CTE Program Review

Program Name: **Biology & Health Science**
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1. Description of Program

Provide a brief description of the program and how it supports the college's College Mission and Diversity Statements, CSM Strategic Goals 2013/14 to 2015/16, and other Institutional Program Planning as appropriate. What is the program's vision for sustaining and improving student learning and success over the next three years?

1. Description of Program

The Biology Department, including Health Sciences, is a vibrant, positive, successful member of the College community, with healthy student enrollments and a faculty that that is focused on student success. The department engages students in courses serving a range of educational goals, including transfer to baccalaureate institutions for science and non-science majors, prerequisites for programs including nursing and medical assisting and other allied health fields, and courses for general education, including a health science course. Biology and Health Science courses are currently taught by eight full-time professors and six adjunct instructors, supported by one full-time lab technician. Two of the full time faculty are undergoing the tenure review process. These two newer hires began teaching full time in the fall of 2015 and fall of 2016.

For the academic year 2015-2016 the department offered 41 sections of 18 different courses in Fall semester and 44 sections of 16 different courses in Spring semester. Six sections in Fall and nine sections in Spring were offered as fully online courses, and three courses' lab sections are web-assisted (BIOL 210, 220, 260).

The Biology department strives to be inclusive and equitable to all CSM students. Faculty and staff recognize, value, and reflect the diversity of the community they serve. The department has a dynamic learning and working environment that encourages multiple perspectives and the free exchange of ideas. Biology faculty are very active in supporting the College's Strategic Goals:

1. Student Success:

Student success is a top priority for the department. Faculty are actively engaged in professional development that keeps them up to date on developments and ideas in education. Through the lecture and lab courses in Biology, students are provided hands-on and active learning opportunities. Several faculty have adopted a pedagogical framework called Reading Apprenticeship, which promotes a student-centered metacognitive approach to teaching and learning. The department provides academic support through a variety of programs. Biology faculty both manage and work in two student learning support centers: the ISC (Integrated Science Center, 36-110) and the A & P (Anatomy and Physiology) Lab, 36-217. Courses in Biology and Health Science are also supported by Supplemental instruction and tutoring from the Learning Center. Faculty in the department use the district's course management systems to support their classrooms, and make them themselves available to students through email, and office hours, and the course management systems. With the recent news that the college received a five year STEM grant to serve Hispanic students, the department anticipates greater support in helping Biology students reach their academic goals over the coming years.

2. Academic Excellence:

Biology faculty routinely discuss student success in achieving course SLOs, and make adjustments to their teaching in response to the data. Special attention is paid to the development of critical thinking and quantitative skills since assessments have indicated students are not achieving success quite as well in these areas. Biology Faculty have also been involved in the Honors Program as foundation instructors and seminar instructors. Faculty assess course SLOs, align course SLOs to CSM General Education SLOs, and have established program and degree SLOs. Biology faculty have a strong presence at campus-wide discussions of SLOs and

assessment. Biology faculty maintain current course outlines through COI and have collaborated with Skyline and Canada College to establish common prerequisites for most 200-level courses.

The department has also partnered with San Francisco State University to offer the CCSF/SMCCD/SFSU Bridges to Baccalaureate Program to its students. The program is designed to enhance the academic and career success of underrepresented minority CSM students in the biomedical sciences. Professor Tania Beliz is the CSM Program Coordinator. The program includes Science-In-Action Seminars and summer research internships for CSM students.

Biology Professor Kathy Diamond and Physics Professor Mohsen Janatpour coordinate the UC CalTeach from California Teach Science and Mathematics Initiative that includes coursework and internships for students interested in a K-12 science teaching career.

Biology faculty demonstrate commitment to institutional excellence by serving on several committees that address academic excellence and student support, including Academic Senate Governing Council, Center for Academic Excellence (Professor Theresa Martin is the Chair), Learning Centers Committee, College Assessment Committee, Committee on Instruction, Evaluation Committee, Distance Education and Educational Technology Committee, Faculty Diversity Internship Program Working Group and others.

3. Responsive, High-Quality Programs and Services:

The Biology department has been at the forefront of distance education at CSM for many years. The Biology faculty teach online, hybrid and electronic supported classes of the highest quality by researching and implementing best practices in online education. With the advent of the Online Education Initiative, faculty now have state-approved guidelines and a rubric for online course evaluation. Student success in online courses often matches or exceeds success in face-to-face classes. The switch to the Canvas learning management system has already been made by three Biology faculty, and they provide help and insights to the other Biology faculty making the transition in 2016/2017.

Biology faculty, along with Chemistry, have implemented the use of Reading Apprenticeship (RA) at the College of San Mateo. Since the beginning Reading Apprenticeship workshop in the summer of 2012, Biology faculty have led the effort to expand the program across the campus, reaching more than 70 other faculty with training and support. Currently, seven Biology faculty (and one Chemistry faculty) are part of an RA STEM grant to develop and assess STEM curriculum using the RA framework. The RA STEM grant, funded by the Helmsley Trust, is managed by WestEd, an educational research and development organization. Theresa Martin of the CSM RA STEM team, is providing professional development statewide for the grant.

Biology faculty have also participated in the state-wide discussions leading to the development and implementation of the Associate of Transfer degree in Biology AS-T, as mandated by California Senate Bill 1440. They have also attended the Biotechnology All-Hands Meeting to discuss the Transfer Model Curriculum for Biotechnology. Faculty continue to revise course SLOs to align with courses in the Transfer Model Curriculum. Biology faculty have attended the ASCCC Curriculum Institute and the CTE Leadership Institute and the CTE Curriculum Academy and the Online Educational Regional Meeting.

As mentioned previously, Biology faculty have been instrumental in providing academic support services to students. Not only did departmental faculty establish the Integrated Science Center and the Anatomy and Physiology Lab, they also were early adopters of Supplemental Instruction on this campus, and are key contributors to the Community College Biology Faculty Enhancement through Scientific Teaching (CCB-FEST), a National Science Foundation sponsored grant to improve Biology teaching administered by the Science Education Partnership & Assessment Laboratory (SEPAL) at San Francisco State University. Through the SEPAL center, the biology department has sponsored several graduate students aspiring to be Biology teachers, and have been able to hire adjunct instructors from recent graduates of the program. Two faculty are participating in the Faculty Diversity Internship Program (FDIP) Working Group to develop internships to recruit qualified faculty who mirror our student population.

4. Support Professional Development:

Biology faculty have led professional development workshops and activities throughout the year. Activities presented include botany hikes, workshops on pedagogy, sustainability and social justice, science seminars, and others. Professor Theresa Martin has reassigned time to coordinate professional development for the campus.

5. Implement the Integrated Planning Cycle and Ensure Fiscal Stability and the Efficient Use of Resources

The Biology department participates fully in the planning cycle, and has been fiscally stable. However, laboratory materials have not been updated in quite some time, and need to be evaluated and enhanced to meet current teaching standards.

6. Enhance institutional dialogue

Faculty from the department participate in many cross-disciplinary activities, including serving on committees, supporting learning

communities, providing professional development, and venues for interdisciplinary dialogue. Biology Faculty strive to be open to new ideas and different perspectives. One of the newer campus initiatives that resonates with many of the faculty is the MINDSET 4.0 initiative that helps students (and teachers) develop habits conducive to academic success, for example: “listening with understanding and empathy”, “thinking interdependently”, and “communicating with clarity and precision”. Faculty are encouraged to integrate these “habits” into their curriculum.

2. Student Learning and Program Data

A. Discuss Student Learning Outcomes Assessment

1. Reflect on recent SLO assessment results for courses and degrees and certificates offered by the program.
Specify how SLO assessment informs curriculum development and changes to curriculum.

Reflect on recent SLO assessment results for courses offered by the program.

The SLOs of the majority of biology courses were most recently assessed in the Spring of 2016, and the data has been entered into TracDat. Most of the instructors report that the course SLOs (>70%) have been successfully met. In general, we identify the weakest areas to be related to SLOs that require well-developed critical thinking skills as well as quantitative skills. Many students are under-prepared when taking courses that make use of these skills and therefore students have a difficult time succeeding with SLOs centered on the same skills. As a department, we continue to have discussions on how to improve the level of preparation of students, particularly those taking 200-level courses.

Identify trends and discuss areas in need of improvement.

The Biology department continues to improve its scope and frequency of SLO assessment. Many instructors now assess every semester and assess most if not all of the SLOs listed for a given semester. However, in courses that include multiple sections, the SLO data reported often is derived from analysis of one or a small subset of the offered sections. One area that could improve is therefore including data for all sections taught for a given course.

The biology department is currently reviewing best practices for creation, implementation, assessment and management of SLOs in order to help us paint a more accurate picture of how well our students are learning and of the areas they need most help in.

Specify how SLO assessment informs curriculum development and changes to the curriculum.

Instructors frequently review the course SLOs for relevance and validity. We typically re-assess the SLOs that frequently under-perform. In these cases, we also discuss how to improve the teaching methods related to under-performing SLOs. In general, biology courses rely heavily on coverage of large amounts of content. We believe that shifting our pedagogy and curriculum design towards a greater focus on active learning approaches and on developing critical thinking will aid in improving the success of our students.

2. Comment on the success rates in the program SLOs that are aligned with specific course SLOs. What do the program SLO and course data reveal about students completing the program? Identify trends and discuss areas in need of improvement. Is the alignment between course and program SLOs appropriate and informative? Describe any additional methods used to assess program SLOs and reflect on the results of those assessments. See course-to-program SLO alignment mapping.

Comment on the success rates in the program SLOs that are aligned with specific course SLOs.

Based on the success of aligned course SLOs, our Program SLOs continue to perform well and improve. The most challenging area for our students continues to be the application of critical thinking skills tied to many of the course and program SLOs.

What do the program SLO and course data reveal about students completing the program?

Students that complete our programs should be well prepared to tackle problems related to the subjects that support the program SLOs.

Identify trends and discuss areas in need of improvement. Is the alignment between course and program SLOs appropriate and informative?

The program SLOs are well supported by the many courses that we teach. However, in order to strengthen the achievement of the Program SLOs by our students, we are in the process of re-evaluating the alignment of course to program (and GE) SLOs as part of the continuing cycle of revisions to the course outlines.

Describe any additional methods used to assess program SLOs and reflect on the results of those assessments

We have used student surveys in the past but found that only a very small number of students complete these and therefore the results are not conclusive enough to warrant discussing. The school has not done these surveys in the last year for the Biology programs. The faculty will investigate implementing e-portfolios or capstone projects as part of assessing the completion of program SLOs.

What do assessment results for the course SLOs (and for the GE SLOs, if available) reveal about student attainment of the GE SLOs?

Students appear to have the most difficult time doing well in courses that emphasize critical thinking and quantitative skills.

3. For any courses in the program that satisfy a GE requirement, which GE SLOs are supported or reinforced by the course SLOs? What do assessment results for the course SLOs (and for the GE SLOs, if available) reveal about student attainment of the GE SLOs? See GE SLO Alignment Summary Report or All Courses GE SLO Alignment Data.

For any courses in the program that satisfy a GE requirement, which GE SLOs are supported or reinforced by the course SLOs?

Most of the courses offered by the Biology Department support the GE SLOs. The SLO supported the most strongly is the Effective communication. The least supported GE SLOs by our courses are: A) Social Awareness and Responsibility and B) Ethical Responsibility/Effective Citizenship.

What do assessment results for the course SLOs (and for the GE SLOs, if available) reveal about student attainment of the GE SLOs?

Students appear to have the most difficult time doing well in courses that emphasize critical thinking and quantitative skills.

B. Student Success Indicators

1. Review Student Success and Core Program Indicators and discuss any differences in student success indicators across demographic variables. Also refer to the College Index and other relevant sections of the Educational Master Plan: Update, 2012, e.g., Student Outcomes and Student Outcomes: Transfer. Basic Skills programs should also refer to ARCC data.

Student success in Biology and Health Science courses remains fairly constant: in 2013-2016 success averaged 60.9%, and retention averaged 78.8%. Biology and Health Science success is about 10 percentage points below the college average and retention is 6 percentage points below the College values for the same time period. Both on-campus and online courses in the

sciences present somewhat greater challenges for students than non-science courses. This may be why success correlates with age, since maturity is an important "skill" needed for regular and productive study, a key to success in the sciences. The department faculty continue to pursue approaches that will improve student retention and success, both within the department and division, and with faculty in other disciplines. Of continuing concern are the disparities among under-represented groups in Biology compared to the College. Biology Department enrollment by ethnic group roughly parallels the college with Filipino enrollment a few percentage points higher and Hispanic students about 2 percentage points lower. From 2013-2016 the percentage success of Black and Pacific Islander students has fluctuated, although this might be a reflection of the very low numbers enrolled at the college and in this program (3.7% and 2.2%, totaling less than 100 students in each group in this program). While the success rate for Biology and Health Sciences is lower that the college overall, Hispanic students are of particular concern with a 15.7% lower success rate in this program compared to the college overall for the same time period. The Biology and Health Science and other Math & Science faculty have engaged in discussions concerning the cultural and societal perspectives on science that may be influencing differences in our enrollment and success compared to the college. Likewise, this is also a reason Biology faculty participate in College committees and professional development activities that investigate ways to improve student achievement.

Biology faculty participate in the Community College Biology Faculty Enhancement through Scientific Teaching (CCB FEST) partnership with SFSU, the State Academic Senate STEM Academy, the Community College Success Network (3CSN) participation in the national Biology Vision and Change Initiative, and participation in AAC&U: Project Kaleidoscope, Ramping Up for STEM Success Initiative, and in the state-wide faculty discipline group developing the Biology Transfer Model Curriculum and the Coaching for Equity workshop. Biology and Health faculty held focus group at the “Village” with the Puente and Mana students to discuss attitudes about online education. We have also had recruited several successful applicants to the Bridges to Baccalaureate program with SF State. Biology faculty have also attended the UCSF LGBTQI Health Forum.

As a way to maintain the quality of our online offerings, the Biology department has an internal policy of requiring STOT or other recognized online training, plus mentoring by experienced distance education faculty. Given the challenges of online teaching, it is essential to have the same quality of instructors as in on-campus courses.

2. Discuss any differences in student success indicators across modes of delivery (on-campus versus distance education). Refer to Delivery Mode Course Comparison.

Student success in biology Distance Education (online classes) has been tracked for several rounds of Program Review. Historically, BIOL 100, BIOL 130 and HSCI 100 were the courses offered both on-campus (Traditional) and online (Distance Ed). Currently, the HSCI XLO course is the only HSCI section offered and exclusively online. BIOL310 Nutrition has recently been offered face-to-face for 2 semester. This course has been a very successful offering online and we hope that it will be a successful face-to-face offering. Although offered, face-to-face sections of HSCI 100 do not fill and have to be cancelled. Several sections of online HSCI 100 also did not fill and the students were referred to the HSCI 100 XLO section.

The combined success rate for BIOL 100, BIOL 130 and HSCI 100, the courses that have a history of being offered face-to-face and online, are 55% compared to 56.5% for face-to-face sections. Each online course shows higher success than the paired traditional sections. Retention was higher online for face-to-face sections by 4.2% (81.7% vs 77.5%). For the Fall semesters 2013, 2014 and 2015, these three courses had a combined 14 online sections compared to 20 face-to-face sections.

The ethnic profile of students taking online courses is not same as in traditional versions of the same course for all groups. The total number of students in some ethnic groups enrolled in online sections is too small to offer a legitimate success and retention comparison with traditional courses. As promised in the previous Program Review, we have begun tracking the enrollment, retention and success of different ethnic groups in online vs face-to-face sections or the same course. We have realized a particularly distinct enrollment disparity with the Hispanic students. This group enrolls in online courses at 7.4% lower than face-to-face section of these three courses, a trend which is noticeable in the college overall. We sought to begin an investigation of this phenomenon by hosting a focus group with the Mana and Puente students in 2015. We anticipate continuing our research into this disparity, because of it turns out to be true this group of students will be missing out on a large part of the future of education.

Biology faculty participate in College committees and professional development activities and anticipate further research to investigate ways to address disparities in achievement.

C. Program Efficiency Indicators. Do we deliver programs efficiently given our resources?

Summarize trends in program efficiency as indicated in the Student Success and Core Program Indicators (LOAD, Full-time and Part-time FTEF, etc.)

Biology has high efficiency, with a LOAD of 579 in 2013-2015 compared to the College LOAD of 511.5 9 (fall term only). In 2013-15 Biology percent full-time FTEF was higher than the College: 61.9% compared to 58.4%. Even so, the department continues to struggle to staff high-demand distance education and traditional courses such as Anatomy and Microbiology with a shortage of qualified adjuncts and especially of full-time faculty. An evening section of Microbiology (BIOL240) was cancelled because the part-time faculty left for a full-time position at another college. With the increasing involvement of Biology faculty in college and district initiatives in the coming year, the need for additional faculty is compounded.

The Biology department is fairly stable in "supply and demand," but is responsive to changes in student need, as well as changes in the College. Demand in some courses has been fluctuating over the past two years, impacting scheduling decisions. For example, enrollments have decreased in BIOL 230, 240 and 260. In Fall 2016 the department offered BIOL 230 as an evening session, which successfully filled. Enrollments have stabilized in BIOL, our foundation biology course. The number of online BIOL 310 sections has been increased every semester, and is now being offered as a face-to-face section during the spring semesters. Moreover, this course will be the foundation course for the new transfer nutrition degree.

The table below compares the number and types of sections of Biology courses offered between Fall 2009, Fall 2014 and Fall 2016, reflecting changing requirements and student need. If not specified the class is traditional (on-campus). Some courses are only offered in Spring semester, so not all comparisons are shown. For example, BIO 102 is offered one section one online section Spring semesters.

Course	# sections Fall 2009	# sections Fall 2014	# sections Fall 2016
BIOL 100	6 on campus + 1 online	4 on campus + 2 online	4 on campus + 2 online
BIOL 110	7	8	6
BIOL 123	1	1	1
BIOL 126, 127, 128	2	3	3
BIOL 130	2 on campus + 1 online	2 on campus + 1 online	2 on campus + 1 online
BIOL 145	1 online	1 online	1 online
BIOL 184	1	1	1
BIOL 195	1	1	1
BIOL 210	1	2 webassisted	2 webassisted
BIOL 220	1	1 webassisted	2 webassisted
BIOL 230	1	1	1

BIOL 240	4	3	1
BIOL 250	6	6	6
BIOL 260	3	2 webassisted	3 webassisted
BIOL 310	0	3 online	3 online
BIOL 329	0	1 new name IDST 102, 104	1 as IDST 102, 104
HSCI 100	7 on campus (incl. 1 coastside) + 1 TV + 1 online	1 on campus + 2 online	1 XLO (increased enrollment)

Biology, Physics and Chemistry departments have coordinated scheduling of Biology major courses so that students will have stable scheduling over several years, and in a way that students can take all of their classes efficiently. Bio majors take a biology and a chemistry class each semester, plus physics and math, in addition to general education classes. With a limited number of sections in these specialize classes, coordination with chemistry, physics, and math is essential for students to complete their transfer requirements efficiently to transfer successfully.

Demand for online courses continues to grow, with sections filling early. Many faculty have committed to teach online courses and are slowly getting re-trained in the new course management system, CANVAS. The online biology teachers are meeting the challenges of retention and success that set online classes apart from traditional courses. The Biology department maintains academic standards by requiring training and mentoring of prospective online instructors.

Percentage of full-time classroom teaching FTEF in Biology fluctuates from 2013 to 2016 (fall semesters) ranging from 49.9% to 72.9% with an average 62% compared to the college full-time classroom teaching FTEF of 58.4% for the same fall semesters. More full-time faculty are needed to achieve college goals of student success, academic excellence and high-quality programs, as well as institutional dialog. In Fall 2016 two full-time Biology faculty will each have release time to work on a District initiative on Distance Education.

3. Career Technical Education

A. Career Technical Education Data (This information is required by California Ed. Code 78016.)

1. Review the program's available labor market data, as applicable. Here are two relevant links:

- State Of California Employment Development Department, Labor Market Information Division (the official source for California Labor Market Information)
- Employment data (by Program Top Code) from the State Chancellor's Office

Explain how the program meets a documented labor market demand without unnecessary duplication of other training programs in the area.

CSM Biology and Health Sciences Department has a local CSM AS degree in Biotechnology and a Certificate in Biotechnology as well as the AS-T in Biology, which is also a sector related degree.

The several programs that support the Life Sciences and Biotechnology industry sector, specifically train students in diverse areas to not only prepare for transfer to four year colleges but also to potentially enter the workforce directly or train people already in the industry. This sector encompasses a group of diverse industries (agriculture feedstock and chemicals, drugs and pharmaceuticals, medical devices and equipment, research testing and medical laboratories and bioscience-related distribution) with a common link – the application of biological scientific knowledge to make products that are useful to humans. In the San Francisco Bay Area the industry is economically critical to the region and provides workforce opportunities for California community college students.

A sampling of the industry need primarily shows baccalaureate degree level job openings yet, the industry representatives at the Regional Biotechnology meeting several years ago discussed the need for more than baccalaureate degree and lab position. There is need for employees familiar with the language of science and biotechnology as well as knowledge of industry equipment and procedures in the job areas of facilities, supply chain and administration and management as well as the need for good written and oral communication skills of all employees.

Our department supports transfer to 4-year colleges in addition to awarding Associate level degrees and certificates in Biotechnology. As such, there is a predicted 10 year (2012 – 2022) stable job growth for this sector for graduates with 4-year degrees. A sampling of the San Francisco, San Mateo and Redwood City area shows a 4%. 3.1% and 1.5% growth in the need for 4-year degree Microbiologists, Biologists and Biological Technicians, translating into approximately 200 jobs per year growth. Considering the reputation that the San Francisco Bay Area has for being a Biotechnology Industry hub, the East Bay and Silicon Valley each have about 2 - 10 times as much industry sector revenue, about $4- 5 billion each compared to San Francisco Bay at $400 Million to $2 million. They each have about 2 – 4 times as much employment in this industry sector. According to a workforce development report summary, the three areas have from 26,000 – 60,000 jobs in this industry sector. As such, this industry sector provides a health regional work force, employment need and financial viability.

From 2013 to 2016 the CSM Biology and Health Sciences Department has awarded 2 Biotechnology Certificates and 21 AS degrees in Biotechnology. As our program's awareness grows, we anticipate working with our Deputy Sector Navigator, Josie Settee, to coordinate our program with the other local programs to avoid unnecessary duplication.

2. Summarize student outcomes in terms of degrees and certificates. Identify areas of accomplishment and areas of concern. collegeofsanmateo.edu/institutionalresearch/degcert.asp

From 2013 to 2016 the CSM Biology and Health Sciences Department has awarded 2 Biotechnology Certificates and 21 AS degrees in Biotechnology.

As our program's awareness grows, we anticipate working with our Deputy Sector Navigator, Josie Settee, to grow our program in appropriate directions.

We are slowly making some adjustments to our courses to support this industry sector. These changes have come about primarily as our regular faculty duty to stay abreast of the developments in our fields of specialty. There is obviously a need to implement a more organized approach to including more biotechnology in our courses.

Community Colleges in the San Francisco Bay area have upgraded their courses and programs by purchasing and updating equipment to resemble industry grade equipment and to align lab skills to workplace standards.

Some CSM Biology courses use contextualized learning modules to help students develop better critical thinking and problem solving skills. A Bioinformatics module, in particular, was developed directly from participating in meetings and workshops sponsored and organized by the Deputy Sector Navigator for Biotechnology.

The following are several emails from a former biology student that participated in that class:

From May 1, 2015:

This might sound kind of random, but I am an former student of yours and did the honors project with you. I wanted to let you know that I'm going to be doing an internship related to deep-sea viruses and bioinformatics this summer. Most of my experience for the internship came from doing the honors project and from the bioinformatics unit of microbiology, which I talked about a lot during the interview. So, I just wanted to say thank you!

Hope everything is going well,

From August 25, 2016:

I don't know if you remember me, but I took microbio and the Honor's Project with you in the Spring of 2014. Your classes inspired me to switch my major from genetics to bioinformatics when I went back to UCSD the following year. I'm now a year away from graduating with a degree in bioinformatics, and a research assistant in a UCSD bioinformatics lab doing research on type 1 diabetes.

I was just thinking about how if I hadn't ended up in your class on the first day (which was entirely possible, as I was deciding between taking microbiology and calc III that semester), I might have ended up somewhere totally different. Bioinformatics is a field that I'm really excited about entering, and I don't know if I would have discovered that if it hadn't been for your influence.

So anyways, thank you! Hope everything is going well.

3. Review and update the program's Advisory Committee information. Provide the date of most recent advisory committee meeting.

We have not attended an Advisory Committee meeting. Some of the data presented above is from the Advisory Committee reports.

But, in order to better understand CTE and the role that CSM Biology and Health Sciences Department may play, faculty member Christopher J Smith has attended numerous meeting and workshops over the past several years. He has attended the CTE Leadership Institute (2016) and the CTE Curriculum Academy (2016) and the BAYWORK Water/Wastewater Career Pathways Summit (2016), part of Workforce Development. He has attended the CSU Program for Education & Research in Biotechnology (CSUperb) in 2012, 2013, and 2014. He attended the Bayworks. He attended the Biotechnology Marketplace INDUSTRY-COLLEGES MEETING in 2014 and the National Biotechnology Education Consortium meeting (2012).

4. Additional Factors

Discuss additional factors as applicable that impact the program, including changes in student populations, state-wide initiatives, transfer requirements, advisory committee recommendations, legal mandates, workforce development and employment opportunities, community needs. See Institutional Research as needed.

1. Distance learning

The Biology department continues to be at the forefront of distance education. Student success in these courses often matches or exceeds success in face-to-face classes. Biology faculty have long-standing departmental standards for online teaching, mentor new online teachers, and are on the Math/Science Technology Committee. Some courses are currently only offered online (BIOL 102, 145, HSCI 100), while some have both on-campus and online sections (BIOL 310, 100).

Since Biology faculty developed and began offering the Extra-Large Online course (XLO) for Health Science 100 in Spring 2015, it has become the only form of HSCI 100 offered, and satisfies all the demand for the course (it is a graduation requirement for UCs and CSUs). The conversion of HSCI 100 to XLO has helped with the shortage of faculty to teach online courses. An additional Health Science Department issues was resolved in the past year: while Health Science has not merged into Biology, the College now allows a single evaluation for faculty teaching Biology and Health Science courses, rather than a separate evaluation for those faculty for each department.

While it is difficult to keep up with the demand for online courses, there has been an increase in training of adjuncts and the addition

of a full-time faculty who teaches online. In Fall 2016 there are 9 online + 7 web-assisted Biology or Health Science sections. For Spring 2017 the department has scheduled 12 online + 7 web-assisted Biology or Health Science sections. For continued growth of online sections, taught by well-prepared faculty, the department continues to need more full-time faculty that are qualified to teach online. The Biology faculty closely assess the qualifications and training of online instructors. Meanwhile there is a continuing problem with limiting class size in online courses. Without the obvious physical limitation of a classroom, faculty feel pressure to allow more students into online courses than their on-campus equivalents.

In the past, there has been dialogue between the Division Dean and the online faculty concerning the enrollment cap for online sections of a course. Currently, online sections of BIOL 100, 130 and 310 are capped at 45 compared to the face-to-face sections capped at 60. During the 2008 economic downturn there was an increased demand for courses and some faculty agreed to increase the enrollment cap for their online classes, which has been rolled back to the previous cap.

To maintain good practice in online education and accreditation standards, and meet state and federal requirements for regular and effective contact and improve success and retention, the department would like to develop a plan for evaluating enrollment maximums and work with administration to develop guidelines for enrollment maximums incorporating suggestions from the position paper of ASCCC. The California Community College State Academic Senate's (ASCCC) Position Paper (2012, http://www.asccc.org/papers/setting-course-enrollment-maximums-process-roles-and-principles) states that "… the primary basis of any determination of enrollment maximums should be the pedagogical factors that influence the success of the students in the course."

A new issue adds to the challenge of offering online courses: the switch from WebAccess to Canvas platforms for CSM courses. Some faculty have been among the early adopters of Canvas, and discovered that the time commitment is more than planned for in training workshops. While on-campus instructors can slowly develop components of Canvas for their classes, online instructors must change over in toto, and there is concern that the training and development time has not been planned for, and lack of professional development time will hinder successful preparation of online courses on Canvas.

2. Articulation

The department's courses are strongly articulated with UCs, CSUs, and private universities. The Biology AS-T and Nutrition AS-T degrees were approved in Spring 2016. Adjustments were completed for Biology courses to comply with the Transfer Model Curriculum Course Descriptors. The Biology department expects students pursuing transfer to the State University system to have a more transparent path. A more strict accounting on the number of units students take before transferring, and a clear listing of chemistry, biology, physics, math, and GE classes students must complete before transferring should expedite transfer readiness as long as students can be accepted to their desired CSU campus. Students pursuing transfer possibilities to the UC system will still have to use ASSIST (assist.org) for more guidance since transfer requirements vary between UCs and programs/majors.

Transfer Model Curriculum Course Descriptors for Anatomy and Physiology were approved in 2012. Our Anatomy and Physiology courses are being adjusted to align with the Bio110B C-ID (Anatomy) and Bio120B C-ID (physiology).

The department may develop HSCI 101 to be able to propose a Public Health AS-T. Faculty will work on this in Spring 2017. If possible HSCI 101 could be offered online.

Bio 220 (botany) and Bio 210 (zoology) are only offered at CSM, and due to the high demand for them by beginning Biology majors, double sections of both are offered both Fall and Spring semesters.

To improve articulation with San Jose State, an important transfer institution for College of San Mateo students, the department added a Human Biology laboratory unit, Biology 132 in Spring 2016. This lab is of use to students for general education as well as pre-health preparation. Biology 132 may be taken concurrently with Biology 130 or after its completion.

3. Classroom limitations and strategic scheduling of classes

The department continues to have limits in course scheduling due to the lack of lecture and lab classrooms in building 36. This is true for high demand courses with dedicated classrooms as well as for lecture courses. As discussed in 2015 Program Review, the department has limitations in dedicated lab rooms such as Anatomy-Physiology lab (36-217). Coordination of lab set-up, equipment placement, and other material preparations complicate the heavy schedule for room 217. Biology faculty hope to participate in interdisciplinary space use in the future building 10-12 Emerging/Innovative Technologies Building.

For both major and nonmajor Biology classes, faculty have determined that scheduling is crucial to filling classes, with a greater pressure to cancel classes that have not reached 20 students by certain dates before semesters begin. Noticeable success in filling classes results from offering courses within continuous hours twice a week. For example, Biology 230 was offered for many years at staggered times over three days (MWF lecture at 10 and W lab 2-5); the course was canceled due to low enrollments Fall 2014 and

2015. For Fall 2016 the course was changed to two evenings and has filled. For Spring 2017 it will be offered MW 2-5. The scheduled class times were carefully coordinated with the faculty and schedules for the other courses Biology majors need to take, in Chemistry, Physics and Math.

Classroom availability is crucial in order to offer CSM courses at convenient times to working students and students who are on other campuses part of the week. Tuesday-Thursday and Monday-Wednesday scheduling are most useful to students, at morning to mid-afternoon times. The days of full-time, 5-days on one campus students, who will take classes whenever they are offered, are gone. Fall 2016 one Biology 100 section is taught in building 10 in order to fit students' preferred times. The department will continue to work to strategically schedule classes for student accommodation.

5. Planning

A. Results of Program Plans and Actions

Describe results, including measurable outcomes, from plans and actions in recent program reviews.

Biology is a diverse field of study, and instructors generally specialize in a few different courses, rather than the entire range of offerings of the department. Adjuncts' loads are usually maximized, and though adjuncts have high regard for the College, they will take a course in a more convenient location when it is offered (and of course a full-time position elsewhere). The Biology department has a very strong need for an Anatomy position at this time, since the department is still short a full-time instructor in Anatomy. Further, an Anatomy/Physiology professor will retire in the next year or two.

More faculty trained in CANVAS will be needed to teach online courses starting in fall 2017. We do not have enough staff to teach all of our online sections. In Spring 2016, there were 11 online + 6 web-assisted Biology or Health Science sections. Current online biology instructors are meeting the challenges of retention and success that set online classes apart from traditional courses. The Biology department's policy for staffing online classes that incorporates a requirement for training and mentoring of prospective online instructors allows assignment of instructors to online courses with confidence in the quality of the course.

Biology faculty have responded to the college's documented need for enhancement of student success by becoming very active in initiatives directly promoting student success. Faculty have taken a proactive role to improve student achievement, especially through in-depth development of Reading Apprenticeship skills and Focused Inquiry Groups, as both leaders and learners. Two full-time faculty and two adjuncts have implemented Reading Apprenticeship practices as regular parts of some or all of their Biology classes. Biology faculty provide leadership in the Integrated Science Center and A & P Center, are active participants in the Learning Support Center Coordinating Committee, CCB FEST workshops at San Francisco State University, the Bridges to Baccalaureate NIH- funded partnership with San Francisco State University, and numerous other initiatives to promote student success. The department has led efforts to adopt the 3CSN-sponsored Reading Apprenticeship Program across the campus, and one faculty member is the campus coordinator of Professional Enrichment through the Academic Senate.

Since the Spring 2015 Program Review, the department was able to purchase all requested equipment, including anatomy models and microscope slides to replace or improve slide sets for Biology 110, 210 and 250. Recent additions to the department have included new microscopes in Microbiology (BIOL 240), digital spectrophotometers for biology labs, and computers for Biology classroom use.

B. Future Program Plans and Actions

Prioritize the plans to be carried out to sustain and improve student success. Briefly describe each plan and how it supports the CSM Strategic Goals 2013/14 to 2015/16. For each plan, list actions and measurable outcomes. Plans may extend beyond a single year.

Describe the professional activities and institutional collaborations that would be most effective in carrying out the program's vision to improve student learning and success.

Biology success and retention is about 5 percentage points below the College values. Of special concern is the difference among under-represented groups in Biology compared to the College. While age is a factor, Black and Hispanic students have at least 10% lower success and retention in Biology than the College overall. Thus Biology faculty continue to participate in College committees and professional development activities that investigate, test, establish and institutionalize teaching and learning methods that improve student achievement. This includes a long-term commitment to Reading Apprenticeship training and applications and related formal and informal faculty inquiry groups that stimulate implementation of productive pedagogical techniques, transformation of the classroom and learning environment, and enhanced interest in the scholarship of education.

Biology faculty have made significant contributions to Student Life at the College of San Mateo. In addition to advising several clubs, biology faculty take active leadership roles at Family Science Day, Maker's Space activities and Earth Day community events. Several faculty members also mentor Honor's Project students as their Foundation Faculty every academic year.

Two biology faculty members serve on the Faculty Diversity Internship Program District-level committee, and the entire Biology department seeks an active role in mentoring prospective faculty in this new program.

The Biology department is committed to continued and increasing pursuit of excellence and offerings in online sections of courses as appropriate. The number of online sections will increase according to demand, as long as skilled faculty are available to teach them. The investigation into XLO (extra large online courses) undertaken in Fall 2014 and continued through the current academic year by Biology faculty was supported by the Chancellor's office, and this initiative will provide a way of determining if this is a feasible and affordable approach to the demand for such classes.

The Biology department has established criteria to have online sections staffed by faculty with training and mentoring in the district-supported LMS. As of fall 2016, faculty teaching online have been formally trained in the use of Moodle, WebACCESS. As the district moves to CANVAS, two faculty members have participated in the CSM CANVAS boot camp. Future staffing of our online offerings may be problematic is not enough faculty are trained to confidently teach fully online classes in the CANVAS LMS.

The Biology Department has established qualifications that a faculty member must have to teach an online class. Qualifications are assessed as follows:

- Formal Training & Successful completion of CANVAS training, at CSM or by @ONE courses, "Introduction to Online Teaching and Learning" and "Introduction to Teaching with CANVAS" or equivalent training.
- One semester to demonstrate use of CANVAS to support a face-to-face class, using the resources and activities listed below. This qualification is to be coached and assessed by a faculty mentor or mentors.
- Proficiency in CANVAS Resources and Activities. The following list is not exhaustive but is a basic list to prepare a faculty to teach an online class:
    - Posting content: documents and news;
    - Interactive activities: forums and chats, comments on assignments;
    - Assessments: quizzes and assignments;
    - Record keeping: Gradebook.
- Ability to communicate online. During the semester of learning and demonstrating proficiency in CANVAS the mentors should monitor and coach the faculty in asynchronous communication and monitoring forums for content and participation and setting up rules for communication, such as how fast emails are answered and commenting frequency in forums, assignments, etc.
- Mentoring. A one-mentor approach or a team mentor approach has been used in the past, where several faculty members observe, coach and assess. The mentor(s) should be added to the course as non-editing faculty to enable monitoring the courses. At a minimum the mentor should do a pre semester review toprovide suggestions, a review meeting every 4 weeks and a follow up meeting after the end of the semester. Full time faculty agree that the team approach will be beneficial since participants can pick up multiple ideas from more people.
- Class size, online versus face-to-face. The department intends to develop a plan for evaluating enrollment maximums and work with administration to develop guidelines for enrollment maximums using best available evidence supporting practices that lead to better student success and retention.

Biology faculty have found inspiration and stimulation from working with colleagues in other disciplines as well as fellow Biologists. Continued support for Reading Apprenticeship training, on and off campus, will have an increasing impact on student success.

Building upon the success of the 3CSN Leadership Community of Practice Institute last summer, several faculty applied for and were accepted for an RA Community College STEM Network Grant that will fund numerous professional development opportunities through Spring 2017. Faculty have led Reading Apprenticeship workshops at CSM on flex day and luncheon events several times over the academic year 2015-2016, and thanks to this new STEM grant, they will continue to offer innovative trainings. These events provide interdisciplinary discussion and practice and promote communication between all faculty that attend. They have included student participation in panels in which they relate their experiences with Reading Apprenticeship in their classes. The faculty have also presented at RA workshops on other college campuses, sharing their experiences and growing expertise.

Continued funding is desirable for conferences that help improve success and retention of STEM students, and further train faculty to implement Reading Apprenticeship in science classes. Examples of professional development activities are:

- Online teaching and learning conferences for advanced level training beyond that offered at CSM
- Participation in STEM related conferences similar to the February 2013, STEM Academy sponsored by the State Academic Senate
- Participation in Reading Apprenticeship workshops
- Participation in Vision and Change Initiatives
- Participation in CCB FEST at San Francisco State University
- Participation in Project Kaleidoscope professional development and initiatives
- Leadership training and/or grant writing training in order to create STEM success initiatives with external funding
- Networking and participation in community college leadership groups such as State Academic Senate, 3CSN, WestEd, RP Group
- Convert WebACCESS content to CANVAS content
- Attendance at the ASCCC Curriculum Institute, both state and regional levels
- Attendance at ASCCC CTE Leadership Institute
- Attendance at ASCCC CTE Curriculum Academy
- Attendance at the Online Educational Regional Meeting
- Attendance at the BAYWORK Water/Wastewater Career Pathways Summit, part of Workforce Development.

The Biology faculty will continue to work on and expand upon collaborative efforts with the other learning support centers. Alignment of services, and a shared vision for these services helps promote a culture of integrated service for students. Further collaboration with student services to help students receive non-academic support would also enhance student success. We are enjoying the dialogue that RA inquiry has generated across instructional programs, and we hope to continue and expand that dialogue to include reading, writing, quantitative skills, and other non-academic skills such as growth mindset, interpersonal communication, time management, etc.

The biology faculty managing the ISC (Integrated Science Center) continues to participate in the Learning Support Centers Coordination Committee. The former Anatomy & Physiology Center is now the Anatomy Lab and no longer participates in LSCCC. One Biology faculty now co-manages the ISC with a Physics faculty, each receiving reassigned time to take on the tasks formerly performed by part-time staff and volunteer faculty. The LSCCC now works to coordinate all Learning Support Centers' activities rather than its original function of setting up parameters for the Learning Center function and interaction with other Learning Support Centers. Both Anatomy Lab and ISC faculty continue to promote initiatives that will provide more paid hours for faculty.

The Biology department will complete a much needed, thorough evaluation and updating of instructional materials, especially those used in the laboratory environment. Current data acquisition tools are more than ten years old and many are relying on outdated technologies. It has also been brought to our attention that new systems would better serve students with sensory, mobility and learning disabilities. For example, in a cardiovascular laboratory exercise in physiology, we currently use stethoscopes and sphygmomanometers to auscultate heart sounds and determine blood pressure. Students with hearing impairments currently have difficulty gathering the data since the equipment depends on interpreting sounds. Many of the newer systems are multi sensory, wireless and can also capture and store data visually. Accessible pedagogy benefits all students and we look forward to working with the Disability Resource Center and various vendors to improve the laboratory experience for all students, especially those with special needs.

6. Program Maintenance

A. Course Outline Updates

Review the course outline update record. List the courses that will be updated in the next academic year. For each course that will be updated, provide a faculty contact and the planned submission month. See the Committee on Instruction website for course submission instructions. Contact your division's COI representatives if you have questions about submission deadlines. **Career and Technical Education courses must be updated every two years.**

BIOL 100, 102, 110, 130, outlines were updated and approved by COI during the 2014-2015 academic year. BIOL 126, 127, 128, 132, 230, 260, 310 outlines were updated and approved by COI during the 2015-2016 academic year. The minor changes made to course outlines included edited SLOs, removal of TBA hours, or content adjustments in response to or anticipation of alignment with State Transfer Model Curriculum requirements.

Courses to be updated	Faculty contact	Submission month
BIOL 220	Tania Beliz	Dec 2016
HSCI 100	Tania Beliz	Spring 2017

B. Website Review

Review the program's website(s) annually and update as needed.

Faculty contact(s)	Date of next review/update
Theresa Martin	Fall 2017

C. SLO Assessment Contacts

SLO assessment contact for the biology department is Santiago Perez, who is acting as the manager/administrator for SLO assessment.

7. Dominant Themes Summary for IPC

Briefly summarize the dominant, most important themes or trends contained in this program review, for division deans to collect and forward to the Institutional Planning Committee. What are the key program issues that matter most? (Brief paragraph or bullet points acceptable).

The biology department continues to have a very strong need for a full-time faculty position. As a case in point, the department currently has an unstaffed Spring double-section of evening Anatomy and an unstaffed single evening section in Microbiology because we do not have enough highly qualified faculty to teach them.

The Biology department continues to be at the forefront of distance education and sets departmental standards for teaching online. The greatest issues are training faculty, staffing online courses, and the changeover to Canvas from WebAccess.

The department's courses are strongly articulated with UCs, CSUs, and private universities. The Biology AS-T and Nutrition AS-T degrees were approved in Spring 2016. This and other measures to ensure transfer success strengthens the department's articulation.

Over the next 2 years faculty will be doing an extensive review and updating of teaching materials used in laboratory classes. The intent of this review is to identify new technologies and modalities that will better serve our diverse student population.

All of the courses taught by the Biology Department have had their SLOs assessed. We are currently reviewing best practices for creation, implementation, assessment and management of SLOs in order to help us develop a more accurate and current picture of how well our students are learning and of the areas they need most help in.

The department continues to have challenges in course scheduling due to the lack of lecture and lab classrooms in building 36. Classroom availability is crucial in order to offer CSM courses at convenient times to working students and students who are on other campuses part of the week.

The biology department continues to be active in professional development and student life on campus and commitment to diversity and equity. We strive to bring our knowledge and training to the greater campus community.