

PROGRAM REVIEW: BIOLOGY MAJORS

2015-2016



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Approved by Academic Senate 2/2/15

1.1 Introduction. Introduce the program. Include the program's catalogue description, its mission, the degrees and certificates offered, and a brief history of the program. Include the number and names of full-time faculty, adjunct faculty, and classified staff. Discuss any recent changes to the program or degrees (*limit to 2-3 pages max*).

The Biology department offers courses designed to address the needs of biology majors (BIO 002, BIO 003), pre-Allied Health students (BIO 004, BIO 005, BIO 014) and non-biology majors who are fulfilling General Education requirements (BIO 012, BIO 015, BIO 016, BIO 018, BIO 019, and the new courses BIO 020 and BIO 025 that have just been approved in Spring 2016). The pre-Allied Health and the non-majors courses and programs have been addressed in different program review documents. This document analyzes the Biology Majors Program and courses.

The Biology Majors Program offered through the Biology Department at Solano College has been in place for 45 years. Our classes prepare students to transfer to universities as life sciences majors and these students represent a significant percentage of the students who transfer from our college. Our classes also fulfill the natural sciences requirement for Certificates of Achievement and A.S. degrees and are fully transferable to CSU and UC systems (AA/AS Area A, IGETC Area 5 Biological, CSU GE Area B2). Over the last 10 years we have successfully responded to an increased student demand by expanding the number of sections offered and offering new sections at the Vallejo and Vacaville Centers.

Currently, each semester, we run 2-3 sections of cell/molecular biology (Bio 002) and 2-3 sections of Evolution, Ecology, and Biodiversity (Bio 003) between the main campus and the two satellite Centers. This represents up to 90 students served in any one semester. Our current FT faculty are: Jim DeKloe, Ed Re, Brad Paschal, Michelle Smith, Philip Summers, and Gene Thomas. Adjunct faculty include Bruce Riddell, Rachel Aptekar, and Michael Silva. John Nogue, the anchor of our organismal biology program, recently retired, and Phil Summers has announced his retirement.

In 2011, the faculty of the biology majors program revised curriculum significantly. Both courses were altered to respond to changes in the biology curriculum at UC Davis, one of the major transfer destinations for our students. This change involved revising the content of Bio 001 to become Bio 003. As a part of this revision, Bio 002 became a prerequisite for the new Bio 003 course. This change was significant, and we plan to continue to evaluate its effect.

There is a *de facto* nationwide standard for the requirements that a student must fulfill to complete a biology major. Students must complete a two semester or three semester complement of biology courses geared toward the major, one year of inorganic chemistry, one year of organic chemistry, one year of physics, and one year of calculus. For the Solano College Biology major the current requirements are:

BIO 002 and BIO 003	10 units
CHEM 001 and CHEM 002	10 units
CHEM 003 and CHEM 004	10 units
PHYS 002 and PHYS 004 OR PHYS 006 and PHYS 007	10 units
MATH 030 and MATH 031 OR MATH 020 and MATH 021	6-10 units
TOTAL	46-50 units

As discussed later in this document, this huge unit requirement has hindered students from achieving a biology degree and has limited the number of students who have declared a biology major from graduating with a biology major. These students typically graduate with a degree in “General Science” or with another degree.

During the upcoming year the faculty will have to re-examine the curriculum and the Associates Degree to respond to the release of the C-ID (course identification descriptors) for these courses and to design an Associates Degree for Transfer (ADT) that aligns with the degree finalized last year. Also, due to faculty retirements and due to the reduction in workload for others who have historically taught this course, the maintenance of a robust program will require the submission of proposals for replacement faculty.

In addition the faculty will respond to a national reform movement called “Vision and Change in Undergraduate Biology Education” initiated by the American Association for the Advancement of Science. <http://visionandchange.org/>

This reform seeks to:

1. Integrate Core Concepts and Competencies throughout the Curriculum
2. Focus on Student-Centered Learning
3. Promote a Campuswide Commitment to Change
4. Engage the Biology Community in the Implementation of Change

Specifically this means to introduce the scientific process early and integrate it into all science classes, change pedagogy to make the students active learners, and change the focus of classes from fact-oriented to concept oriented. The reform worries that exploding amount of information in the biology field means that depth is being sacrifice for breadth.

The goal of the Solano College biology major is to create a community of scholars in an educational setting that mimics the attributes of the professional scholarly community. This aligns with the goals of the Vision and Change effort. Our strength, our extensive and high quality laboratory experience that we provide to students helps us achieve this goal.

1.2 Relationship to College Mission and Strategic Goals. Describe the program’s relationship to the overall mission of the college: “Solano Community College educates an ethnically and academically diverse student population drawn from our local communities and beyond. We are committed to help our students to achieve their educational, professional and personal goals centered on thoughtful curricula in basic skills education, workforce development and training, and transfer level education. The College accomplishes this three-fold mission through its dedicated teaching, innovative programs, broad curricula, and services that are responsive to the complex needs of all students.”

The Biology major program supports Solano College's Mission and Strategic Goals. We serve a culturally and academically diverse student population from the local community and beyond. The Principles of Biology courses, Bio 002 Principles of Cell and Molecular Biology and Bio 003 Evolution, Ecology and Biodiversity are transferable. All of the biology courses are devised to introduce key biological concepts, to stimulate critical thinking, to have the students gain knowledge of the scientific method, to teach them to keep laboratory notebooks using legal scientific format, to teach them to analyze and evaluate scientific data, to have them develop laboratory skills in current techniques using state-of-the-art equipment, and to carry out field studies using ecological techniques; all of this is designed to assist our students in achieving their educational, professional, and personal goals. The biology staff and faculty are deeply committed to providing the rigorous training required by students succeed after transfer as a major in the life sciences by teaching students with current best-practices, materials and curricula, and to provide services that are responsive to the needs of all students by offering a variety of course day and times.

Table 1. SCC's Strategic Directions and Goals

Goal 1: Foster Excellence in Learning

Obj. 1.1 Create an environment that is conducive to student learning

Program Evidence:

Biology courses are offered throughout the day to meet the needs of typical fulltime students, as well as, those individuals who work full-time. Our faculty continually strive to create an atmosphere of respect for student needs by providing flexible office hours and open communication through the use of technology (social media, emails, teacher websites, etc.). Faculty continuously upgrade classroom technology to meet evolving student needs, including internet, videos, animations and PowerPoint, to demonstrate concepts and techniques. Course lecture notes and relevant website links are shared with students at course websites set up by instructors. In addition, faculty and students meet in seminar sessions to discuss select scientific writings.

These courses provide extensive hands-on laboratory training. The emphasis in the lab is for students to gain hands-on experience in laboratory skills that will aid them in their future careers. We provide an environment that nurtures skills and builds workplace simulations. We achieve this through a number of approaches including having the students work in groups to build teamwork dynamics, designing integrated and sequential experiments modeled on real life workplace experiences, offering a simulated bioreactor “run” over the course of a week which involves working in shifts over 24 hour periods and provides the students with the effect of a real-time production facility experience. Lab and field investigations allow students to pose questions, conduct experiments, collect and analyze data, and then writing their results and analysis in a scientific paper format.

Obj. 1.2 Create an environment that supports quality teaching

Program Evidence:

There is a national movement to reform the teaching of biology majors; this initiative, called Vision and Change, has been initiated by the American Association for the Advancement of Science. The faculty who teach biology majors has been following this effort and will make every effort to incorporate the ideas of this national effort into these courses and this program. Faculty share ideas and classroom practices in both formal and informal settings. Faculty who teach majors participate in extensive professional development workshops and conferences in both their scientific fields and in pedagogy.

The full-time faculty members of the biology majors are committed to supporting and mentoring new faculty to ensure that we maintain quality instruction in our courses. We also insure that the classrooms, laboratories, and courses are constantly re-worked and updated to include state of the art equipment, materials, and methods. These revisions increase the possibility that the students are exposed to the most effective tools, techniques and approaches for their field of study.

Obj. 1.3 Optimize student performance on Institutional Core Competencies

Program Evidence:

Communication

During lectures, demonstrations, and lab work, students develop competence in listening and responding to questions, reading comprehension, writing essays and reports, and communicating with faculty and fellow students. In Bio 002, the students are required to keep a detailed laboratory notebook using the legal notebook format. Most faculty require group presentations on laboratory or other topics that involve the development of a comprehensive Powerpoint presentation where they must present a compelling narrative on their subject matter with well-developed and articulated ideas, and logical conclusions. This must be presented to and critiqued by their peers and faculty. These sessions have emulated the format of a university seminar course which has proven to be quite successful and we plan to expand in future.

Critical Thinking and Information Competency

In both the lecture and laboratory sessions, students are constantly challenged on their critical thinking and subject knowledge. Especially in the lab, they are provided with opportunities to collect and analyze data, perform calculations, draw conclusions, solve problems, and on occasion design their own experiments. Through this experience students must use their critical thinking skills to determine the relevancy of data and demonstrate the ability to draw accurate conclusions.

Global Awareness

Through lectures, discussions, and lab work, students develop an understanding of scientific methodology and its application. In the Evolution, Ecology, and Biodiversity class the topics of the class naturally lend themselves to create awareness of global challenges facing humankind: global climate disruption, human population growth, and the loss of biodiversity.

Personal Responsibility and Professional Development

The goal of the biology major is to create a community of scholars in an educational setting that mimics the attributes of the professional scholarly community. As a part of this approach our students develop the professional habits that lead to the level of personal responsibility required to succeed in this community and they learn the avenues of professional development that they will encounter in their professional careers (seminars, professional talks, intensive field methods). Due to the extensive laboratory experience, students have the opportunity to further develop the appropriate social skills required for teamwork in a group setting. Together these experiences prepare each student to succeed in their transfer studies and in their future careers.

Goal 2: Maximize Student Access & Success

Obj. 2.1 Identify and provide appropriate support for underprepared students

Program Evidence:

The biology courses in the biology program, Bio 002 and Bio 003, can be very challenging for students. Since Bio 002 has Chem 001 as a prerequisite, and Bio 003 has Bio 002 as a prerequisite, students are generally well prepared for the program. However, many students benefit from a variety of supportive measures. Faculty typically teach students study strategies such as Cornell notes, study groups, ways to improve memory and retrieval, and ways to write a more robust essay question on an exam, and other approaches. In addition, the Tutoring Center is free and available to any student five days a week. The faculty has worked closely with library staff and through these efforts the Solano College Library has an excellent collection of biology textbook and other materials. We also provide one-on-one guidance to students when appropriate and when requested or when they are struggling with course work.

Obj. 2.2 Update and strengthen career/technical curricula

Program Evidence:

Since each course has a six hour per week laboratory, this provides the faculty-student contact that allows one-on-one science mentoring and career mentoring. Encouragement by the faculty helps the students build self-confidence and strengthen their resolve and increases their opportunities to continue in a life science career. Some students continue to medical school, dental school, pharmacy school, or another professional school. The Cell and Molecular Biology course serves as a prerequisite to our biotechnology program; this program is formally designated as a career technical education program by the California Community College Chancellors Office that can lead to a professional certificate. The biotechnology program provides the opportunity to experience a simulation of working in a real-world production facility. Through our interactions with industry and following the literature we are made aware of evolving techniques and technologies and strive to incorporate in our curricula. In the future we plan to provide opportunities for independent research; One possible example is through a collaboration with the Joint Bio Energy Institute in Berkeley. We also arranging addition opportunities to participate in a regional long-term research efforts; one example of this is the involvement of Bio 003 students in the Longterm Intertidal Monitoring and Experiential Training for Students program (LiMPETS). Other research opportunities are also being explored.

Obj. 2.3 Identify and provide appropriate support for transfer students

Program Evidence:

Each course is transferable to the UC and CSU system. We have seen an increasing number of state university and UC students who are coming back to take these classes in a “reverse transfer”; this demographic might increase if we offer more classes in Vacaville which is closer to the local universities. Throughout the semester instructors mentor students on the transfer process and aid them in meeting their requirements and deadlines and assisting them with best matches for furthering their education. The courses will potentially need to be modified during the upcoming curriculum review process to comply with the statewide C-ID initiative. In addition, a AS-T transfer degree will have to be designed.

Obj. 2.4 Improve student access to college facilities and services to students

Program Evidence:

We have improved student access by establishing two new sections per year of Bio 002 at the Vacaville Center, two new sections of Bio 003 at the Vallejo Center, and a new section of Bio 002 on the main campus. The faculty has been working closely with architects to design a new biotechnology/science building at the Vacaville Center and a new science building on the main campus. This will be equipped with up to date and task-appropriate equipment, much of it sourced from the biotech industry which will insure that students will be well prepared to pursue future careers in this field. Since we post announcements and links to campus events and workshops, we have enhanced student awareness of campus services.

Obj. 2.5 Develop and implement an effective Enrollment Management Plan

Program Evidence:

Classes are offered in a way that gives students options. At Fairfield, Bio 002 is offered at different times during the day; in the past we also offered a night section and we are considering reinstating this scheduling. At Vacaville, both Bio 002 and Bio 003 are offered. At the Vallejo Center only Bio 003 is currently offered. We are planning to expand our offerings of all classes. However, the loss of tenured faculty and reduced workloads by others, in addition to the high costs of running laboratory courses may prohibit from scheduling multiple offerings and implement an effective expansion plan. We must prioritize the new offerings of Bio 002 and Bio 003 in the Vacaville and Vallejo centers.

Goal 3: Strengthen Community Connections

Obj. 3.1 Respond to community needs

Program Evidence:

The biology majors program has been involved in projects providing support to instructors and students in the public school system. Through our life science programs, we have worked with every high school in the county and many in neighboring counties. We have a relationship with Vacaville High School, Vanden High, Will C. Wood High, Buckingham Charter High, Vacaville Christian Schools, Dixon High, Rodriguez High, Armijo High, Vallejo High, and Jesse Bethel High in Solano County. We also have relationships with American Canyon High, Davis High, and Winters High. This interaction includes serving on advisory committees, advising on curricula, forming partnerships that support grant applications, and serving as guest speakers. In addition we have worked with several elementary schools and community groups (e.g. Boy Scouts) to provide STEM education. The availability of a technically well-trained workforce has helped to attract and retain biotech companies (most notably Genentech) to the region which is of considerable value to the local community.

Obj. 3.2 Expand ties to the community

Program Evidence:

We will continue to pursue all of the activities in Objective 3.1 above, and look to expand interactions with high school, middle school, and elementary school faculty. We will also continue to work with local authorities like the Solano Economic Development Corporation in helping to target and attract high tech industry in the life sciences to the region.

Goal 4: Optimize Resources

Obj. 4.1 Develop and manage resources to support institutional effectiveness

Program Evidence:

The biology majors classes need a variety of resources to support institutional effectiveness including the extensive use of classrooms and well-equipped laboratories. Currently all classes offered at the Fairfield campus and Vacaville and Vallejo Centers are in general adequately supported in terms of equipment and teaching resources. However, additional resources will be needed to expand. We make every effort to supplement equipping labs and classrooms through donations and grants.

Obj. 4.2 Maximize organization efficiency and effectiveness

Program Evidence:

Materials necessary to support Bio 002 include extensive chemical reagents, cultures, equipment, and software. All of the material is currently provided to all classes. In order to run a high quality program there is a need for extensive technical help. One full-time technician prepares the Bio 002 laboratories (in addition to supporting all biotechnology classes) at the Fairfield campus. In addition, one full-time technician supports all biology and chemistry classes at the Vacaville Center, and a separate full-time technician supports all of the science courses at the Vallejo Center. One full-time supports all of the biology courses on the main campus. As the program expands it will be necessary to hire an additional technician at the Vacaville center to accommodate the additional growth of biology offerings after a new science building is built.

Obj. 4.3 Maintain up-to-date technology to support the curriculum and business functions

Program Evidence:

Remaining current will always be a challenge in the rapidly changing field of molecular biology. We have worked at cultivating relationships with companies in the greater Bay Area. Through these relationships we are kept abreast of evolving techniques and state of the art equipment. In addition we routinely succeed in sourcing relevant equipment and having it donated to our program (e.g., Real Time PCR apparatus, Gel Imaging systems, etc.) We have been very successful at winning competitive grants including NSF ATE and Department of Labor TAACCCT grants. Solano College succeeded in winning a bond measure, Measure Q, which will enabled the construction of a state-of-the-art Biotech/Science teaching laboratory in Vacaville and a new science building on the Fairfield campus. The Vacaville building is planned to open in Fall 2017.

1.3 Enrollment. Utilizing data from Institutional Research and Planning (ITRP), analyze enrollment data. In table format, include the number of sections offered, headcounts, the full-time equivalent enrollment (FTES), and the WSCH for each semester since the last program review cycle. If data is available for the number of declared majors in the discipline, please include as well. Compare the enrollment pattern to that of the college as a whole, and explain some of the possible causal reasons for any identified trends.

The following chart provides data on courses and students from Fall 2010 to Spring 2014 for the majors biology program as compared to the college as a whole.

Majors Biology	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014
Sections	6	6	2	3	3	3	3	3
Enrollment	164	157	66	81	80	78	96	85
FTES	49.31	47.10	19.97	24.60	24.73	23.40	26.20	25.50
FTES/Section	8.23	7.85	9.99	8.2	8.24	7.8	8.73	8.5
Solano College	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014
Sections	1,317	1,355	1,345	1,186	1,170	1,168	1,261	
FTES	4,052	3,906	3,975	3,753	3,591	3,474	3,546	
FTES/Section	3.08	2.88	2.96	3.16	3.07	2.97	2.81	

For the period from Fall 2010 through Spring 2014 the number of majors biology sections decreased; a major component of this was the transition from Bio 001 to Bio 003. Although the enrollment has decreased, the FTES/section has remained relatively constant especially over the more recent period of Spring 2012 to Spring 2014. Again, the decrease can be attributed to a decrease in the number of sections of Bio 001 (now Bio 003) due to the introduction of the Bio 002 prerequisite for that course.

During the same period the college as a whole saw decreased sections across most disciplines and the campus enrollment has decreased accordingly. Within this context, the majors biology program has a considerably higher FTES per section than the average FTES per section campus-wide, although the FTEs per course varies widely with some having high enrollments and some very low enrollments. This indicates the higher demand on average for majors biology courses than other subjects. During the economic downturn following the 2008 financial crisis, one of the few areas of the economy to have remained relatively robust is the life science industry with relatively few lay-offs and downsizing.

Indeed, locally, Genentech continues in a growth phase following a number of therapeutic drug approvals. This industry is one of the principal job sources for our students.

1.4 Population Served. Utilizing data obtained from Institutional Research and Planning, analyze the population served by the program (gender, age, and ethnicity) and discuss any trends in enrollment since the last program review. Explain possible causal reasons for these trends, and discuss any actions taken by the program to recruit underrepresented groups.

Ethnic, gender, and age representations for biology major courses are listed in the tables below. Although in 2013-14 there is a significantly greater ratio of females to males (66.85% to 32.6%), the previous years saw a more even number of females and males. During the period under review, there was a relatively equal number of both males and females. Females typically have a slight edge in most years which is comparable to the ratio for the college as a whole and to national enrollment trends. The ethnicity and age demographics for biology courses are similar to the college as a whole, although we serve a greater percent of Asian students and a lower percent of black non-hispanic students. An outreach effort coordinated with the college's MESA program could address this discrepancy. The number of Hispanic students continues to increase, reflecting a college wide and community wide trend. Again, additional emphasis on an interaction with the MESA program might increase this number further. The age of the majority of the students (70-80%) falls within the 18-25 age range, the age of traditional college students. The 20–30% of the students that fall outside of this range is a significant number.

Fig. 2 Percentage of Students by Gender 2010-2014

		2009-10	2010-11	2011-12	2012-13	2013-14
BIO Major	Female	53.16%	50.50%	59.72%	45.28%	66.85%
	Male	45.11%	48.83%	39.58%	52.83%	32.60%
	Not Reported	1.72%	0.67%	0.69%	1.89%	0.55%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%

Fig. 3 Percentage of students by ethnicity 2010-2014

Ethnicity Distribution by BIO Group and Academic Year						
Course ID (group)	Primary Ethnicity Category (group)	2009-10	2010-11	2011-12	2012-13	2013-14
BIO Major	American Indian or Alaskan Native	4.60%	7.02%	5.56%	6.92%	7.18%
	Asian or Pacific Islander	37.93%	29.43%	39.58%	38.36%	32.60%
	Black Non-Hispanic	6.90%	7.02%	5.56%	4.40%	6.08%
	Hispanic	12.36%	11.37%	15.28%	15.72%	20.99%
	Other	12.07%	18.39%	7.64%	12.58%	8.29%
	White Non-Hispanic	26.15%	26.76%	26.39%	22.01%	24.86%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%

Fig. 4 Percentage of students by age 2010-2014

Age Distribution of Majors Biology Group by Academic Year						
Course ID (group)	Age Group	2009-10	2010-11	2011-12	2012-13	2013-14
BIO Major	0-17	3.16%	3.01%	2.78%	0.63%	
	18-25	83.33%	75.59%	72.22%	88.05%	83.98%
	26-30	8.05%	13.38%	12.50%	5.66%	9.94%
	31-35	1.72%	3.34%	6.94%	1.26%	3.87%
	36-40	1.15%	1.00%	2.78%	1.89%	2.21%
	41-45	1.72%	1.67%	0.69%	0.63%	
	46+	0.86%	2.01%	2.08%	1.89%	
	Total	100.00%	100.00%	100.00%	100.00%	100.00%

Conclusions:

For the major’s biology program, the relatively equal number of male to female enrollment over the years indicates that the foundational nature of the biology major appeals to all genders. The program provides a platform for many career options including going straight into technical employment or transferring to a university. The lower percentage of non-Hispanic black students and the increasing number of Hispanic students are trends that should be addressed, perhaps by strengthening the relationship between the program and the MESA program. Biology students are predominantly 18-25, which is typical of the college as a whole. But the number of the students in the non-traditional age group is significant. Those taking Bio 002 as a prerequisite for the biotech courses tends to skew somewhat older as many are returning students or retraining following other careers.

1.5 Status of Progress toward Goals and Recommendations. Report on the status of goals or recommendations identified in the previous educational master plan and program review.

Table 2. Educational Master Plan

Educational Master Plan	Status
<p>1. Continue to support the educational needs of biology programs including allied health preparation, biology majors’ transfer preparation, biotechnology program preparation, and general education biology courses.</p>	<p>Majors Biology strives to meet the needs of students by providing state of the art equipment, hands on laboratory experiences, real-time simulations of actual production run in biotech facility, industry placements, and transfer assistance to universities. The major will continue to support the educational needs of students by expanding access to in-demand classes, updating teaching materials and equipment, meeting student demand for section availability, as facilities allow. Student access to biology classes will be greatly improved with the addition of new facilities at the Vacaville and Fairfield campuses.</p>
<p>2. Expand offerings on the Vacaville and Vallejo campuses</p>	<p>We have greatly improved student access by establishing two new sections per year of Bio 002 at Vacaville, two new sections of Bio 003 at Vallejo Center and a new section on the main campus. Once the new Biotechnology/Science building is opened on the Vacaville campus in 2017 then more sections of Bio 002 and Bio 003 will be added.</p>
<p>3. Continue to update laboratory equipment and techniques to reflect new knowledge and developments in this rapidly progressing field</p>	<p>Bio 002 and Bio 003 has added new laboratory equipment and techniques to mirror activities in universities and industry. In a number of instances laboratory activities in recombinant DNA and genomics surpass those offered in many universities. For example, we have introduced genomic cloning using degenerate primer sets, the development model organism <i>C. elegans</i>, and many techniques which are not offered in many universities.</p>

<p>4. Assess need for additional full-time biology professor and make appropriate recommendations.</p>	<p>Although called for an increase in number of faculty positions in the previous program review, the number of faculty positions has decreased. In order to effectively run the program we must fill faculty positions vacated due to retirement and replenish our adjunct faculty pool. The hiring of at least one full time faculty member specifically for the biology majors program is critical for the continued excellence of this program.</p>
<p>5. Assess enrollment patterns and determine needs for additional online offerings.</p>	<p>We have added additional course sections in response to additional demand. We will continue to monitor enrollment trends and strive to add more sections. The importance of the laboratory experience to these courses and to this program makes it difficult to design online offerings.</p>

Table 3. Program Review Recommendations

Program Review Recommendations (Previous Cycle)	Status
<p>1. Add two full-time biology technicians. Need technicians to support additional courses at Fairfield campus and Vacaville and Vallejo</p>	<p>A technician has been hired at the Vacaville Center to support both biology and chemistry courses and the recent addition of a technician at the Vallejo Center has been converted into a full-time position. We still require one full-time biology technician at the Vacaville campus. The opening of the new buildings on the main campus and on the Vacaville campus will require additional technical support.</p>
<p>2. Add more laboratories, which are needed to: (a) meet student demand (b) upgrade equipment/facilities to meet technological and academic changes biology in 21st century</p>	<p>(a) The new Biotech/Science Building at Vacaville Center will include new teaching classrooms and laboratories outfitted with state of the art equipment and support facilities. This project is in the planning stage and is scheduled to finish in 2017. (b) The new labs are designed to the highest standards and will incorporate the most up to date equipment and infrastructure. (c) As the new labs are planned, we are including interactive 'smart' technology for use in the labs and lecture hall.</p>

3. Hire additional faculty to expand and to replace those who have retired or gone on reduced load.

The college will need to hire a faculty member next year and another the following year to assure a robust program.

1.6 Future Outlook. Describe both internal and external conditions expected to affect the future of the program in the coming years. Include labor market data as relevant for CTE programs (*limit to one page or less*).

The training of biological scientists remains an important goal if the US is to remain competitive in the 21st century Bioeconomy. After the requested and/or expected improvements described in Section 2, Table 3 above, the program will remain strong. Majors biology is fundamental to many fields and careers including all medical professional degrees such as pharmacy, dentistry, nursing, medicine, veterinary medicine etc. It remains a strong major for transfer students to enter the UC and state universities. This program also serves as the core prerequisite for the new Solano College Bachelors in Biomanufacturing. In addition, this program serves as a strong prerequisite for many technical and certificate programs, including medical technician, paramedic, physician assistant etc. Other areas include technician positions in production facilities in the biotech industry. Given the stability of the biotech sector during the economic downturn, the growth of this area in the region and Solano's reputation for high quality training, the future career prospects for bio majors who pursue the biotech certification is strong. However, an issue of concern is maintaining the quality of the program and meeting demand given the variability of state support from year to year. It is difficult to attract, and especially to retain, quality faculty in an environment of uncertainty and in a situation where academic salaries cannot compete with corporate salaries. That being said, the new science/biotech facility being developed in Vacaville will allow us to expand offerings in the future. The quality of the facility, infrastructure, and equipment should insure that we can attract both first class instructors and students and assure the continuing quality and growth of this major.

CURRICULUM DEVELOPMENT, ASSESSMENT, AND OUTCOMES

2.1 Program Learning Outcomes

Using the chart provided, list the Program Learning Outcomes (PLOs) and which of the “core four” institutional learning outcomes (ILOs) they address. In the same chart, specifically state (in measurable terms) how your department assesses each PLO. For example, is there a capstone course (which one), is it a passing grade on certain assignments or exams that demonstrate acquisition of the PLO, is it acquiring specific skills necessary for a licensing exam, completing a portfolio, etc.?

Table 4. Program Learning Outcomes

Program Learning Outcomes	ILO (Core 4)	How PLO is assessed
1. Design and/or interpret an investigation, including data collection and/or analysis	II. Critical Thinking and Information Competency Communication	Laboratory assignment with lab notebook evaluation and laboratory report written in scientific paper format.
2. Describe the molecular basis of genetics and energetics.	II. Critical Thinking and Information Competency	Exam questions on the final exam in Bio 002.
3. Explain the principles and mechanisms of microevolution and macroevolution.	II. Critical Thinking and Information Competency	Essay exam question on the final exam in Bio 003

2.2 Report on how courses support the Program Learning Outcomes at which level (introduced (I), developing (D), or mastered (M))

Table 5. Program Courses and Program Learning Outcomes

Course	PL01	PL02	PL03
Biological Science 002	M	M	D
Biological Science 003		M	M

2.3 Utilizing table 6, describe the results of program learning assessments and any planned actions to increase student success where deficits were noted. Results should be both quantitative and qualitative in nature, describing student strengths and areas of needed improvement. Action plans should be specific and link to any needed resources to achieve desired results.

Table 6. Program Learning Assessments

Program Learning Outcomes	Date(s) Assessed	Results	Action Plan
1. Design and/or interpret an investigation, including data collection and/or analysis	F 12 S 13 F 13 S 14 F 14 S 15	Acceptable PLO compliance: F12 (91%) S13 (89%) F13 (95%) S14 (96%) F14 (93%) S15 (97%)	The assessment process shows that a high percentage of students achieve this PLO in the assessed classes. The next step is to extend a common assessment to all classes.
2. Describe the molecular basis of genetics and energetics.	F 12 S 13 F 13 S 14 F 14 S 15	Acceptable PLO compliance: F12 (83%) S13 (83%) F13 (68%) S14 (81%) F14 (79%) S15 (75%)	The assessment process shows that an acceptable percentage of students achieve this PLO in the assessed classes. The next step is to extend a common assessment to all classes.
3. Explain the principles and mechanisms of microevolution and macroevolution	F 12 F 13 S 15	Acceptable PLO Compliance: F12 (89%) F13 (81%) S15 (95%)	The assessment process shows that a high percentage of students achieve this PLO in the assessed classes. The next step is to extend a common assessment to all classes.

2.4 Describe any changes made to the program or courses that were a direct result of program learning assessments.

In general faculty report positive outcomes from the PLO assessments reflecting the fact that these classes have a well-defined curriculum and experienced instructors. Specifically, the

assessments have met the criterion of having 70% of the students achieving proficiency with the PLO, and as the compliance level above indicates (with a single assessment falling below the threshold), this occurs consistently. The Bio 003 course serves as a capstone course, the student's haven taken Chem 001, Bio 002, and then Bio 003 – and the high success rates reflect the extensive background that the students have received. The PLOs would benefit from a common assessment and an application of the assessment to all sections. Also, a discussion with faculty from peer colleges on their experience with PLOs perhaps would be beneficial; the faculty will initiate this discussion during the next review cycle.

Student Learning Outcomes

2.5 Describe the current status of SLOs in your program. Are SLOs being updated as necessary? What is the planned assessment cycle (need to be assessed at least twice during the program review cycle)? Are assessment results driving course level planning? If deficiencies are noted, describe planned actions for change. Address how courses with multiple sections have been aligned so that a common tool is utilized to assess student learning outcomes; describe any steps taken to standardize measures.

SLOs for Bio 002 and Bio 003 have been established, and they have been assessed yearly, at least in some sections, since 2010. Student understanding of Bio 002 SLOs have been assessed every semester (this is more than was required by the college-wide SLO cycle). Bio 003 SLOs have been assessed during several semesters. While the faculty are assessing the same well-established SLOs, and although there is an ongoing effort to develop a common assessment with common criteria, this has not yet been implemented. Faculty teaching these courses will meet and establish common rubrics to be used for SLOs assessment. The data indicate that these course level SLOs are consistently achieved.

2.6 Review the course level SLOs completed by the program in the last year to ensure accuracy of information provided (core four, level of mastery, assessment tool, etc.). Note if any changes are needed.

Faculty reviewed the course level SLOs for Bio 002 and Bio 003 and are satisfied with them. Again, although the SLOs are well established the course-to-course alignment could be improved with a common assessment. For Bio 003 the assessment, especially the alignment of SLOs, remains a work in progress.

2.7 Describe any changes made to the program or courses that were a direct result of student learning outcomes assessments.

In general faculty report positive outcomes from the SLOs assessment reflecting the fact that these classes have a well-defined curriculum and experienced instructors. However some changes have been introduced by some faculty such as:

Several instructors have adopted the practice of giving practice essay questions to students

before the lecture exam in an effort to allow them to gain additional experience in the type of writing appropriate for this (faculty report that the lack of writing skills remains a weakness of some students). This practice allows students to better understand the appropriate level of detail and the rigor that they will encounter once they transfer. The students would benefit from a change of curriculum, especially in Bio 003, toward a more inquiry based approach. They would help reinforce the implementation and assessment of the PLOs; this matches with the national “Vision and Change” effort to reform biology education.

Curricular Offerings

2.8 Course offerings. Attach a copy of the course descriptions from the most current catalogue. Describe any changes to the course offering since the last program review cycle (course content, methods of instruction, etc.) and provide rationale for deletion or addition of new course offerings. Also state whether a transfer degree has been established in accordance with SB 1440. Include a discussion of courses offered at Centers (Vacaville, Vallejo, Travis) and any plans for expansions/contraction of offerings at the Centers.

Bio. 002 Principles of Cell and Molecular Biology

Prerequisite: CHEM 001. Course Advisory: Eligibility for English 001.

This course introduces biology majors to the basic concepts of cell and molecular biology and to the laboratory techniques used to study cells and biological molecules. Subjects include the structure and function of biological molecules, prokaryotic and eukaryotic cell structure and function, cell physiology and metabolism, Mendelian and molecular genetics, and the techniques used in biotechnology to manipulate DNA. Three hours lecture, six hours lab.

Sections offered Fall 2015:

Two sections at Fairfield campus

One section offered in Vacaville.

Bio. 003 Evolution, Ecology & Biodiversity

Prerequisite: MATH 104, BIO 002. Course Advisory: Eligibility for English 001.

This course for biology majors covers evolution, ecology, and the diversity of life. The laboratory component includes invertebrate and vertebrate dissection and several weekend and all day field trips. Students must successfully complete both the lecture and the laboratory portions of the course. Field trips may be required. Some field trips may involve a fee. Formerly BIO 001. Three hours lecture, six hours lab.

Sections offered Fall 2015:

One section at Fairfield campus, One section at the Vallejo campus, One section at the Vacaville campus

These courses will have to be extensively reviewed and potentially changed during the upcoming curriculum review process to match statewide C-ID course descriptions. This critical job must be completed by the end of Spring 2016.

2.9 Fill rates/Class size. Based on data from ITRP, discuss the trends in course fill rates and possible causes for these trends (include comparison/analysis of courses by modality if applicable). Address how the size of classes affects courses and if there are any necessary adjustments to course classroom maximums. If there are courses that are historically under-enrolled, discuss strategies that might increase enrollment.

The fill rates for Bio 002 have been high and remain high averaging 93% as shown below. The enrollment in Bio 003 (previously Bio 001) decreased dramatically once transition was made from Bio 001 (that did not require a Bio 002 prerequisite) to Bio 003 (that required a Bio 002 prerequisite). The average fill rate for Bio 001 and Bio 003 was 89%, with 89% as the fill rates for both Bio 001 and Bio 003. Maximum classroom sizes are appropriate for Cell and Molecular Biology (Bio 002) and Evolution, Ecology, and Biodiversity. (Bio 003); these maxima are dictated by laboratory space.

Fig. 5
BIO 002 Cell and Molecular Biology

	S 2010	F 2010	S 2011	F 2011	S 2012	F 2012	S 2013	F 2013	S 2014	F 2014	Mean
Fill rate	93%	68%	77%	106%	97%	97%	78%	110%	97%	105%	93%
Class size	56	41	46	64	58	58	47	66	58	63	56

Fill rates vary but remain strong and are potentially increasing – this enrollment trend should be monitored with the potential of adding more sections. Cohort sizes were relatively stable (averaging 56 students) with the exception of a few dips during Fall 2010 and Spring 2011.

Fig. 6
BIO 003 (Bio 001 before Fall 2011) Evolution, Ecology, and Biodiversity

	Fall 2009	Spring 2010	F 2010	S 2011	F 2011	S 2012	F 2012	S 2013	F 2013	S 2014	F 2014	Mean
Fill rate	87%	94%	88%	86%	73%	77%	73%	106%	100%	90%	93%	89%
Class size	104	113	106	104	22	23	22	32	30	27	84	

Bio 003 enrollment dramatically decreased with the change from Bio 001 and the addition of the Bio 002 prerequisite. The fill rates varied between 73% and 106% of maximum enrollment. The trend appears to be increasing, but this should be monitored with the potential of adding more sections. The number of students enrolled in Bio 003 varied between 30 and 84; with the small sample size it is difficult to see the trend.

2.10 Course sequencing. Report on whether courses have been sequenced for student progression through the major, how students are informed of this progression, and the efficacy of this sequencing. Report on whether curriculum is being offered in a reasonable time frame (*limit to one or two paragraphs*).

Students enrolled in Biology Majors courses have a defined sequence. They must complete Chem 001, and this sometimes means that they must complete Chem 010 which sometimes requires CHEM 160. After completing Chem 001 the students enroll in Bio 002 and only after completing Bio 002 they can continue to Bio 003. In the past the organismal biology course, Bio 001 did not have a Bio 002 prerequisite. The faculty made this change in an effort to increase student success. It had been observed that non biology majors had been inappropriately enrolling in Bio 001 because the low number implied to them that this was the first biology course to take. The faculty believed that these students would have been better served fulfilling their general education requirements with Bio 015 or Bio 016. Also, the course content in Bio 001 was extensive and there was a rationale that the Bio 002 prerequisite would allow Bio 003 faculty to cut some course content and focus on more advanced topics. (For example, the students would enter Bio 003 already knowing the subjects of mitosis and meiosis and those subjects would not have to be covered. Students would enter with a knowledge of Mendelian genetics and that would make the population genetics subject covered in Bio 003 easier for them.) This change dramatically diminished enrollment, but did accomplish the desired effect of limiting the audience of the second biology course to Biology majors. During next year's curriculum review process the faculty will review the student success data and determine whether to remove a strict Bio 002 prerequisite and to instead make it an advisory.

Students who are pursuing a Biology Majors path are informed by course descriptions in the college catalog online, and by counselors and instructors that Chem 001 is a prerequisite for Bio 002 and that Bio 002 is a prerequisite for Bio 003. The college's enrollment process does not allow students to enroll in these courses without the appropriate prerequisite.

2.11 College Preparedness/Basic skills. Describe the basic skills component of the program, including how the basic skills offerings prepare students for success in transfer-level courses. If your program doesn't have designated basic skills courses, then explain how your courses support fundamental writing and/or mathematic competencies. Analyze courses with course advisories, prerequisites and/or co-requisites to see whether this level of preparation supports student success.

Not applicable.

2.12 Student Survey. Describe the student survey feedback related to course offerings. In terms of the timing, course offerings, and instructional format, how does what your program currently offer compare to student responses?

Student surveys were administered in spring 2014 and in spring 2015. The spring 2014 survey was an online survey (SurveyMonkey), and the spring 2015 survey was on paper and administered during class.

Student Survey Data Spring 2014:

Two surveys were performed in Spring 2014. In the first survey, 50% of the respondents had completed both Bio 002 and Bio 003. Some (22%) had taken other biology classes as well. The survey was also sent to alumni, so these respondents were in a position to comment in a substantive way on the operation of the department, the college, and the major. A majority (84%) were taking or had taken Bio 002 and Bio 003 as part of a major, and a majority (67%) were transferring.

BIO 002

80% of students were very satisfied or satisfied with the availability of Cell Molecular Biology (Bio 002) classes. 8% were dissatisfied or very dissatisfied with the availability of Cell/Molecular Biology (Bio 002) classes. The rest were neutral.

BIO 003

56% of students were very satisfied or satisfied with the availability of Bio 003 classes. 12% were dissatisfied or very dissatisfied with the availability of Bio 003 classes. 33% were neutral.

Class Times Survey:

62% + 25% of students preferred morning (8 or 9am) start times – there was a preference for a 9 am rather than an 8 am start.
25% preferred evening start times. 42% preferred afternoon classes.

Weekend Labs Survey:

43% would attend Saturday morning labs. 11% would attend Saturday afternoon labs. 58% would not attend Saturday afternoon labs.

Evening Start Time Survey:

80% preferred 6:00pm start.
20% preferred 6:30pm start.

Hybrid Class Survey:

39% would take a hybrid class. 61% would not take a hybrid class.

Science Learning Center Survey:

87% would use a science/biology learning center. 13% would not use a science/biology learning center.

The Spring 2014 Biology Majors Survey is giving in its entirety:

1. How many Biology courses have you taken successfully completed with a C or better at Solano College?

#	Answer	Response	%
1	<i>I'm finishing my first one this semester.</i>	9	14%
2	<i>One</i>	16	25%
3	<i>Two</i>	25	39%
4	<i>Three</i>	7	11%
5	<i>Four or more</i>	7	11%
	<i>Total</i>	64	

2. Which Biology courses have you completed? Select all that apply.

#	Answer	Response	%
1	<i>BIO 002</i>	52	93%
2	<i>BIO 003</i>	28	50%
3	<i>BIO 004</i>	9	16%
4	<i>BIO 005</i>	6	11%
5	<i>BIO 012</i>	1	2%
6	<i>BIO 012L</i>	1	2%
7	<i>BIO 014</i>	7	13%
8	<i>BIO 016</i>	8	14%
9	<i>BIO 016L</i>	0	0%

10	BIO 018	0	0%
11	BIO 019	2	4%
12	BIO 047 or BIO 049 or BIO 099	3	5%

3. In which Biology course are you currently enrolled?

#	Answer	Response	%
1	BIO 002	11	52%
2	BIO 003	5	24%
3	BIO 004	2	10%
4	BIO 005	0	0%
5	BIO 012	0	0%
6	BIO 012L	0	0%
7	BIO 014	1	5%
8	BIO 015	0	0%
9	BIO 016	0	0%
10	BIO 016L	0	0%
11	BIO 018	1	5%
12	BIO 019	0	0%
13	BIO 047, or BIO 049, or BIO 099	1	5%

4. What is your reason(s) for taking this class? (mark all that apply)

#	Answer	Response	%
1	General education requirement	17	27%
2	Required for major	52	84%
3	Transfer	43	69%
4	Professional development	8	13%
5	Required for my current job	0	0%
6	Prerequisite	29	47%
7	General interest	19	31%
8	Fits my schedule	7	11%
9	Other	2	3%

5. At which campus do you prefer to take your Biology classes? (mark all that apply)

#	Answer	Response	%
1	Fairfield (Main)	59	94%
2	Vacaville	17	27%
3	Vallejo	10	16%

6. What were your reasons for choosing Solano College? (mark all that apply)

#	Answer	Response	%
1	Location	55	87%
2	Good programs/reputation	37	59%
3	Childcare available	0	0%
4	Availability of classes	24	38%
5	Other	7	11%

7. How do you choose your classes? Rank your choices on 1 through 6, one being the most important!

#	Question	1	2	3	4	5	6	Total Responses	Mean
1	Fits my schedule	6	14	6	8	13	15	62	3.85
2	Needed for my Major	25	1	2	1	1	32	62	3.77
3	By instructor reputation	8	9	9	14	10	12	62	3.73
4	By friends advice	5	6	21	12	10	8	62	3.65
5	By Rate My Professor	8	7	16	11	11	9	62	3.60
6	By Location	8	9	7	9	16	13	62	3.89

8. How satisfied are you with the availability of Biology courses?

#	Answer	Response	%
1	Very Satisfied	17	27%
2	Satisfied	28	45%
3	Neutral	8	13%
4	Dissatisfied	9	15%
5	Very Dissatisfied	0	0%
	Total	62	

9. Weekday Start Times

#	Answer	Response	%
1	Early Morning (8am)	15	25%
2	Morning (9am-noon)	38	62%
3	Afternoon (1-4pm)	26	43%
4	Evening (after 5pm)	15	25%
5	No preference	4	7%

10. Weekend Labs

#	Answer	Response	%
1	Saturday morning	23	38%
2	Saturday afternoon	12	20%
3	Would not attend on Saturdays	33	54%

11. If evening courses are your preference, please state whether a 6:00pm or 6:30pm start time is preferable.

#	Answer	Response	%
1	6:00pm	12	80%
2	6:30pm	3	20%
	Total	15	

12. Would you take (have you taken) an online/hybrid Biology course?

#	Answer	Response	%
1	Yes	24	39%
2	No	37	61%
	Total	61	

13. Would you utilize a Biology/Science learning center/computer lab if it were available?

#	Answer	Response	%
1	Yes	53	87%
2	No	8	13%
	Total	61	

14. If you are planning to take BIO 002 and/or BIO 003, would you consider taking it at night?

#	Answer	Response	%
1	Yes	37	63%
2	No	22	37%
	Total	59	

15. How satisfied are you with the quality of textbooks and instructional materials utilized in the Biology departments?

#	Answer	Response	%
1	Very Satisfied	25	42%
2	Satisfied	24	41%
3	Neutral	10	17%
4	Dissatisfied	0	0%
5	Very Dissatisfied	0	0%
	Total	59	

16. How satisfied are you with the quality of the classrooms Biology courses are taught in?

#	Answer	Response	%
1	Very Satisfied	25	42%
2	Satisfied	22	37%
3	Neutral	8	14%
4	Dissatisfied	4	7%
5	Very Dissatisfied	0	0%
	Total	59	

Conclusions from the spring 2014 student survey

From the survey the students seem to be generally satisfied with the courses. They show satisfaction with the textbook and the facilities, although they are happier with the Bio 002 laboratories than with Bio 003. There seems to be a strong feeling from the student to offer more variety in times and faculty for Bio 002 and Bio 003.

The students were impressed with the equipment and offerings in Bio 002, but less impressed with Bio 003. This may imply that students are somewhat satisfied with these offerings, but there is room for improvement.

There are some comments about the lack of night courses; we offered these options in the 1990's. We will consider offering them again.

Location and time of offering play a major role in the students' choice of classes. A majority preferred to take classes on the main Fairfield campus. A majority of students indicated that they would not attend a Saturday class.

The new science buildings on the Fairfield and Vacaville campus will contain new biology labs and this might offer the ability to expand and to generate the variety that the students expressed that they wanted. These project are in the planning stage and is scheduled to finish in 2017 and 2018.

The comments about the campus as a whole on the qualitative portion of the survey should be passed on to the administration. The students seem much happier with the components of their campus experience relating to biology than with the condition or circumstances of the campus as a whole.

II. Student Survey Data Spring 2014:

The student survey in the spring of 2015 was administered in class to 118 students (two sections of Bio 002 and two sections of Bio 003).

Spring 2015 Student Survey Bio. 002 & Bio. 003	
n=118	
1. Why did you take this class? Circle the letter that best describes	# responses
(A) I intend to transfer to a university as a biology major, and this course is required.	62
(B) I intend to transfer to a university as a science major other than biology (e.g., chemistry, etc.), and this course is required.	35
(C) I am already a student at a university, and I decided to take this class at Solano College rather than at my university campus.	3
(D) I already have a bachelor's degree from a university, and I am taking this course to satisfy the entrance requirement to a professional school (e.g., medical school, dental school, physical therapy, etc.)	9
(E) I am taking this course for a reason other than A, B, C, or D.	4
2. If you answered A or B above (plan to transfer to a university), which university do you plan to transfer to?	
UCD	66
Sonoma State	2
Stanford	1
UC Berkeley	2
Cal Poly SLO	2
UCLA	1
UC Irvine	1
Sac State	6
UC San Diego	2
SJSU	4
Univ. of Wash.	1
Pomona College	1
Univ. of Pacific	1
SDSU	1
USC	1
Humboldt State	4
UC Santa Cruz	2
SFSU	2
Don't know	3
3. Are you the first person in your immediate family to go to college?	
Yes	44 (38%)
No	72 (62%)

4. Circle the letter that best describes the number of hours you work at a paid job each week.	
(A) I do not work at a job	34
(B) less than 10 hours per week	17
(C) 10-15 hours per week	13
(D) 15-20 hours per week	24
(E) more than 20 hours per week	27
5. Are you currently enrolled as a student at a university (e.g., U.C. Davis, Sac State, etc.)	
Yes	5
No	114
6. How many semester units are you taking this semester?	
(A) less than 6 units	4
(B) 6-10 units	15
(C) 11-15 units	58
(D) 15-20 units	40
(E) 21 or more units	1
7. As of right now, what is your career goal after you finish a bachelor's degree?	
(A) Graduate school in biology (e.g., master's degree, PhD)	15
(B) Work for a private company (e.g., biotechnology company, consulting firm, etc.)	22
(C) Education/teaching (e.g., elementary school, high school, etc.)	2
(D) Medical school	42
(E) Dental school	3
(F) Pharmacy school	11
(G) Physician Assistant	2
(H) Physical Therapy	2
(I) Other--briefly describe: _____	10
(J) I don't know yet; still deciding	8
8. As biology student, which of the following do you struggle with the most? Circle one.	
(A) note-taking	4
(B) time management	40
(C) test anxiety	19
(D) math skills in science classes	4
(E) ways to improve memory	22
(F) getting organized	2
(G) essay questions/writing assignments	6
(H) using a textbook effectively	4
(I) understanding what I read	6
(J) none of the above	9

9. Circle the number that best describes the number of hours spent studying for this class each week.	
(A) 0-1 hours	6
(B) 2-3 hours	42
(C) 4-5 hours	45
(D) 6-7 hours	19
(F) 8 or more hours	4

Fig. 7

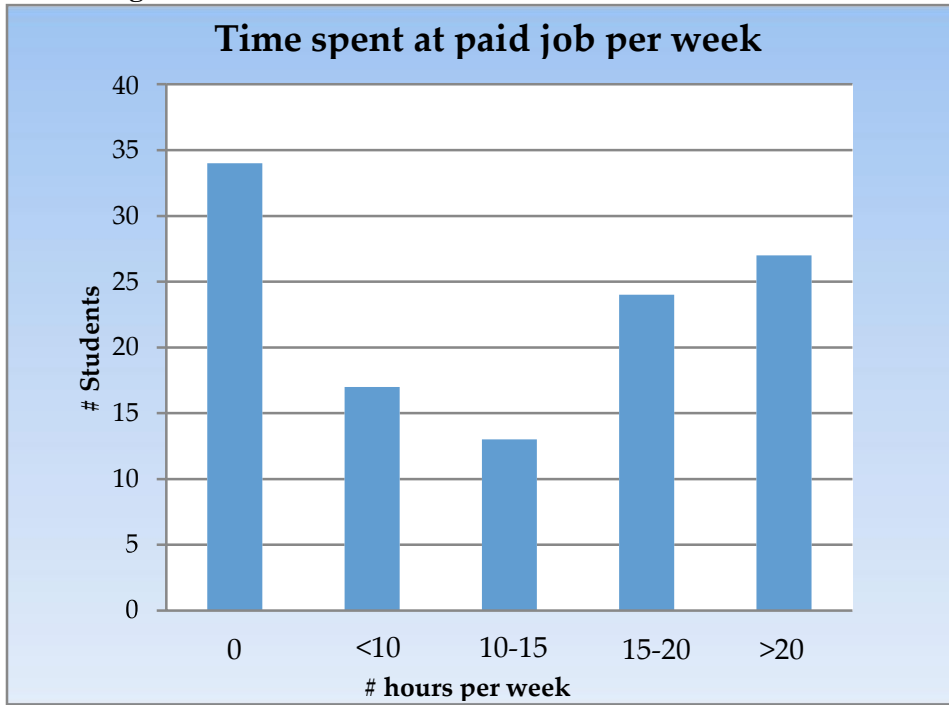


Fig. 8

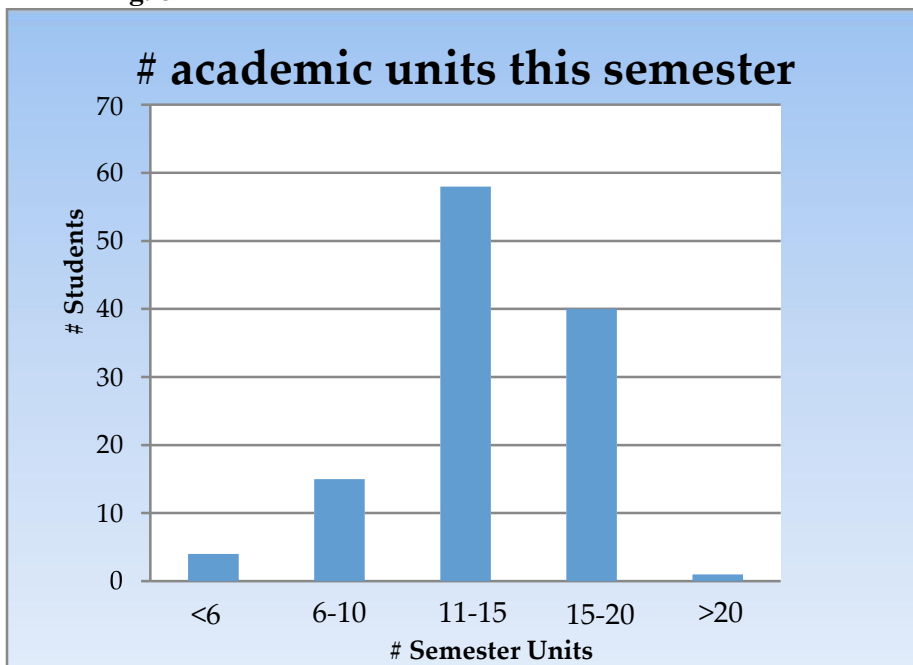
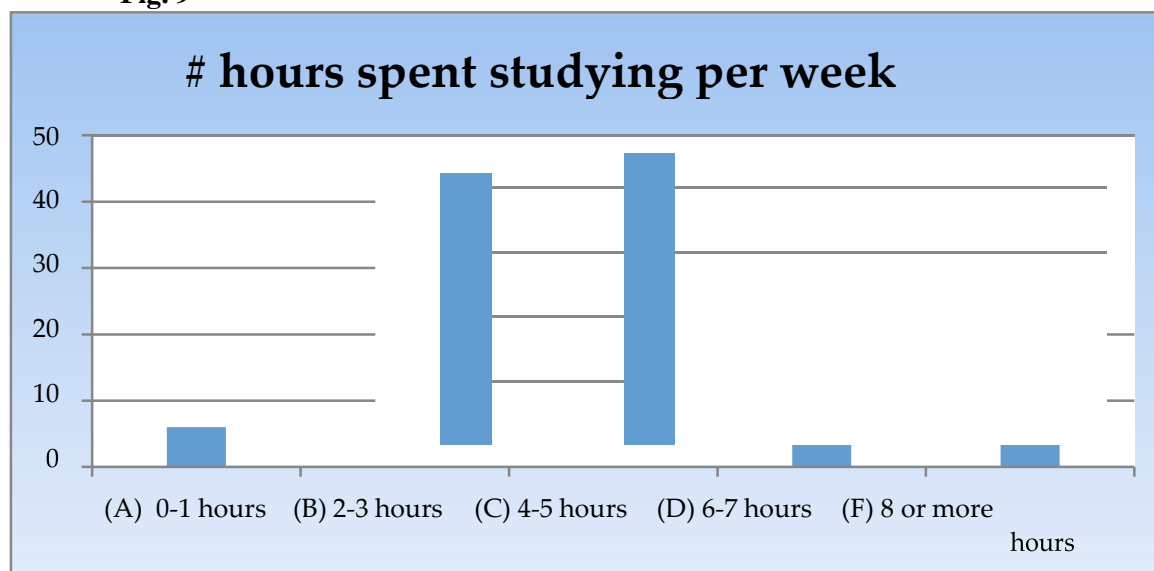


Fig. 9



Conclusions from the spring 2015 student survey

The spring 2015 survey revealed the following highlights:

- The majority of students who take Bio 002 and Bio 003 do so to complete requirements to transfer as a biology major (62/113 students or 55%). The next largest group of students take these courses to transfer as a science major other than biology (35/113 students or 31%). Not surprisingly, similar results were found in the spring 2014 survey (required for major = 84%). In addition, there were five students who were concurrently enrolled at a university, and nine post baccalaureate students completing requirements for professional schools (e.g., medical, etc.).
- The vast majority of students surveyed intend to transfer to UC Davis as their top choice of transfer destinations (66/103 or 64%).
- Many students enrolled in Bio 002 and Bio 003 are the first in their family to go to college (44/116 students or 38%).
- Students either work many hours per week at a paid job or not very much at all (see Fig. 1 above). Approximately one quarter of the students are working in excess of 20 hours per week (27/115 students or 23.5%). Conversely, just under one-third of the students do not work at a paid job at all (34/115 students or 29.6%).
- The majority of students are taking 11-15 units of classes in the spring of 2015 (58/118 students or 49.2%), but a significant number of students are taking 15-20 units (40/118 students or 33.9%). See Fig. 2 above.
- Regarding career intentions, most students intend to pursue the following: medical school (42/117), work for a private company (22/117), graduate school in biology (15/117), or pharmacy school (11/117).
- Time management (40/116 students), ways to improve memory (22/116), and test anxiety (19/116) were identified by students as the top three academic skills they struggle with the most as a biology student.
- Most students reported studying less than five hours a week for Bio. 002 and/or Bio. 003 (See Fig. 3 above).

2.13 Four-year articulation (if applicable). Utilizing the most current data from the articulation officer, and tools such as ASSIST.org, state which of your courses articulate with the local four year institutions and whether additional courses should be planned for articulation (*limit to one or two paragraphs*).

Biology Majors two primary courses (Bio 002 Cell and Molecular Biology, Bio 003 Evolution, Ecology, and Biodiversity,) all currently articulate with UC and CSU four-year institutions. To maintain this articulation the faculty will have to submit the C-IDs for these courses for review during the 2015-2016 academic year.

2.14 High school articulation (if applicable). Describe the status of any courses with articulation/Tech Prep agreements at local high schools. What (if any) are your plans for increasing/strengthening ties with area high schools and advertising your program to prospective students? (*limit to one or two paragraphs*).

This is really not applicable to biology majors, but the biotechnology program interacts extensively with the high schools and the Industrial Biotechnology certificate and degree is articulated with many of the local high schools. Since the faculty who teach biology majors also teach biotechnology, they interact extensively with biology faculty from every high school within the Solano Community College District, with every principal in the District, and with the Solano County Office of Education. Again, as biotechnology and not as biology, the college is involved in four Career Pathways Trust grants which requires extensive interaction. The biology program benefits from this interaction with biotechnology.

2.15 Distance Education (if applicable). Describe the distance education courses offered in your program, and any particular successes or challenges with these courses. Include the percentage of courses offered by modality and the rationale for this ratio.

Not applicable. We currently do not have any Distance Education offerings and do not plan to develop them in the near future. We have discussed the potential, but the extensive laboratory requirements for the courses within the majors program limits the DE possibilities. The student survey also showed relatively little interest in Distance Education or Hybrid Courses.

2.16 Advisory Boards/Licensing (CTE) (if applicable). Describe how program curriculum has been influenced by advisory board/licensing feedback. How often are advisory board meetings held, provide membership information and what specific actions have been taken. Attach minutes from the past two years.

Again, this is really not applicable to the biology majors program. But, the biotechnology program has a robust Advisory Board and the biology majors program benefits from this.

STUDENT EQUITY & SUCCESS

3.1 Student Success. Anecdotally describe how the program works to promote student success. Include teaching innovations, use of student support services (library, counseling, DSP, etc), community partnerships, etc.

Faculty who teach in the biology majors program use a variety of means to promote student learning and success. At the beginning of a semester, many faculty provide their classes with an overview of techniques that promote student success. For example, faculty may show students how to use Cornell Notes, various graphic organizers, mnemonics, and other study skills. These resources are also listed on the course syllabus. As the semester progresses, many faculty refer students to the campus-wide Student Success Workshops (e.g., time management, test anxiety, etc.) and the campus Tutoring Center. Furthermore, many faculty offer review sessions and some faculty participate in on-going study groups during one or more of their office hours. The common theme to all of these techniques and skills is to encourage students to actively engage the course material in some way and not to rely solely on passive study techniques.

Faculty also promote student engagement by providing the students with a context to understand much of the material in Bio 002 and Bio 003.

The apparent success between females and males is highly variable between semesters and from year to year. In some semesters females are more apparent than males, and in other semesters males are more successful than females. The same variability is seen in gender retention differences. There are not consistent patterns in gender success and retention.

Fig. 10 Success and Retention by Gender

Success by Gender									
		2010-2011		2011-2012		2012-13		2013-2014	
Gender desc		Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
BIO Major	Female	53.52%	73.75%	86.11%	88.00%	88.24%	71.05%	83.05%	64.52%
	Male	62.34%	69.57%	85.19%	80.00%	84.44%	74.36%	89.19%	72.73%
	Not Rep		50 %	100 %		100 %	100 %		100 %
Retention by Gender									
		2010-2011		2011-2012		2012-13		2013-2014	
Gender desc		Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
BIO Major	Female	76.06%	88.75%	94.44%	94.00%	97.06%	94.74%	94.92%	75.81%
	Male	84.42%	89.86%	88.89%	90.00%	91.11%	89.74%	94.59%	86.36%
	Not Rep.		50 %	100 %		100 %	100 %		100 %

Success and retention by different age cohorts is highly variable from semester to semester and year to year. These age cohorts have different numbers of students in each cohort (some are very small), and cohort size differences likely explain most of the variability. If there is a trend, and it's a very coarse trend, it is that older students may be more successful than younger students. On a different note, retention rates are overall very high.

Fig. 11 Success and Retention by Age

Success by Age Group									
		2010-2011		2011-2012		2012-13		2013-2014	
	Age Group	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
BIO Major	0-17	28.57%	50.00%	66.67%	100 %	100 %			
	18-25	55.14%	70.59%	95.00%	84.38%	85.51%	70.42%	83.95%	69.01%
	26-30	78.26%	64.71%	80.00%	100 %	100 %	100 %	100 %	50 %
	31-35	80.00%	100 %	66.67%	100 %	50 %		100 %	66.67%
	36-40	33.33%		66.67%	0.00%	100 %	100 %	66.67%	100 %
	41-45	0.00%	75.00%	0.00%			100 %		
	46+	100 %	100 %	100 %	50 %	100 %	100 %		
Retention by Age Group									
		2010-2011		2011-2012		2012-13		2013-2014	
	Age Group	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
BIO Major	0-17	57.14%	100 %	66.67%	100 %	100 %			
	18-25	79.44%	88.24%	100 %	93.75%	92.75%	91.55%	95.1 %	80.28%
	26-30	95.65%	82.35%	80.00%	100 %	100 %	100 %	100 %	60 %
	31-35	80.00%	100 %	83.33%	100 %	100 %		100 %	100 %
	36-40	66.67%		66.67%	0.00%	100 %	100 %	66.67%	100 %
	41-45	0.00%	100 %	100 %			100 %		
	46+	100 %	100 %	100 %	50 %	100 %	100 %		

Patterns of student success in Majors Biology amongst different ethnicities are similar to the success trends found campus-wide and nation-wide. However, success within the same ethnic group differed between students in the Majors Biology program and similar students campus-wide. In general, students of a particular ethnic group were *more* successful in the Biology Majors program than on the campus as a whole (e.g., 75.5% of Hispanic students were successful in the program, whereas 64% of Hispanic students were successful campus-wide between F10-S14). This pattern seems to be even more pronounced after the biology majors curriculum was changed (e.g., 81.7% of Hispanic students were successful in the program, whereas 64% were successful campus-wide between F11-S14). Similar patterns can be seen across other ethnic groups. (see Figures 12-14 on the next page.)

The faculty wanted to take a very close look the success of different ethnic groups, and so the data used for this analysis is more resolved than the data used for other measures such as age. Rather than look at cumulative percentages, this analysis used the actual number of students in

the program and how many of those students were successful. This approach is more informative.

Fig. 12 Aggregate success data for F10-SP14 (data from before and after the curriculum change)

Bio. Program Total F10-SP14	# students in majors Bio. program	# successful students in majors Bio. Program	% success in Majors Bio.	% Success SCC campus-wide
Am. Indian/Alaskan native	39	33	84.6	65
Asian or Pacific Islander	147	107	72.8	68
Hispanic	85	64	75.3	64
Black non-Hispanic	24	16	66.7	54
Other	59	44	74.6	68
White non-Hispanic	123	94	76.4	70

Fig. 13 Success before the curriculum change and between F10-SP11 (Bio 001 & Bio 002)

Bio. Program Total F10-SP11	# students	# successful students	% success	% Success SCC Campus-wide
Am. Indian/Alaskan native	14	12	85.7	65
Asian or Pacific Islander	38	26	68.4	68
Hispanic	14	6	42.9	64
Black non-Hispanic	6	3	50.0	54
Other	29	18	62.1	68
White non-Hispanic	45	31	68.9	70

Fig. 14 Success after the curriculum change and between F11-SP14 (Bio 002 and Bio 003)

Bio. Program Total F11-SP14	# students	# successful students	% success	Campus-wide comparison
Am. Indian/Alaskan native	25	21	84.0	65
Asian or Pacific Islander	109	81	74.3	68
Hispanic	71	58	81.7	64
Black non-Hispanic	18	13	72.2	54
Other	30	26	86.7	68
White non-Hispanic	78	63	80.8	70

Provide possible reasons for these trends AND planned action to equalize student success.

These trends in success are similar to campus-wide and nation-wide trends, and like these broader trends, the reasons for student success in majors courses is complex and multi-factorial. Some of the factors that influence success are not related to the classroom and school settings. As such, a rigorous analysis to explain student success is beyond the scope of this report. Having said that, biology faculty are taking action to make a positive difference in some of the trouble spots that Biology Majors students encounter.

In the student survey given to all biology majors classes in the spring of 2015, students reported that they wanted more help with specific academic and study skills (see section 2.12). Specifically, students reported that they wanted help with time management, ways to improve memory, and addressing test anxiety. The faculty will direct students to attend Student Success workshops at the Academic Success Center on time management, memory techniques, and managing test anxiety. These topics are routinely offered in these workshops every semester. In addition, one biology faculty member will offer the workshop on memory techniques. This workshop will be offered campus-wide. In addition, the biology faculty will work with the MESA program in order to recruit more students into the MESA program.

3.2 Degrees/Certificates Awarded (if applicable). Include the number of degrees and certificates awarded during each semester of the program review cycle. Describe the trends observed and any planned action relevant to the findings.

According to the Chancellor’s Office Data Mart, the number of A.S. degrees in biology (program code 0401) during the review cycle of 2011-2014 were as follows:

Fig. 15

	2010-	2011-	2012-	2013-
# A.S.	10	5	4	7

The number of students graduating as a biology major is shockingly low, given the popularity of this major on our campus and on most campuses in the United States. The number of awarded degrees is small compared to the number of students who have declared biology as a major. Anecdotally, many students have expressed that the high unit count of a biology A.S. degree makes them opt for an alternate A.S. degree such as general science, or they transfer without an A.S. degree.

This indicates a major flaw in the design of the biology major, which requires a mandatory 46 – 50 units when most other majors require 18 – 26 units. Even the other science programs required fewer units.

<u>Major</u>	<u>Units</u>
Biology	46–50
Anthropology	19-
Biotechnology	22-24
Business	27
Chemistry	26–30
English	25
Foreign Language	20
History	18
Mathematics	20-21
Music	21-
Political Science	18-19
Physics	35–39
Psychology	18
Social Sciences	18

It is obvious from the selection above that the biology major is an outlier and the number of units must be reduced. This is also required by the state effort to produce Transfer Model Curriculum. This problem will be addressed comprehensively and changed as part of the curriculum review process. Maintaining the current unit total for a biology major at Solano Community College is not a choice; this must be changed since the 46-50 unit major is not allowed in an Associates of Science-Transfer degree. The faculty will address this disparity during the upcoming curriculum review process.

3.3 Transfer (if applicable). Describe any data known about students in your program who are transfer eligible/ready (have 60 transferable units with English and math requirements met). Include how your program helps students become aware of transfer opportunities (*limit to one or two paragraphs*).

Unlike some of the majors on campus, most of the students completing Bio 002 and Bio 003 transfer within a year of completing these classes. As an integral part of the program, and especially during the six hour per week laboratories, our faculty counsel them individually on transfer, what it takes to transfer, and how to succeed after transfer.

We informally track the students after transfer as a way to assess our program. We have a relationship with several of the local universities, especially UC Davis, and they have collected data on the students' success after transfer. Our students succeed at a rate comparable to those of peer colleges.

3.4 Career Technical Programs (if applicable). For career technical programs, describe how graduates are prepared with the professional and technical competencies that meet employment/ licensure standards. State if there are any efforts made to place students in the workforce upon graduation, including any applicable placement data.

Bio 002 serves as a prerequisite for the college's Industrial Biotechnology program, a Career Technical Education program. This program is analyzed in a separate report.

PROGRAM RESOURCES

4.1 Human Resources. Describe the adequacy of current staffing levels and a rationale for any proposed changes in staffing (FTES, retirements, etc.). Address how current staffing levels impact the program and any future goals related to human resources.

Current staffing for the classes that are part of this program includes two full-time instructors teaching Bio 002 (Jim DeKloe and Edward Re) and three full-time instructors teaching Bio 003 (Brad Paschal, Gene Thomas, Jim DeKloe) and two part-time instructors teaching some lab sections (Rachel Aptekar and Bruce Riddell). Michelle Smith taught a lab section of Bio 003 one semester, but her primary duty remains Bio 015.

We have suffered from the retirement of John Nogue and the loss of Phil Summers (who dropped teaching Bio 003 due to a reduction of load and is now retiring). The implementation of the Biomanufacturing Bachelors degree will pull one or two faculty from the Bio 002 program into a full-time biotechnology teaching assignment. In addition, we will be expanding our Bio 002 offerings in Vacaville and continuing our Bio 003 offerings in the Vallejo center. Therefore we need more faculty teaching in the program. To compensate for the changes described above, and to increase the expertise of the group, we should hire another full-time biology instructor devoted to the Biology Majors program.

4.2 Current Staffing. Describe how the members of the department have made significant contributions to the program, the college, and the community. Do not need to list all the faculty members' names and all their specific activities, but highlight the significant contributions since the last program review cycle.

The biotechnology program and by extension the Bio 002 Cell and Molecular Biology program continues to grow and innovate. During the last four years, there has been substantial improvement and addition of equipment used in the labs. A National Science Foundation Advanced Technological Education grant is bringing single use bioreactor equipment to the lab. Intramural grant proposals, including those written by Irene Camins, have brought additional equipment to Vallejo. This includes a photobioreactor to grow algae.

Brad Paschal, Jim Dekloe, Gene Thomas, and John Nogue were instrumental in changing the Biology Majors curriculum. This change included a significant revision of Bio 001 (Organismal Biology) into Bio 003 (Evolution, Ecology, and Biodiversity) and the requirement of Bio 002 as a prerequisite to Bio 003.

Brad Paschal has explored more field based experiences such as plankton monitoring and intertidal monitoring for Bio 003 students. These experiences involve collecting data for professional scientists and organizations.

Brad Paschal has also worked on a doctoral degree in education (currently ABD), and he taught graduate level science education courses for new science teachers the School of Education at U.C. Davis.

During the Program Review time, Edward Re and Jim DeKloe were chosen by the American Association of Community Colleges as Finalists for their Innovation Awards.

Jim Dekloe was chosen to receive the Solano College Faculty of the Year award in 2011, and Jim Dekloe, Ed Re, and Brad Paschal were recipients of the Presidential Recognition Award (in 2011, 2011, and 2013 respectively).

4.3 Equipment. Address the currency of equipment utilized by the program and how it affects student services/success. Make recommendation (if relevant) for technology, equipment, and materials that would improve quality of education for students.

Bio 002 has benefitted from a relationship with the Biotechnology program. When on the main campus, the Bio 002 courses have access to all of the equipment used in Room 1852. Offering Bio 002 in Vacaville has been problematic with the laboratory being underequipped. Bio 002 will benefit from the remodel of Room 114 and ultimately from the construction and equipping of the new Biotechnology/Science Building on the Vacaville campus.

Since the Bio 003 curriculum will likely change as a response to the national “Vision and Change” curriculum reform, Bio 003 will require additional equipment. Likewise, Bio 003 will benefit from the construction of the new Biotechnology/Science Building on the Vacaville campus and from the Science Building on the main campus.

4.4 Facilities. Describe the facilities utilized by your program. Comment on the adequacy of the facilities to meet program’s educational objectives.

The Biology Majors program is in the fortunate position to benefit from a major building construction boom carried out by Solano College. Currently Bio 002 is taught in the well-equipped Room 1852 on the Fairfield campus where, again, it benefits from a relationship with the Biotechnology program. Bio 002 has been expanded to Vacaville and the proximity to UC Davis represents a major opportunity to attract additional students. This section of Bio 002 has been offered in the life science classroom, Room 110, which has been inadequate for its needs, but will be able to move into the recently remodeled Room 114. Bio 002 will benefit from the construction and equipping of the new Biotechnology/Science Building on the Vacaville campus.

Bio 003 has been taught in its traditional classroom, Room 305, on the Fairfield campus. It will benefit from the construction of the new Biotechnology/Science Building on the Vacaville campus and from the new Science Building to be built on the main campus.

Despite these positive changes in facilities for biology programs, there are larger areas of concern that impact the Biology Majors program. Firstly, we would like to echo the concerns expressed in the Allied Health program review. We are very concerned that the entire Cost of Ownership of the new buildings has not been addressed. We can build the new buildings, but we are concerned that no plans have been drawn out for preventative maintenance or for routine maintenance.

Secondly, because of budget cuts to the maintenance and operations staff, there is currently not routine janitorial services to our labs. Due to the activities that take place in all of our biology labs, the floors in the lab need to be swept and wet mopped on a regular basis followed by a scheduled yearly steam cleaning, waxing, and buffing of the floors. We would like to support their contention that this is a safety matter rather than a cosmetic need. The maintenance of the current facilities is inadequate and is not being addressed. We are worried that the same state of neglect might compromise the major investments in new buildings that we are making on behalf of the community that we serve.

4.5 Budget/Fiscal Profile. Provide a five year historical budget outlook including general fund, categorical funding, Perkins, grants, etc. Discuss the adequacy of allocations for programmatic needs. This should be a macro rather than micro level analysis.

Budgetary planning has been problematic with uncertainties arising about existing budgets. (The budget in the BANNER system has not consistently been accurate.) Before 2013, the Biology major program had sufficient funding for two sections of Bio 002 per year and for two sections of Bio 003 per year. The number of sections has increased to five sections per year of Bio 002 on the main campus and an additional two sections of Bio 002 in Vacaville and the Bio 003 offerings have expanded to five section per year; the funding for expendables has not proportionally increased and has not kept pace with inflation. The Bio 002 program shares materials (e.g. pipets, pipet tips, agarose, etc.) with the general biology courses, but benefits from a relationship with the Biotechnology program.

Currently the Bio 002 budget on the main campus is spending \$10,000 per year in expendables for the five sections. In Vacaville, Bio 002 consumes approximately 60% of the expendables budget which means approximate \$8,400 per year.

For years we have operated Bio 003 on a shoe-string budget, relying on preserved slides and on previously purchased pre-dissected animal specimens. In recent years we have been adding additional new laboratories, in an effort to update the laboratories, and therefore we have been incurring additional expenses.

The two sections on the Fairfield have been spending \$1000 per year and the two sections on the Vacaville campus have been spending \$1000 per year. Similarly, approximately \$1,000 has been devoted to Bio 003 in Vallejo.

PROGRAMMATIC GOALS & PLANNING

5.1 Summarize what you believe are your program's strengths and major accomplishments in the last 5 years. Next, state the areas that are most in need of improvement.

A. Strengths of the Biology Majors program:

The biology faculty are proud of the program that exists here, and we suggest that it would do well when judged against any program at any college or university in the United States. Specifically, our areas of greatest strength include:

1. Faculty: The great strength of the Biology Majors program at Solano College is its well-qualified and well-trained faculty members and staff. These faculty members work cooperatively to uphold the academic standards set for the courses. The faculty keep up to date on both scientific and technical advances and on pedagogic innovations in this field with professional development.
2. Staff: The courses could not achieve their high quality without the technicians who run the laboratories: Jennifer Low, Christine Kucala, Angela Eason, and Irene Camins. Each has an academic preparation much greater than the minimum required by the job, and each has duties greater than that which would be expected by a comparable technician elsewhere. During this year they have been asked to attend meetings, prepare equipment lists, examine blueprints, and have been given other responsibilities above and beyond their normal duties. Both Christine Kucala and Jennifer Low have been recognized as employees of the year and Angela Eason has been nominated multiple times. The strength of the program would be diminished without them and we cannot praise them enough.
3. The emphasis on laboratory: The strong lab component gives the students extensive time to develop skills in well-equipped laboratories. When students exit Bio 002, they transfer with an ability to carry out all of the techniques important to a modern cell and molecular biology laboratory. These techniques can be placed on a resume and used to gain employment or to gain a position in the research laboratory after transfer. The laboratories in Bio 003 reinforce lecture material allowing a strengthening of the students' knowledge of these fundamental biological principles. Bio 003 labs also include field work for students to collect and then analysis data. And in some sections of Bio 003, students read and discuss scientific writings in a seminar format. These types of experiences allow students to experience science as science is practiced by professionals
4. Funding for equipment and expendables in Bio 002: The Bio 002 labs tend to be expensive. The college has supported a strong laboratory budget. The Bio 002 program has benefitted by its proximity to the biotech program – it can use some of the equipment purchased by biotech.
5. The new Biotechnology/Science Building in Vacaville and the new Science Building on the main campus will provide a major boost to the program.

B. Weaknesses of the Biology Majors component of Biology:

1. One weakness of the Biology Majors program is the small size of the teaching team. There is so much going on. The program really needs one or more new hires.
2. A second weakness of the Biology Majors program has been lack of funding for innovation in Bio 003. This will be required if we are to change the curriculum next year to comply with the “Vision and Change” reform.
3. We will echo the weakness from our colleagues who wrote the Applied Health biology report. A major weakness of the campus is the fact that the understaffed maintenance and

operations group do not have the resources to clean as needed. There is inadequate resources for preventative maintenance. To our colleagues' comment that there is "absolutely unacceptable poor cleanliness of all labs and most of lecture rooms used for our classes," let us add to that the rest rooms and the entire main campus lack attention. This is hurting our enrollments; an informal poll of the Vacaville students cited poor rest room maintenance as a major reason that they avoid the main campus.

Again, to quote the Allied Health report: "Faculty feel that it is mandatory to find a solution to this ongoing problem in order to immediately provide a better teaching environment for the [Biology Majors], and in order to immediately improve overall SCC image and in order to maintain in a good condition the new buildings as they are going to be built on our campus. It is sad to see how the "new" building 400 is already showing the effects of a very low level of care, maintenance and cleanliness. It would be very sad to see the same happening to the buildings that are not built yet."

We view this as a re-occurring and serious problem that the campus needs to solve.

4. Non-Teaching Duties of Faculty: While a major strength of the Biology Majors program is the faculty, a major weakness is that the attention and efforts of these faculty continue to be siphoned away by non-teaching duties. This report is a good example of that. While analysis and long range planning are worthy goals, time is finite; the hundreds of faculty person-hours spent on this report were taken from other activities: curriculum planning, reading about scientific innovations, meeting with students, etc. Now, there is a creeping scope of expanding administrative duties. SLOs and PLOs and their assessments have been added to grading without additional time to support the effort. New efforts and important efforts from the State like C-IDs and TMCs take time. Committee assignments seem to have increased. This year there has been additional meetings with architects to help them design the new buildings. While all of these constitute worthy endeavors, they collectively take time away from teaching and especially from the innovation required to keep our program up-to-date.

5.2 Based on the self-study analysis, prioritize the program’s short (1-2 years) and long term goals (3+ years). Check whether the goal requires fiscal resources to achieve.

Table 7. Short-Term and Long-Term Goals

Short-Term Goals	Planned Action	Target Date	Person Responsible	Source
1.	The curriculum for Bio 002 and Bio 003 must be changed to match the statewide C-ID curriculum and then submitted for review. This is critical to do by the end of the 2015-2016 academic year or we will lose transferability.	By end of spring 2016	Bio 002 and Bio 003 faculty	NR
2.	The Biology major must be redesigned to become an AS-T to match the statewide TMC curriculum and then submitted for review. This is critical to do by the end of the academic year or we will lose transferability.	By end of spring 2016	Bio 002 and Bio 003 faculty	NR
3.	The Biology faculty will re-assess the effectiveness of requiring Bio 002 as a mandatory prerequisite for Bio 003.	Spring 2016	Bio 002 and Bio 003 faculty	NR
4.	Biology faculty will develop common SLO assessments	Spring 2016	Bio 002 and Bio 003 faculty	NR
5.	Hiring and training at least one new faculty member to teach cell and molecular biology. If possible, this hire should add diversity to the faculty	January 2016	Hiring Committee Training of new faculty by existing Faculty	1 additional FTE

6.	Increase biology faculty participation in Student Success Workshops offered at the Academic Success Center.	Spring 2016	Faculty	NR
7	Increase Bio 003 funding for expendables	Spring 2016	Bio 003 faculty	DB
Long-Term	Planned Action	Target Date	Person Responsible	Source
1.	Assess the effectiveness of the introduction of the Biology AS-T on increasing the number of students completing a Biology A.S.	Spring 2018	Faculty	NR
2.	Consider adding evening and/or weekend biology majors courses.	Spring 2018	Faculty and dean	NR
3.	Hiring one new full time faculty member to teach Evolution, Ecology, and Biodiversity to staff expansion classes in new buildings at Vacaville and the replacement of retired/reduced load faculty. If possible, this hire should help diversify the faculty pool.	By end of spring 2018	Hiring Committee TBD	1 additional FTE
4.	Initiate a discussion of PLOs with peer community colleges.	By end of spring 2018	Faculty	NR
5.	Initiate a discussion that increases a collaboration with the MESA program.	Fall of 2016	Faculty	NR

In the source column denote “SP” for Strategic Proposals, “DB” for Department Budget, “P” for Perkins or “NR” for No Additional Resources Needed.

SIGNATURE PAGE

6.1 Please include a signature page with all full-time faculty and as many part-time faculty as you are able. The signature page should include lines with the signatures and then typed names of the faculty members.

The undersigned faculty in the BIOLOGY MAJORS program, have read and concur with the finding and recommendations in the attached program review self-study, dated

11/30/15.

Jim Dekloe
Faculty Name

Brad Paschal
Faculty Name

Ed Re
Faculty Name