduates with bio-related degrees. In 2010, LA County graduated 5,053 students with degrees ranging from AA degrees to doctoral degrees. Of those 5,053, 1,237 were Associate degrees. West LA College is a critical contributor to these graduates. In response, West's Science Division recently created a successful STEM program that continues to enroll an increasing number of students each year. However, to keep up with the increasing demand for students with STEM training, the Science Division will need to expand their course offerings to include more upper level science courses such as molecular and cell biology, biochemistry and biotechnology.

One emerging trend in community colleges is programs or courses in Biotechnology. These courses are designed to give students direct training in many areas of biology, chemistry and biochemistry so that students completing these courses can apply for jobs as lab technicians within a wide variety of science labs. Within the LACCD system, LA Trade Tech offers 2 bio-manufacturing courses called Biotechnology 010 and 012. LA Valley College offers 6 Biotechnology courses that range from lecture only theory courses

to ones with laboratories demonstrating key lab skills. Locally, Santa Monica College offers two Biotechnology courses, called Biology 4: Modern Applications of Biology and Biology 75: Biotechnology Methods. The course description for Biology 75 specifically states that the course will prepare students for jobs as lab technicians. Each of these courses were created upon recognition that biotechnology and the need for trained laboratory technicians as an emerging trend and an expanding area of the labor market.

As an initial response to this obvious technological trend, the Biological Sciences Division offered its first biotech-oriented course this past summer. Bio 285 was a hands-on lab course. It was taken by our STEM students, in addition to other science students and two Culver City High School students. Biology 285 gave the students direct experience working in a biotech laboratory setting. This course will serve as a basis for the expansion of the Division's offerings into biotech-based STEM courses designed to give our students hands-on experience in the practical application of their STEM education. A new course, new Biology 185 course: Techniques in Tissue Culture will be offered in the winter of 2016. To our knowledge, this course will be the first of its kind offered within the LACCD system and will be used as a foundation for creating the basic skills course described in Unit Goal 2 of this Review.

This program review specifically contains a Unit Goal (Goal 2) which proposes the creation of a Basic Skills laboratory course (i.e. Biotech 001) within our Biological Science Division that will be part of a CTE certificate program, as well as a future Biotech program. This course will provide our students with a set of critical laboratory skills enabling them to work within today's modern scientific laboratories. This course will include traditional lectures that will give enrolled students a strong theoretical foundation. More importantly, it will also provide them, in a laboratory setting, hands-on experience performing some of today's most common lab protocols, training them in the middle skills required for working in today's science labor market. The creation of Biotech 001 would bring our Science Division up to par with other local colleges and make our students more competitive in today's job market.

Question: Describe the technological advances that have been implemented to improve and streamline the Discipline/Program/Service.

Answer: During the summer of 2015, the Division offered a new course, Biology 285: Techniques in DNA. Since this course offered our students hands-on training in working with DNA in a laboratory setting, pieces of equipment were acquired by the instructor of record, Dr. Patricia Zuk. These pieces of equipment were either donated pieces of equipment or were purchased using her own funds. Those pieces that were purchased have been made available to the Science Division as a whole.

The equipment acquired for Biology 285 were smaller pieces such as vortexers, water baths, micropipets and pipette dispensers. However, large-scale pieces of equipment required for the continued development of the Division are still missing. Some of these pieces of equipment are now being acquired through a grant to develop the College's CTE programs. This equipment will also be made available for the Biological Sciences Division and also to the faculty and students of the Physical Sciences Division (i.e. Chemistry, Biochemistry and Physics).

Module: Survey Results

Question: Describe the results of relevant surveys (point-of-service surveys, student surveys, staff surveys).

Answer: The data collected on the various surveys over the years, convey that ~70% of respondents say as students their mission is to transfer to 4-year universities or onto professional programs like nursing. Over 50% have expressed interest in getting AA degrees in the Life Sciences, such as Biology.

Question: Discuss the implications of the survey results for the program.

Answer: Many of our students are preparing to enter clinical programs such as nursing, respiratory therapy, physical therapy, and other professional programs, including those in medicine, dentistry, pharmacy. Demand in these fields is anticipated to increase in the foreseeable future. As the demand for these health science professionals increase, it is evident that the Biological Sciences discipline will need to develop more innovative programs to attract and train those students wishing to enter these fields. In response to this, Unit Goal 1 of this Program Review is the development of the Division's Virtual teaching methodology in order to help improve the Division's enrollment levels and the success of these students.

Module: Curriculum

Question: I assistance that may be needed to resolve the problem. Missing course outlines of record: Refer to the report of courses with missing CORs, which is posted at the link in the Instructions section. Please describe the steps the division has taken or plans to take to correct the problem. Describe the additiona

Answer: All courses in the division have updated course outlines.

Question: Out-of-date course outlines of record: Refer to the report of courses with CORs that are out-of-date. Please describe the steps the division has taken or plans to take to correct the problem.

Answer: To our knowledge, there are no out-of-date CORs. .

Question: How does the department determine that classes are taught consistently with the official course outline of record?

Answer: There is a continuous Divisional directive to do that.

The full time instructors and adjuncts of the discipline meet at the start of every semester to ensure that all CORs are up to date and are being used in the curriculum. One of the Biological Science Division's faculty members (Patricia Zuk) is a member of the curriculum committee. Dr. Zuk has been working with the committee and the faculty of the Division to ensure all CORs are up to date and are in line with current state guidelines

All faculty are required to submit a copy of course syllabus by or before the second week of the semester. Each syllabus must reflect what is on the course outline. To assist them in preparing their syllabi, the Division has template syllabi available to all faculty members - both full-time and adjunct. If the need arises, these templates may be made available to all faculty using the Divisional website. The adjuncts are also asked to submit copies of their quizzes and exams. Performance evaluations on the instructors also dictate that they follow protocol.

Question: Are required courses scheduled in appropriate sequence to permit students to complete the program in the prescribed program length?

If yes, describe the rationale upon which the sequence is based.
If no, what is the plan for alleviating these problems? Explain.

Answer: Changes to our curriculum have been made during the last program review. The past summer saw the offering of a new laboratory-based course Biology 285 in which students had hands-on training in the manipulation of DNA. This past year also saw the approval of two new courses Biology 110 and Biology 10 that will be offered in the spring of 2016. Both of these courses are UC/CSU transferable.

The Science Division has created road-maps that outline how the student may obtain an AA degree in Biological Sciences within two years or transfer to various UC and CSU institutions as a Life Science major. An example of such a roadmap is given here.

(* = Electives)

Year 1 Fall: Math 260 5 units; Chem 101 5 units; Library Sci 101 3 units; *English 101 3 units = 16 units total

Year 1 Spring: Math 261 5 units; Chem 10 5 units; Biology 6 5 units; *Art 101 3 units = 18 units total

Year 2 Fall: Biology 7 5 units; Chem 211 5 units; Health 2 3 units; *Speech 101 3 units = 16 units total

Year 2 Spring: Chem 212 5 units; *Anthr 101 3 units; *Phys Sci 1 3 units; *Phys Sic 14 1 unit = 12 units total

This roadmap gives the students a simple to follow course sequence but allows them flexibility in terms of the electives they choose. Suggestions are given in terms of these electives in regards to whether the student is intending to transfer to a 4-year university or go on to a vocational program. The sequence is designed so that the students can complete their "foundation" courses in the fall of their first year (e.g. Math 260, Chem 101). In subsequent semesters, the students then complete more advanced courses.

This roadmap has many iterations and can be used by a wide variety of students. For example, those students wishing to continue on to professional schools such as nursing could alter the roadmap to include more suitable courses such as Anatomy 1 and Physiology 1 in Year 2.

To ensure that students can complete this roadmap in a timely manner, changes to our required courses have been made. For example, Biology 6 and Biology 7 are both required to transfer to the UC and CSU systems as a Life Science majors and are required for acceptance into many health science programs such as medical school. These two courses are now taught each fall and spring semester, rather than on alternating semesters. This relieves a bottleneck that used to exist for our Life Science students and now facilitates the timely granting of an AA.

With the addition of two new Biology courses: Biology 10 (Field Biology) and Biology 110 (Genetics), students are now being given even more options as to how many UC/CSU pre-requisites they can complete here at West. Both Bio 10 and Bio 110 will be offered for the first time in the spring of 2016 and will be offered each fall and spring semester. These two courses are listed in the COR as UC/CSU transferable. For example, Biology 10 may be taken by students wishing to fulfill their LS1 requirement at UCLA, while Biology 110 will be transferable as LS4 Genetics. The Biology faculty is currently working with local UC and CSU campuses to ensure that all four majors level biology courses - Biology 6, 7, 10 and 110 - are properly articulated with the UC and CSU systems. Once the equivalency of these courses is determined and/or confirmed, the faculty will work with the curriculum committee to ensure that assist.org is properly updated.

In addition to Biology 10 and 110, Biochemistry 221 is also being added to Biological Science roadmaps. Biochemistry 221 will be offered each fall and spring semester and will be taught by new Biochemistry faculty. The offering of Biochemistry 221 here at West will complement the Chemistry 211 and 212 series within the Chemistry AA roadmap.

With the addition of Physics 6 & 7 being offered each Fall and Spring semester, together with Biology 10 & 110 and Biochemistry 221, the number of transfer level classes offered each regular semester has increased dramatically within the Science Division. As a result all Science roadmaps, including that of Biological Sciences, will be examined and changed this year so that students can still fulfill their requirements for transfer or obtain an AA/AS degree within two years.

Question: How does your division assure the relevance, appropriateness and currency of each of its programs? Cite each program (degree/certificate program or meaningful grouping of courses) and the student data and environmental scan data that support the assertions.

Answer: The Biological Science faculty works closely with Dean Pracher to ensure that our curriculum remains up to date with changes in the local economy and workforce. Through this relationship, the Division has begun to develop both a Biotechnology Program and a Biotechnology Certificate/CTE Program. Both are designed to reflect the current changes in the fields of Biology and Biotechnology. To this end, the head of this development team, Dr. Patricia Zuk, has begun meeting with local Biotech business leaders and, together with Dean Pracher, has met with SoCalBio - a consortium of local Biotech companies. It is the intention of these meetings to develop a relevant Biotech program that will benefit those students wishing to pursue research careers in biotechnology or to acquire jobs in this field. To assist in this, the Division is exploring the creation of a formal internship program that our students may enroll in to receive credit. In addition, West LA College is a member of several biotech organizations such as SoCalBio and BioLink - an organization dedicated to linking educational institutes with biotech companies.

Also, many of our faculty have held research positions and continue to follow their respective fields. Developments in these fields are routinely added to current course content.

Question: hybrid classes?
How can the outreach, online and hybrid classes be improved? What outreach, online and hybrid classes has your department offered?
How many courses are offered via Distance Education, and for how many has a COR addendum for DE been prepared?
What are the benefits and problems associated with outreach, online and h

Answer: The Biological Science Division now has eight different Biological Sciences courses and each has a laboratory component. To-date, they are all taught in classrooms. However, Biology 3A was offered as a hybrid for the first time in Spring 2011 and we continue to support one such class every semester. This year, hybrid Biology 3A was taught by Dr. Kareen Martin. Analysis of this hybrid class identifies an 85% retention rate and a success rate of 68% which is higher than the Division success rate of 65%.

Analysis of hybrid Biology 3A has shown that it consistently has higher retention and success rates in comparison to traditional classroom methodologies. This is likely due to its more flexible schedule. As a result, the Division wishes to offer additional hybrid sections of Biology 3A, thus increasing its enrollment and success levels. In addition, the Division also wishes to develop additional hybrid classes such as Biology 7 and Physiology. Both Bio 7 and Physiology would offer on-line lectures coupled to on-campus discussion sections and traditional labs. Since Bio 7 and Physio labs are quite complex, a hybrid format would allow our faculty to substantially expand these labs, coupling them to short discussion sections and offering our students a morerigorous and better learning experience without the time restrictions imposed by traditional lecture/lab courses.

To create these hybrid offerings, the Division will work with the library and its media techs to examine the feasibility of recording lectures for hybrid courses. Hybrid classes would allow the Division to expand its enrollment levels by offering access to students who would take classes with us but cannot adapt their schedules adequately to come to class several times a week. It would also allow the students 24/7 access to lectures, allowing them to learn on their own time and to view lectures multiple times. Such a format would improve their chances of success.

If feasible, the Division will prepare COR addenda for each hybrid class in concert with the curriculum committee.

In terms of outreach, this past spring semester, Dr. Patricia Zuk met with the Biology faculty at Culver City High School. Culver City High School has worked with many Divisions at West for many years and has expressed a desire to work more closely with the Biological Sciences Division. As a start to this outreach, students were invited to enroll and attend this past summer's Biology 285 directed study class. Two students attended the course. The Biological Sciences Division will open access to this summer course again in 2016 in the hopes of attracting more students. Dr. Zuk and Dr. Simons and Dr. Cooper from CCHS also discussed inviting their biology classes to attend some of the college's science lectures and labs so that the students could experience college classes firsthand.

Question: Describe any long term changes or additions to the curriculum that you are exploring, planning or developing.
Changes that you plan to initiate in the coming year should be reflected in the Planning Section.

Answer: Within LA County, there are over 2,900 Life Science and Biotechnology companies. Expanding the area to include the Inland Empire and Orange County and the number of companies is over 5,400. Combined, these companies employ over 100,000 workers (over 45,000 in LA County) and add over \$40 billion to the regional economy. As a means of contributing to our local businesses and economy, the Life Science Division is still very interested in the creation of an AA/AS degree program with an emphasis on Biotechnology. However, the Division recognizes that this is a significant undertaking and one that will require careful and gradual expansion of their program and the addition of new faculty to its staff.

To this end, the Division offered its first Biotech course this past summer as the STEM course, Biology 285. This 6-week course trained students how to work with DNA in a laboratory setting not unlike one they would find in a Biotech company. This course will be offered again this summer. In addition, a new STEM course, Biology 185, will be offered this winter. This 5 week course will introduce students to Tissue Culture Techniques. Tissue Culture is an intrinsic part of the Biotech research laboratories and is a highly demanded skill for anyone wishing to work in the industry. Both of these courses could be expanded into full-semester courses that could be integrated into the Biotech AA degree program.

However, these courses can also serve as the starting point for a Basic Skills CTE course that the Division has begun developing over the last year. A statewide supply and demand analysis of Life Sciences and Biotechnology Middle Skills Workforce (The Battelle Report - 2014) identified over 8,000 businesses in California employing over 235,000 people. Within our state, a 5% increase in life science and biotechnology jobs was recorded from 2007 to 2012. In 2013, 17,000 middle-skills workers were employed, with a \$20 median wage. That year, experts projected 950 new openings requiring middle skills in subsequent years. Middle skills jobs general require workers to have some education and training beyond their high school diploma but require less than a bachelor's degree. Community college programs primarily prepare students for jobs in middle skills applications.

In the Biotech field alone, there were 3,297 Biotech job postings statewide in 2013. Of these, 423 were filled by community college prepared students (31 from LA area colleges). Therefore, there is a significant gap between the number of potential jobs and those filled by community college-trained students. To increase the number of properly training community college students who could successfully win these biotech jobs, the Battelle report proposed the creation and implementation of Skill Builder Basic Courses. These courses would give students training in many of the basic skills most biotech companies require of their workers. Both current employees and those wishing to enter the workforce would enroll in such courses. The current employee would receive additional training that would improve their position within the company and their yearly salary. The applicant would improve their chances of getting the job.

To capture this cohort of students, several LA area community colleges, including many from the LACCD, have begun to develop Basic Skills courses as part of a Biotechnology Program that aims to prepare students to successfully apply for these Biotech job openings. Within the LACCD system, LA Trade Tech offers 2 bio-manufacturing courses called Biotechnology 010 and 012. LA Valley College offers 6 Biotechnology courses that range from lecture only theory courses to ones with laboratories demonstrating key lab skills. Locally, Santa Monica College offers two Biotechnology courses, called Biology 4: Modern Applications of Biology and Biology 75: Biotechnology Methods. The course description for Biology 75 specifically states that the course will prepare students for jobs as lab technicians.

To keep pace with these colleges, the Biological Sciences Division is in the process of developing its first CTE basic skills course. This course is part of this Program Review as Unit Goal 2. Specifically, Goal 2 proposes the development of a Basic Skills course that will form the core of a CTE certificate program a program that could be expanded in the future to become a more rigorous Biotechnology Program that students could use to transfer or to acquire an AA/AS degree.

This proposed Basic Skills course (e.g. Biotech 001) will form the core of a future Laboratory Science Technician Certificate, in addition to being an integral part of a Biology AA/AS degree with an emphasis of Biotechnology. This basic skills course will be offered in the spring of 2016 with a limited enrollment of 24 students. It will follow the Battelle Report's recommended guidelines by developing common skill-based assessments driven by employer criteria. Following completion of this course, students will have received training in many of the skills that are frequently demanded by both Life Science and Biotechnology companies. This course will also form the foundation for a Laboratory Science Technician Certificate that the Division has begun exploring. Several new CTE programs have been identified by local community colleges that would be suitable for a Certificate of Completion or Achievement. Biotechnology was one of them. The Division is currently working with Dean Pracher on the development of a C-ID linked to a Laboratory Science Technician CTE certificate program. A Basic Skills course like Biotech 001 could be part of that program.

Outside of the life sciences, the Division is also in the planning stages for the creation of an Environmental Science certificate. As a response to market demand for educated employees ready to take part in a growing "green technology" sector, the Division currently offers two environmental science classes (one which focuses on biological processes and another which focuses on the changes in the physical environment) every semester. A proposal to add to these two classes and create an Environmental Science certificate program, similar to ones offered by Santa Monica College and other community colleges, is being discussed and will be developed further in the upcoming year.

This certificate program ties into Unit Goal 3 of this Program Review which proposes improving the multi-disciplinary approach to the Division's curriculum. Environmental Science education requires such an approach. This certificate program will be developed to include courses that combine knowledge from multiple disciplines found within the Science Division (i.e. biology, chemistry, earth sciences, oceanography) as well as classes in social studies that discuss the history of environmental legislation in the U.S. as well as ethics related to environmental laws. Once established, this certificate program will allow the Division to once again offer classes not currently in its catalog (i.e. oceanography) and will bring together classes from the major Divisions in the Science Division (Biological, Physical and Earth Sciences) into one certificate program. As a first step to creating this certificate, the Division will improve upon its two Environmental Sciences courses. For this, a resource request detailing the improvement of the Environmental Science laboratories is included in this Program Review.

Unit Goal 3 also describes the Division's collaboration with the Physical Sciences Division in the creation of a new course combining both Biology and Physics. This multidisciplinary course Biophysics is a popular addition to many Life Sciences curricula. The Division will work with Dr. Elizabeth Bell over the next academic year in the development of a Biophysics curriculum that students could take for credit applicable to an associate's degree or transfer to a four-year institute.

Question: List new or changed degrees and certificates that have been approved by the Curriculum Committee during the previous year, or are in the planning stages.

Program Name	Award Type	Curr Comm Action	Date of CC of Action	Type of CC Action
Laboratory Science Technician	Noncredit Certificate	NA-New program under development		

Module: Student Learning Outcomes

Question: Describe how course SLOs were assessed and how faculty were involved in the process in the prior year.

Answer:

Each faculty member has a schedule of required SLO phases for each course and each semester Dr. Bahta has met with each faculty member to ensure they are familiar with the SLO assessment process.

The Science Division does not have a committee representative - but one will be chosen from our new faculty - Prof. Bryon Curletto or Dr. Vered Mirmovitch.

Question: Based on course SLO assessments in the prior year, what changes to the course were implemented? List the changes to each course that were made based on SLO assessments.

Answer: Last year's Program Review outlined two significant changes to our courses based on assessment. Both changes will be fully implemented this year and included in our SLO assessments.

The first change was the acquisition of a cadaver for the Anatomy curriculum. This cadaver will be utilized in the spring semester to help our anatomy students and increase their success in the course.

The second change was the creation of a Science Division Study Center (SDSC). This center (formerly called the LRC) will be up and running for the winter semester and will be available for all Science Division students. This SDSC will be open in the evenings and limited hours on the weekend and will contain a variety of educational materials to supplement the labs and courses taken by our students in the traditional classroom setting. We believe that this SDSC will have a direct impact on student success rates by giving them access to materials they encounter in laboratory outside of class hours. This SDSC will also have an impact on the success rates of other Divisions, such as the Allied Health Division, in that it would also be made available to their students.

Question: Based on any of the following assessment methods:
 a. course SLO assessment;
 b. analysis of course sequencing;
 c. indirect assessment indicators such as state exams or employer surveys;
 d. student success data such as retention, success rates, degrees/certificates awarded
 what changes to the program are planned or being implemented?

Answer: In an analysis of course sequencing, several changes were identified and will be implemented this year. This first is the addition of two new Biology courses - Biology 10/Field Biology and Biology 110/Genetics. These two classes, once articulation with CSU and UC is completed, will satisfy additional lower divisional requirements for transfer to the CSU and UC systems. The Division is working with the Curriculum committee and with the articulation officers at UCLA and Cal State LA to ensure that these two courses will be equivalent to their lower division Biology classes. In addition, Biochemistry 221 will be offered for the first time.

This year will also see the development of more hybrid courses and an improvement of the Division's virtual teaching methodology. Specifically, Anatomy and Physiology will be impacted by this through the acquisition of virtual teaching tools designed to improve the success of the health science student.

This year will also see the development of multi-disciplinary courses like Biophysics to be added to our curriculum in the futures. It will also see the improvement of existing multi-disciplinary courses (Environmental Sciences) through the purchase of new laboratory equipment.

Finally, a basic skills biotechnology course will be developed in response to workforce trend analysis as an indirect assessment indicator.

Question: Will these planned changes based on Program SLO assessment necessitate a resource request?

Answer: Yes - this Program Review contains Resource requests directly related to Program SLO assessment
 1 - acquisition of virtual teaching methodologies for Biological Science courses
 2 - acquisition of laboratory supplies for creation and implementation of a biotechnology course
 3 - acquisition of laboratory supplies for multi-disciplinary courses such as Environmental Sciences, Field Biology and Biophysics

Question: How has faculty dialogue regarding assessment results and improvement plans been conducted and documented?

Answer: At divisional and college meetings.

Module: Departmental Engagement

Question: What interdepartmental collaboration has your Discipline/Program/Service been involved in during the past six years?

Answer: The Science Division runs efficient interdepartmental programs amongst our Disciplines of Biological Sciences, Physical Sciences and Earth Sciences.

We meet regularly on matters academic (course scheduling, course prerequisites, curriculum, development, etc...) and administrative (supply budget, student classroom, conduct policy etc.) to ensure that our individual discipline goals intersect. Since many of our pre-requisite and introductory Life Science courses intersect with that of Physical and Earth Sciences, these meetings are held to ensure that each discipline works together to ensure the alignment of the college's vision and mission.

The laboratory technicians from chemistry and the biological sciences work in unison to run the science laboratories, maintaining proposed budgets and relieving science faculty members of the routine chores that detract from academic responsibilities.

The implementation of Biochemistry 221 is a direct result of the interdepartmental collaboration between Biology and Chemistry. In addition to Biochemistry, conversations are ongoing between Dr. Patricia Zuk of Biological Sciences and Professor Elizabeth Bell of the Physics Department about the creation of additional multi-disciplinary courses such as Biophysics and Bioengineering. Dr. Vered Mirmovitch of Biological Sciences is also working with Dr. Beraki Woldehaimenot to improve the Environmental Sciences program and have it smoothly intersect with her new Biology 10/Field Biology course.

This interdepartmental collaboration is the subject of Unit Goal #3 in this program review.

Question: What has your Division/ Department/ Program done since the last review to establish connections with schools, institutions, organizations, businesses, and corporations in the community?

Answer: The Science Division's STEM program is designed to mentor and support those students interested in careers in science, technology, engineering and math. Those students will enter our community's labor markets as highly trained workers. As such, one goal of our STEM program is to work with surrounding institutions, organizations and businesses without our community in order to ensure that their professional needs are met by future workers. This goal may also be met through the creation of a Laboratory Science Technician CTE program (see Unit Goal 2). These workers will acquire in-demand middle skills through their taking of basic skills courses within our Division. Community colleges have specifically been identified as a vital source of these workers to local workforces and West is well positioned to take advantage of this labor demand.

In addition, many students who take our upper division Biology courses (i.e. Biology 6 or 7) wish to gain

direct work experience while taking these courses. Many of these students actively seek out internships with local Life Science and Biotech companies. Within LA County, there are over 2,900 Life Science and Biotechnology companies. Expanding the area to include the inland empire and Orange County and the number of companies is over 5,400. To help students make connections with these companies and to develop and acquire internships, the Division wishes to improve its ties with these businesses. Specifically, the Science Division will begin to actively explore the development of a more formal internship program for its students. This program will connect biology and chemistry students with local Biotech companies and will re-institute courses (Co-operative Education Biology 921, 931, 941) that the students, in consultation with their professor and the company, can take for college credit. These internships will not only give the student credit but may ultimately improve their chances of acquiring a job in their chosen field.

Our Division has also established other connections with the community.

This past spring Dr. Zuk met with Dr. Lisa Cooper and Dr. Peggy Simon of Culver City High School. During that meeting, the two schools agreed it would be beneficial to establish a relationship between the high school and the Biological Sciences Division. To that end, two of their students enrolled this summer in the directed study Biology 285 class. Additional students will be invited for next year. In addition, the Division will work with CCHS in bringing their biology classes to our campus for a day of learning at the college level.

This year, Dr. Zuk, Dr. Bahta and Dean Pracher also met with Dr. Terry Robins, CEO of Clinical Genomics Training Center. The meeting was to discuss opening some of the Biological Sciences space to Dr. Robins so that he might set up a laboratory manager training program. Dr. Robins was very interested in our space and will continue to keep in touch with the Division as he goes forward with his plans.

Dr. Zuk and Dean Pracher also met with Ahmed Enany of SoCalBio. The Division is part of a CTE funding project and the meeting was to introduce us to the services of SoCalBio and how they can provide a link between the college and local biotech business. Dr. Zuk has also continued to meet with members of this CTE funding team throughout the year. The last meeting was held at ELAC and brought together the CTE Project Manager, Wendie Johnson, with the heads of other Biotech programs at Citrus College, ELAC and Pasadena City College. Dr. Zuk also met with Dr. Elaine Johnson and Daniel Micheal of BioLink - a project out of City College of San Francisco that connects educational institutions with local biotech research companies.

Finally, to further increase our connection with the community, the S-STEM program offered a seminar series that invited professionals within our community to come and give talks to not only our S-STEM students but to the students of the Science Division. These talks introduced our student body to the opportunities that exist within our business community but also allowed these businesses to meet our student body and discover the advanced level of education that the Division is bringing. Finally, the Science Division as a whole is in the planning stages for cooperative grant proposal in partnership with one or two area colleges and universities to the Department of Education.

Module: Professional Development

Question: In order to keep current with new developments in your field, are there areas of unmet professional development needs among faculty in this program? If yes, please describe.

Answer: As the field of Biological Sciences is continually evolving, there is always a need for on-going professional development. New grant funding has assisted with some of this on a national level. However, additional development is necessary and critical for the continued success of the division. New funds are needed for: (1) Professional Society membership for full-time faculty members (2) Attendance and participation by faculty members in regional conferences and workshops. (3) Enrollment by faculty in Short Courses sponsored by Professional Organizations. (4) On-line subscription of relevant Journals and Magazines. The Division is also continuing our recently established a mentoring program to foster academic growth in new tenure-track faculty.

Question: For each regular full-time faculty member in your program, provide the committees in which each person is active, and list the 2 most significant professional development activities engaged in over the last 2 years. Activities may include workshop and conference attendance, courses taken, FTLA, Leadership Institute, etc. Committee roles may include chair, secretary, member, etc.

1 Faculty Name	4 First Prof Dev Activity	5 Year First PD Activity	6 Second Prof Dev Activity	7 Year Second PD Activity	
Patricia Zuk	Curriculum	member	Flex Day	2013	
Lauri Escudero	Environmental work	member	Flex Day	2012	
Steven Fink			Flex Day	2009	
Bryon Curletto					
Vered Mirmovitch			FELI	2013	

Module: Facilities

Question: List and describe any current facilities challenges (e.g., location, quantity, quality) affecting your division/department's ability to achieve its goals and meet instructional needs.

Answer:

The ability of the Life Science Division to meet growing labor and market trends - such as increasing numbers of STEM, environmental and biotech jobs - through effective training of our students requires improvement of our facilities. For example, within the MSA building are numerous preparation rooms that could be outfitted as small laboratories capable of being used for our proposed Biochemistry and Biotechnology courses.

In addition, the configuration of our classrooms makes it difficult to teach such upper level courses as Biology 6, Biology 185, Biology 285 and Environmental Science. These rooms in their current state will also make it difficult to teach our new courses Biology 110 and Biochemistry 221. As such, the Division will need to configure many of its classroom-style rooms (such as MSA 303) with its low tables designed for a lecture setting into laboratory benches. Site visits to other LACCD campuses such as ELAC and LA Mission has shown us that the appropriate classroom for teaching upper level courses like Bio 6, Bio 110 and Biochem 221, in addition to Environmental Science and Biotechnology courses, is a laboratory-style room with four-person laboratory height benches, complete with plumbing for water and gas and electricity. As such, re-configuring rooms such as MSA 303 (Biology 6) and MSA 309 (Biology 3B) into classrooms appropriate for laboratory work would allow us to teach classes such as Biology 110, Biochemistry 221 and Environmental Sciences, in addition to our long-standing courses of Biology 6 and 3B. The re-configuring of these rooms would give the Division more flexibility in terms of the laboratory training offered and would allow us to better train our students using a more hands-on laboratory approach. These classrooms would be modelled after the Anatomy and Microbiology labs on the second floor or the chemistry labs on the fourth floor. Rooms such as MSA 211 and 203 could be kept as they are as they may be used for classroom lectures.

With respect to currently offered courses, the Division would be able to better serve its students by updating lab equipment, computer equipment and software packages. For example, a significant improvement of Environmental Sciences is desired by the Division and is included in Unit Goal 3. This improvement will

necessitate the acquisition of more modern testing equipment for the lab. Microbiology 20 would greatly benefit from upgrading their microscopes and the purchase of more modern preparatory equipment. Many of our more advanced Biology 285 courses we offer to our AA degree and STEM students are difficult to implement, run and maintain because of a lack of appropriate facilities and equipment. Finally, all biological science courses would also benefit from upgrades to our prep labs and their equipment so that they meet more modern standards.

Question: Specify the division/ department's short term goals (1 year) for facilities improvement and functionality.

Answer: 1) Adoption of Virtual Anatomy tools: The proposed increased use of on-line supplemental teaching methods and interactive virtual laboratories will necessitate better student access to computers. As such, biology students will benefit from the purchase of virtual teaching systems, including the purchase of several tablets for Anatomy. These tablets (loaded with virtual teaching programs) will allow faculty to enhance the impact their teaching has on their students by allowing them to conduct virtual dissections. This, together with the cadaver purchased through last year's Program Review, will allow the students to learn human anatomy in a more realistic setting. This will also allow our Division to decrease the number of cats purchased for dissections each year. Preserved cats are not only expensive and need to be purchased each and every year, they are also a biohazard and require specialized disposal companies - another cost incurred by the Division. The use of virtual tools on tablet devices, combined with the cadaver will expose our Anatomy students to cutting-edge teaching techniques and improve the success within our program.

2) Acquisition of Virtual Physiology Labs: The purchase of virtual Physiology systems such as BIO-PAC is also desired by the Biological Sciences division. Such systems will give our physiology faculty the chance to better teach advanced physiological concepts such as EKGs, cardiac function, blood pressure and respiratory volumes without relying on the student's ability to use pieces of equipment that can be difficult and time-consuming to learn to use.

3) Immediate improvements to the Microbiology program include the establishment of a microscope servicing contract that will maintain the numerous microscopes we have within the microbiology lab. In addition, the purchase of a demonstration microscope/projection system will allow our microbiology faculty the opportunity to show students laboratory material at a more detailed level, increasing their understanding of the laboratory material. The division also wishes to upgrade their microbiology scopes within the next year or two to better benefit our students.

4) Upgrade of Environmental Sciences laboratory. Many of our Environmental Science students are interested in engaging in hands-on lab experience. This will require the acquisition of more relevant and modern testing equipment that will form the core of an improved Environmental Sciences lab. This lab and its equipment could also be used by other classes, including Field Biology 10, in addition to Earth Science and Physical Science students. Equipment in this lab would be used in the data collection and analysis of environmental measurements, air testing, soil and water quality, creating smog in bottle, and measuring electricity produced by solar energy.

Question: Specify the division/ department's long term goals (2-6 years) for facilities improvement and functionality.

Answer: Creation of a dedicated Biotechnology lab space.

An increasing segment of the science labor market today requires advanced training in STEM, including that of the biological sciences. Future technological and scientific advancements in fields such as stem cell research, regenerative medicine and biomedical engineering will require the services of well-trained and skilled laboratory technicians.

To meet these needs, West's Science Division wishes to expand their course offerings to include upper level science courses such as Biochemistry, in addition to a Basic Skills biotechnology course that would be part of a certificate program and part of a future Biotechnology program. Offering these two classes on a regular basis as part of the Division's course catalog will necessitate the upgrading of our lab facilities to allow for the labs commonly run in these courses.

Because of the advanced cell and molecular biology taught in Biotechnology and Biochemistry courses, laboratories are difficult to run without upgrades to more modern equipment and facilities, in addition to the

purchase of new equipment. For example, conducting many of the common Biotechnology and Biochemistry labs requires a classroom with lab bench-height benches outfitted with plumbing, gas and electrical (similar to those found in chemistry labs). We have a limited number of these types of classrooms on the second and third floors of the MSA building where the Biological Science labs are typically held. However, a re-configuring of the Major's Biology room (MSA 303) could allow for its use as a Biotechnology space. In addition, it would also allow the Division to upgrade the quality and relevance of the labs taught in Biology 6. Re-configuring MSA 312 into a similar laboratory room would result in a room that could be used for Biochemistry 221. Upgrading these rooms would have a direct and significant impact on the success of our science students as it would allow for us to significantly upgrade the quality of our classes.

Module: CTE Programs

Question: Does this Division offer any CTE programs? IF THE ANSWER IS 'NO' SKIP THE SECTION ABOUT CTE PROGRAMS, AND GO ON TO THE PLANNING SECTIONS.

Answer: No

Question: Review labor market demand. How does your program meet labor market demand? Cite specific examples and sources.

Answer:

Question: Advisory Board Membership. List the member name, company name, title and CTE program for each member.

Answer:

Question: Advisory Board Meetings. List the following information for each meeting held in the last year:

AB Name	Dates	Number Attendees	Minutes
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Question: What have been the major outcomes of your advisory board meetings? Of those outcomes, which have been acted upon, and what is your plan of action with regard to other outcomes discussed?

Answer:

Question: Describe and assess the evidence of students' attainment of intended learning outcomes, as measured by the employment and completion success of its students. [Ed Code 78016(a)(3)]

Answer:

Question: Is this program subject to approval/accreditation by specialized state, regional, or national accrediting agencies?

Answer:

Question: Indicate recommendation of the most recent accreditation evaluation of the program and corrective actions taken or planned. The most recent accreditation report and all additional pertinent documentation and explanations should be available on site for consultation.

Answer:

Question: Describe how you have assessed the appropriate improvements in student achievement and learning that have occurred as a result of the improved program practice.

Answer:

Question: Based on survey results, provide a brief analysis of employer satisfaction with program graduates.

Answer:

Question: Provide a brief analysis of student performance on licensure or board exams on first attempt for each program in the Division.

Answer:

Module: Completion

Question: Division Chair/ Program Manager: Fill out your name and date of final approval, save, and submit the program review.

Answer:

Question: List the people who participated in this Program Review.

Name	Role
Patricia Zuk	Full Time Faculty
Abraha Bahta	Full Time Faculty