Program Review - Instructional Program Plan

Program Title Biological & Health Sciences

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Executive Summary

Please summarize your program's strengths, opportunities/challenges, and action plans. This information will be presented to the Board of Trustees. (1000 word limit)
Click here to enter text.

Program Context

1. Mission: Please identify how your program aligns with the college's mission by selecting the appropriate check box(es):

   ☐Career Technical ☐Basic Skills **X** Transfer **X** Lifelong Learning

   If your program has a mission statement, include it here.

   MISSION STATEMENT: The Biological Sciences Program provides well-supported, personalized, interactive, and hands-on instruction in the life sciences that is accessible to a very diverse student population. We share our own enthusiasm for biology and use multi-faceted and rigorous approaches to education to help enhance or instill in students a driving curiosity that leads them to fully explore the wonders of the living world. With guidance, personalized instruction, and their own self-motivation and empowerment to learn, students will be prepared for professional programs and more advanced academic degrees in the biological, natural, and health sciences.

   VISION: The Biological Science Program incorporates current computer and laboratory technology and methods into our curriculum. We challenge our students to meet the expectations of a rigorous curriculum and challenge ourselves, as faculty, to maintain high educational standards and to stay current in the biological sciences. To meet the challenges of a continually diversifying and ever-growing student population, we continue to look forward and plan consistent evaluation and modifications to our curricula. We provide continually updated methodologies and equipment to meet the burgeoning employment demands of the community and to prepare students seeking degrees and employment in the biological, natural, and health sciences.

2. Articulation: Describe how your program's articulation may be impacted by changes in curriculum and degree requirements at high schools and 4-year institutions. Describe your efforts to accommodate these changes.

- Transfer Model Curriculum (TMC) templates for Biology and Nutrition & Dietetics were released in early February 2015. Proposals to create these transfer degrees for our campus are currently in the Curriculum Approval Process and will be discussed/potentially approved at the March 13, 2015 Curriculum Committee meeting. Once these degrees are locally approved they will be submitted to the state for approval and implementation. Neither degree requires the creation of new courses and both may stimulate additional interest in our department from prospective students.

3. Community and Labor Needs: Describe how changes in community needs, employment needs, technology, licensing, or accreditation affect your program. CTE programs should identify the dates of their advisory group meetings.
   - Our allied health core courses (Human Anatomy, Human Physiology, Microbiology, Nutrition) are experiencing a shift in their student populations away from pre-nursing to other allied health programs. In particular, an increase in kinesiology students has been noted in these courses as a result of our campus offering the AA-T in Kinesiology (BIOL 250 and BIOL 260 are Core Courses for this degree). As such, the full-time faculty that teach these courses (Prof. Hirzel and Prof. Behonick) plan to liaise with faculty in the Kinesiology Department as well as campus athletics coaches to discuss strategies for helping these students succeed (particularly those who are student-athletes).
   - Our department has explored the possibility of offering a biotechnology program and the demand for graduates of such a program. Our most recent conversations suggest that local biotech companies do not have a demand for Associate's Degree-level graduates and are primarily seeking employees with at least a Bachelor's degree. We are in continuing conversation with Jonathan Bissel of Community, Contract, and Continuing Education regarding biotech industry needs.

Looking Back

4. Curricular Changes: List any significant changes that have occurred in your program's curricular offerings, scheduling, or mode of delivery. Explain the rationale for these changes.
   - In Fall 2014 we began offering BIOL 260 in the mornings and continue in Spring 2015. For the past several years we have offered this course in the afternoons only due to scheduling conflicts with BIOL 250 which shares a laboratory space. With the acquisition of 16-005 as a joint Biology/Geology laboratory space and with a declining number of sections, we took the opportunity to provide students with the morning course which frees students' afternoons for other courses or work.
   - We have developed online sections of BIOL 100 and 310. Enrollments in BIOL 310 were 31 and 37 for fall/spring. We plan on offering BIOL 100 online for the first time this summer.
   - The AS-T for Biology is currently in the Curriculum Approval process and will be submitted for approval by the state upon approval from the campus Curriculum Committee. The AS-T for Nutrition & Dietetics is currently in the Curriculum Approval process and will be submitted for approval by the state upon approval from the campus Curriculum Committee. The latter ADT is new to the college and the district. The degree did not require us to create any new courses so implementation is straightforward. We hope that this new degree will spark interest in students

who may wish to pursue transfer to a four-year nutrition program at a CSU (e.g. the B.S. in Nutritional Sciences at San Jose State University).

5. Progress Report: Provide your responses to all recommendations received on your last program review and report on progress made on previous action plans and toward your strategic goals.
Link: 2013-2014 Program Plan and Feedback forms

   Recommendation/Feedback: "The assessments for the SLOs for the 6 HSCI courses need to be assessed ASAP at the end of each semester the course is offered. Also, there are BIOL courses that also need to be assessed as there is no data for the past two plus years."
Response: Please see comments for question 9 for details. For the Health Science department a major challenge in this area is the low number of full-time faculty. There is only one full-time faculty member in Health Science; she is shared with the Biology department and she has not been teaching HSCI courses consistently since 2012. The remainder of the courses are taught by part-time faculty, many of whom do not enter SLO data regularly. Similarly, the Biology courses for which SLO data is missing are those taught by rotating part-time faculty. We will work this year to hold all faculty accountable for doing SLOAC. We will also request a full-time faculty Biology position to take ownership of the curriculum and assessment of the introductory biology courses.

   Recommendation/Feedback: "Cannot locate a plan for necessary curriculum development."
Response: We are unsure what plan the reviewer refers to. We continuously update our curriculum as needed indicated either by internal analysis or C-ID/TMC.

   Recommendation/Feedback: "Would recommend development of a Bio Tech major to increase enrollments in the discipline. Further, we should be connecting industry partners in Redwood City to the college in the development of this discipline."
Response: Please see comments for question 3. Community & Labor Needs.

   Recommendation/Feedback: Regarding Departmental Action Plans, "skeletal plan developed for Biology, need to develop action plan for Health Science. Need to strengthen action plan for next year's goals."
Response: We have addressed current action plans more thoroughly in this year's document.

6. Impact of resource allocations: Describe the impact to-date that each new resource (staff, non-instructional assignment, equipment, facilities, research, funding) has had on your program and measures of student success.
   - New laptops in general biology and cell labs are running new software without crashing. These laptops enabled a new lab in bioinformatics to be added to BIOL 225.
   - The acquisition of new models for the Human Biology and Human Anatomy labs has proved very helpful in ensuring students have the materials needed for study.

- The acquisition of additional laboratory space for Human Physiology (16-005, currently used as a joint Biology/Geology laboratory space) has been key in offering multiple sections of this course and at varying times. See comments for question 4 for more details.
- The acquisition of microscopes in the Human Anatomy and Physiology laboratory (18-221) due to the purchase of new microscopes for the General Biology laboratory has allowed histology lessons to be run in this space (in previous semesters, teachers had to find open time in the Microbiology or General Biology laboratories to teach these lessons). The acquisition of new muscle slides in last year's equipment request was highly advantageous as the muscle slides in the general Biology Department stocks are showing severe wear (i.e. tissue damaged, mounting medium dried-out).

Current State of the Program

Data packets link http://www.canadacollege.edu/programreview/datapackets1314.php

7. Connection & Entry:
   A. Observation: Describe trends in program and course enrollments, FTES, LOAD and Fill Rates. Cite quantitative data and specific tables from the data packets.

Biology

Enrollment in BIOL courses increased from 2151 in 2009/10 to 2433 in 2011/12. However, enrollments again steadily declined to just 2104 again in 2013/14 (Success and Retention 2009/10 through 2013/14 document, Tables: Course Success and Retention Annually, & By Semester). This same trend is still apparent when observing Student Characteristics 2009/10 through 2013/14 Biological Science document, Annual Unique Headcount table: unique head count rises from over 1672 in 2009/10 to through 1821 in 2011/12, but declining again down to 1602 by 2013/14.

These recent declines mirror trends in college-wide enrollments for the last two academic years (Cañada College Success and Retention 2009/10 through 2013/14 document, in the tables Course Success and Retention Annualy and By Semester), presumably losing students to the rising job markets (see George Avalos's Nov. 2014 article, "Bay Area job market surges in October and the boom is likely to continue for two years," http://www.mercurynews.com/business/ci_26985531/bay-area-job-market-surges-october, and related articles from the San Jose Mercury News). Notice that the job trends and times of the declines and inclines almost exactly inversely correlates with the our Dept. and campus-wide enrollment patterns.

As with overall enrollment and headcounts, FTES, Load, and Fill Rates in BIOL have experienced declines during the last two academic years (Productivity 2008/09 through 2013/14 Biology document: Productivity By Year and By Semester tables) following several years of steady rise. FTES declined from a rise to 421 in 2010/11, down to 300 in 2013/14. Load declined from a peak of 691 in 2010/11 to 531 in 2013/14. Fill rates declined from a peak of 94% in 2010/11 down to 83% in 2013/14. Again, these recent declines mirror the trends in overall campus FTES, Load, and Fill Rates during the same years (Cañada College Productivity

2008/09 through 2013/14 document: Productivity By Year and By Semester tables). Declines in these categories might largely be attributed to rising job market opportunities in the Bay Area as noted above, reducing enrollments and to resulting reductions in BIOL sections, losing 12 sections from 2010/2011 to 2013/14 (Productivity 2008/09 through 2013/14 Biology document: Productivity By Year and By Semester tables).

Health Science

Enrollment in Health Science courses increased from the 2009-2010 academic year to the 2010-2011 academic year, but has declined steadily since the 2010-2011 academic year (Annual Unique Headcount of 563 in 2010-2011 as compared to 417 in 2013-2014; Annual Unique Headcount Table, Student Characteristics 2009/10 through 2013/14 Health Science document). This decline mirrors that observed for the college overall, which also showed a decrease in Annual Unique Headcount since the 2010-2011 academic year (11,560 in 2010-2011 as compared to 11,178 in 2013-2014; Annual Unique Headcount Table, Student Characteristics 2009/10 through 2013/14 document). There are several additional factors which likely contributed to this trend including the loss of concurrent enrollment courses in this department during this time period (see "Currently K-12" group in Student Enrollment Status Table, Student Characteristics 2009/10 through 2013/14 Health Science document), as well as the cancellation (due to low enrollment) of HSCI 116 during the Spring 2012, Fall 2013 and Spring 2014 semesters (which resulted in the running of 1 less HSCI course during the affected semesters).

FTES and LOAD in Health Science have declined since the 2009-2010 academic year (FTES: 38.8 in 2009-2010 as compared to 21.64 in 2013-2014, LOAD: 601 in 2009-2010 as compared to 443 in 2013-2014; Productivity by Year Table, Productivity 2008/09 through 2013/14 Health Science document). This trend mirrors that observed for the College overall during this time period (FTES: 4615.26 in 2009-2010 as compared to 3736.49 in 2013-2014, LOAD: 606 in 2009-2010 as compared to 478 in 2013-2014; Productivity by Year Table, Productivity 2008/09 through 2013/14 document), although the specific fluctuations seen between the 2009-2010 and 2013-2014 academic years are different between the Health Science department and the College as a whole.

Fill rates for the Health Science department were higher than those observed for the College overall for all but 1 of the academic years assessed (2009-2010: HSCI 78.5%, Cañada 77.2%; 2010-2011: HSCI 94.7%, Cañada 86.0%; 2011-2012: HSCI 77.5%, Cañada 80.0%; 2012-2013: HSCI 80.4%, Cañada 77.0%; 2013-2014: HSCI 74.5%, Cañada 70.0%; Productivity by Year Table, Productivity 2008/09 through 2013/14 Health Science document, Productivity by Year Table, Productivity 2008/09 through 2013/14 document).

B. Evaluation: What changes could be implemented, including changes to course scheduling (times/days/duration/delivery mode/number of sections), marketing, and articulation that may improve these trends?

Biology

Introduction of online sections of Bio 100 and Bio 310 may increase enrollment for these courses. The current initiative for GE Thematic Pathways may enable sections of these courses to have perspectives that would fit with chosen pathways, which might increase enrollment.

Aside from the GE Pathways efforts, special sections of these GE courses could be designed to appeal to students interested in particular approaches. For example, Prof Hirzel adapted Bio 100 curriculum around a theme of sustainability when he taught this course several years ago. This revision of curriculum would take concerted effort by an instructor dedicated to this course, and right now adjunct instructors rotate responsibility for this course.

Also, introducing more morning lectures and laboratories, begun in fall 2014 for BIOL 260 as mentioned earlier, will provide more scheduling opportunities for students and instructors.

Certainly, more active marketing and outreach at campus Majors Days and Club Days, as well as more direct communication with local high schools could help fill and expand our program offerings. Perhaps the college Marketing and Outreach staff could create suitable hard-copy materials for these events that promote biological sciences.

Other options include more online offerings for lecture courses, as has begun with BIOL 100 and BIOL 310, that could reach more students with restricted schedules. Enrollment in hybrid sections of BIOL 110 have been steady for several terms.

Health Science

The Health Science department has experienced trouble in successfully offering new courses. HSCI 116 Women's Health Issues, which was created in 2012, has thus far been offered during 6 semesters but has run successfully only twice. Despite initially perceived demand, transferability, general education fulfillment and the fact that the course is a selective for all degrees currently offered in the Biology department, it has failed to gain traction on this campus. A restrategizing effort for this course and the Health Science department as a whole is currently being planned (see section 11).

While a TMC in Public Health Science is currently being considered at the state level, it is unclear whether such a degree could be offered on our campus. As currently structured, this transfer degree would require the creation of at least one new Health Science course (Introduction to Public Health) and it is unclear whether sufficient demand for such a course/degree exists at Cañada.

Additional considerations for increasing enrollment in Health Science include the following:

- creation of new courses tailored to more specific student populations (e.g. student-athletes, kinesiology students)
- development of online sections of regularly-offered HSCI courses (e.g. HSCI 100)
- packaging of HSCI courses into GE pathways currently in development to boost enrollment. this strategy is being considered specifically for HSCI 116, which may be particularly suited to GE pathways that focus on Diversity Studies or Gender & Sexuality.

8. Progress & Completion:
   A. Observation: Describe trends in student **success** and **retention** disaggregated by: **ethnicity, gender, age, enrollment status, day/evening**. Cite quantitative data and specific tables from the data packets.

Biology

Overall Success and Retention in our BIOL courses have fairly consistently been around 67% success and 81% retention, with recent dips in 2013/14 to 63% and 78% respectively (Success and Retention 2009/10 through 2013/14 Biological Science Department document: Annual Retention and Success table). Comparatively, campus-wide success has stayed consistently at about 70% Success and 84% Retention, a few points higher than in BIOL courses (Cañada College Success and Retention 2008/09 through 2013/14: Course Success and Retention Annually table).

The Retention and Success by Ethnicity table reveals that for the last 5 years among our greatest ethnic populations (White, Hispanic, Unknown, and Asian respectively and historically), 70-76% of white students are successful and 81-86% are retained, with dips of about 5 percentage points in the last year or two. "Unknown" students' success and retention is close to that of White students. Hispanics have much lower success at 49-57% with recent rises, and retention at 73-78% with recent slight declines. Clearly, success and retention of our Hispanic students needs to be better addressed by providing as much support and preparation as possible before and during enrollment in BIOL courses. Asian students succeed in BIOL courses 73-84% (most commonly around 77% in the last 4 years), and Asian retention is 83-90% for the last 5 years, mostly in the high 80%. Asian students are a very successful and dedicated group. Filipino student success has fallen from 75% to 64% in the last three years, and their retention has fallen from 85% to 77% in the same time. Students who identify as coming from African American descent have had varied success between 41% and 56% for the last 5 years, and their retention varied between 63% last year and 79% in 2010/11. Native American student trends are difficult to pinpoint due to very low enrollments in BIOL (ranging from only 3-9 students per entire academic year).

The Retention and Success by Gender table shows that female student success has declined from 77% to 63% in recent years, and their retention rate Male student success consistently trails a few %age points behind female students, varying between 60% and 67% , and their retention rate has held consistently between 78% and 82%, trailing just behind female students. (Success and Retention 2009/10 through 2013/14 Biological Science Department document: Retention and Success by Gender table). These trends are consistent with overall student Success and Retention trends.

Enrollments in BIOL have been consistently about 67% female and 31% male for the last 5 years (Student Characteristics 2009/10 through 2013/14 Biological Science document: Student Gender, Age and Ethnicity tables). This trend of female predominance in the BIOL program (7 %age points higher than campus-wide) is even more pronounced than the national averages in recent years, as reported by Eddy et al. article in *Life Sciences Education* from May 2014, "Gender Gaps in Achievement and Participation in Multiple Introductory Biology Classrooms" (http://www.lifescied.org/content/13/3/478.full). Results in this study demonstrate the

continuing trends of female predominance in choosing biological/health majors in college (and also in class participation), consistently near 60% female in Life Science majors. This trend holds only for the Life Sciences, while other STEM majors are predominantly male.
The campus and BIOL program's predominant age group, 18-22 years, has had only a 54%-63% success rate in recent years, while the next two age groups, 23-28 and 29-39 (also high enrollment groups) succeed at a nearly 15-20 %age points higher rate (Success and Retention 2009/10 through 2013/14 Biological Science Department document: Retention and Success by Age table)! It seems apparent that the more recent high school graduates require much better guidance and preparation for college BIOL courses (see suggestions in Part C below). However, the retention rate among this young predominant age group is still good, from 76-80% retention, very close to the next two age groups.

Perhaps consistent with the struggles of our younger age groups mentioned above, First-Time Student enrollees have struggled with low success rates, 46-56%, but this has improved to about 65% success in the last two years (Success and Retention 2009/10 through 2013/14 Biological Science Department document: Retention and Success by Enrollment Status table). This might be attributed to better and more pro-active counseling services on campus, and better prerequisite checking across the District. Returning Students have also struggled with low-mid 60%s in success, and so more counseling intervention is likely needed with these students as well. Both of these student groups also struggle college-wide (Cañada College Success and Retention 2008/09 through 2013/14: Retention and Success by Enrollment Status table). Retention rates of BIOL students in these two groups are decently comparable to other groups at 78-83%, including rises in the last 3 years.

Retention Rates have remained consistent between Day and Evening enrolled students, at 79-82% for the last 5 years. However, Success Rates have varied, showing notable declines from 77% to 60% in evening classes (Success and Retention 2009/10 through 2013/14 Biological Science Department document: Retention and Success by Day or Evening courses table). More active effort is needed to ensure that quality instruction and student support continue reach our large population of evening students!

Web Assisted Courses, such as BIOL 260 and some sections of BIOL 110 and 130 demonstrate great 70-84% success rates and 84-91% retention rates (Success and Retention 2009/10 through 2013/14 Biological Science Department document: Retention and Success by Distance Ed Description table), nearly 10 points higher than standard face-to-face only courses, but success declined significantly in the last 2 years. These combinations of face-to-face instruction and also extensive online activities are working very well for students, thought the declines must be addressed. Standard non-online courses have roughly 65% success and 80% retention. Hybrid courses have had low success rates, 52-64% in the last two years, and Online success dropped majorly to 41% last year. Students struggle significantly more in these online and hybrid courses with less face-to-face contact, while students in simply web-enhanced courses are flourishing overall.

Health Science

Overall, the Health Science department has shown Success and Retention Rates that are consistently higher than those observed for the College as a whole since the Fall 2009 semester (Course Success and Retention by Semester table, Success and Retention 2009/10 through 2013/14 Health Science Department document; Course Success and Retention by Semester table, Success and Retention 2009/10 through 2013/14 document).

Success rates for students in Health Science are consistently above 70% since the 2009-2010 academic year (notable exceptions occur in the Native American student population which has a consistently low headcount in the department, likely skewing the data for this group). For most of the groups surveyed, their Success Rate in Health Science was higher than that observed for the same group at the College overall. It is worthwhile to note that for most academic years reported, African American students had the lowest Success Rate in the department (Retention and Success by Ethnicity Table, Success and Retention 2009/10 through 2013/14 Health Science Department document; Course Success and Retention by Ethnicity table, Success and Retention 2009/10 through 2013/14 document). While the Health Science department continually serves a higher proportion of female than male students, the students in this department displayed high Success Rates regardless of gender. Success Rates for all reported genders for all reported academic years remained above 70% (with the exception of students of Unreported Gender during 2009-2010 at 63%) and were higher than those reported for the College as a whole (Retention and Success by Gender Table, Success and Retention 2009/10 through 2013/14 Health Science Department document; Course Success and Retention by Gender table, Success and Retention 2009/10 through 2013/14 document). Success Rates remained high for most students when disaggregated by age group; the notable exception was the "Under 18" group which reported the lowest success rates of all age groups for 3 of the 5 academic years reported (58% in 2009-2010, 70% in 2010-2011, 70% in 2011-2012; Retention and Success by Age Table, Success and Retention 2009/10 through 2013/14 Health Science Department document; Course Success and Retention by Age table, Success and Retention 2009/10 through 2013/14 document). This same trend was apparent when the data was disaggregated by enrollment status, as those students in the "Currently K-12" group showed low Success Rates during these same semesters (57% in 2009-2010, 64% in 2010-2011, 63% in 2011-2012; Retention and Success by Enrollment Status Table, Success and Retention 2009/10 through 2013/14 Health Science Department document; Course Success and Retention by Enrollment Status table, Success and Retention 2009/10 through 2013/14 document). Success Rates reported for day students have been consistently lower than those reported for evening students for all academic years reported (Retention and Success by Day or Evening Table, Success and Retention 2009/10 through 2013/14 Health Science Department document).

Retention rates for students in Health Science did not fall below 89% for any year reported for any ethnic group surveyed and were consistently higher than those reported for the College as a whole (Retention and Success by Ethnicity Table, Success and Retention 2009/10 through 2013/14 Health Science Department document; Course Success and Retention by Ethnicity table, Success and Retention 2009/10 through 2013/14 document). Retention Rates for all reported genders for all reported academic years did not fall below 87% and were higher than those reported for the College as a whole (Retention and Success by Gender Table, Success and Retention 2009/10 through 2013/14 Health Science Department document; Course Success and

Retention by Gender table, Success and Retention 2009/10 through 2013/14 document). Retention Rates remained at or above 87% for all age groups reported for all academic years reported and were consistently higher than those reported for the College as a whole (Retention and Success by Age Table, Success and Retention 2009/10 through 2013/14 Health Science Department document; Course Success and Retention by Age table, Success and Retention 2009/10 through 2013/14 document). Retention Rates remained at or above 80% for all enrollment statuses reported for all academic years reported and were consistently higher than those reported for the College as a whole (Retention and Success by Enrollment Status Table, Success and Retention 2009/10 through 2013/14 Health Science Department document; Course Success and Retention by Enrollment Status table, Success and Retention 2009/10 through 2013/14 document). Retention Rates remained at or above 84% for both day and evening students for all academic years reported and were consistently higher than those reported for the College as a whole (Retention and Success by Day or Evening Table, Success and Retention 2009/10 through 2013/14 Health Science Department document).

B. Observation: For online courses describe any significant differences in the success and retention of students who are taking online courses compared to face-to-face courses.

Biology

BIOL 310 Nutrition is the only Biology course taught completely online, although BIOL 100 will soon be offered as well. As mentioned earlier, success in purely online courses last year was very low, 41%, while retention was also lower than other courses, at 70%. More work must be done to monitor and perhaps intervene early to help students be more successful in online and hybrid courses.

Health Science

n/a - no HSCI courses are currently offered online.

C. Evaluation: Based on these trends, what do you feel are significant factors or barriers influencing student success in your courses and program? What changes (e.g. in curriculum, pedagogy, scheduling, modality) could be implemented to improve these trends?

Biology

Student preparedness is a perpetual challenge in biology courses in general. The scientific terms can seem to be equivalent to learning a new language, and many of our students are already working on mastery of English. As previous data have shown, success in math is key to success on many other courses, including biology. We should continue to encourage students to take math and chemistry early and often, before diving into biology courses.
Collaboration with instructors in these related courses could produce problems and case studies that involve biological aspects. The physics of motion apply to organisms as well as to blocks on ramps. Perhaps a FIN or other organized structure could provide the basis for these collaborations on modified curriculum.

Reading and interpreting a scientific text can be a challenge. Denise Hum (Math) is leading a group of faculty, including some biology faculty, in Reading Apprenticeship training

during this term and through the summer. Implementation should begin next fall in several courses.

The idea of an Anatomy Academy proposed last year will be revisited and evaluated thoroughly. Implementation may require grant funds - it's not clear yet what direction we may go. It is still debatable if and how such a program may be effective in improving success for Anatomy students.

For nonmajors, if course topics can be presented in a way that is most relevant to their current interests, then students may remain motivated to completion. This may take a major renovation of the curriculum, and require the dedication of FT faculty. The position proposal is appended.

Health Science

The most noteworthy trends in this dataset are the low Success Rates observed for Under 18/Currently K-12 students (see part a for details). This group comprises both the concurrent enrollment students who take HSCI courses at their high school campuses as part of an Early College program and Middle College students who take HSCI courses on campus. These data confirm what several instructors have observed anecdotally - that high school students enrolling in these courses are more likely to be underprepared for the demands and, as a result, not ultimately succeed in the course. Changes that have been implemented which may have contributed to the increase in this group's success in 2012-2013 and 2013-2014 include better advising/guidance by high school staff enrolling students in these courses.

As the data demonstrate, the Health Science department disproportionately enrolls female students in its classes. It is unclear why this is so and whether measures should be taken to increase the enrollment of male students.

Overall the Health Science department has higher success and retention rates than the college as a whole. This may be due, in part, to skewing from the First Aid courses which, like CPR, are effectively Pass/No Pass courses in which virtually all students learn to demonstrate the necessary skills to earn certification.

9. SLO Assessment:
https://smccd.sharepoint.com/sites/can/CANSLOAC/default.aspx

A. Are all course SLOs being systematically assessed at least once/4 years? Describe the coordination of SLO assessment across sections and over time.

Biology

Among 11 regularly offered biology courses, most have regular assessments of their associated Course SLOs on record in Tracdat. Several of the courses are missing assessments for 1 or 2 SLOs (BIOL 110, 225, 230, 250, and 310). A few courses are missing assessments for 3 or more SLOs (BIOL 100, 103). In addition, some of the SLOs should be reassessed soon, per the

college policy of assessing all Course SLOs over a 4-year period. The expiration date has arrived for some SLO results, even though criteria were met in the last assessment.

There has not been good coordination among sections of each course, as far as assessments and collating results. Mostly, the FT faculty seem to complete assessments and reports. Some PT do likewise, but it is not as consistent across courses. Without any FT faculty to "lead the charge" in BIOL 100, very little assessment has been done at all. BIOL 110 has a few more results on record, but most of these were done several years ago and should be reassessed. Perhaps more specific assessment information and assistance in planning assessments needs to be provided to PT instructors at the beginning of each term. FT instructors could benefit from these discussions, as well.

Health Science

- The following HSCI courses are currently in the Cañada College catalog. The SLO assessment record for each is as follows:
  - HSCI 100 - 4 of SLOs for this course were assessed at least once in the last 4 years. 1 SLO has no record of ever being assessed.
  - HSCI 104 - no SLO assessment records in TracDat
  - HSCI 105 - no SLO assessment records in TracDat
  - HSCI 115 - 2 of the SLOs for this course were assessed once in the last 4 years. The remaining 5 SLOs currently listed for this course have no record of ever having been assessed. The Course Outline of Record for this course was updated in Spring 2015; the number of SLOs for this course was reduced to allow for more timely assessment.
  - HSCI 116 - 2 of the SLOs for this course were assessed once in the last 4 years. The remaining 3 SLOs currently listed for this course have no record of ever having been assessed. A major limitation is that this course has been offered successfully only twice (Fall 2012, Spring 2014) since its creation in 2011.
  - HSCI 430 - no SLO assessment records in TracDat
  - HSCI 432 - no SLO assessment records in TracDat
- A major limitation for SLO assessment and coordination in Health Science is the dearth of full-time faculty in this department. While Prof. Behonick is a full-time faculty member in Health Science she is shared between the Health Science and Biology departments and has not consistently taught Health Science courses since 2012 (from 2009-2012 she taught one HSCI course each semester). As a result, those responsible for Health Science courses (and the associated SLO assessments) are predominantly, if not all, part-time faculty, several of whom teach off-campus at concurrent enrollment sites each semester. The Health Science department has not yet developed a strategy for effectively coordinating the SLO assessment efforts of these part-time faculty (see section 11).

B. Summarize the dialogue that has resulted from these assessments. What are some improvements in your courses that have been implemented through SLO assessment? How has student learning been improved by changes in teaching? Cite specific examples.

BIOL 130/132:

- BIOL 130 Human Biology is a prerequisite course for BIOL 250, and serves as a gatekeeper to boost student preparedness for Human Anatomy. So it is not too surprising that success rates are not as high as in other biology courses. However, in an attempt to foster better study habits, Prof. Rhodes has adopted a package of Mastery Learning modules that accompanies the textbook. The strategy is similar to that of Prof. Hirzel, in that students take frequent, low-stakes quizzes to practice retrieving information. These modules are adaptive, adjusting the choice of questions to focus on topics that each student is unsure about or selects the wrong answer. Results will be analyzed at the end of spring term.

- BIOL 132 Lab, which accompanies BIOL 130, faces the challenge of including students from up to 4 sections of BIOL 130, as well as those students who have taken BIOL 130 years before. The sequence of labs was rearranged to better align with most sections of BIOL 130. All BIOL 130 instructors are given the lab schedule in advance to allow them to adjust their syllabus accordingly. This seemed to work better for students in two Fall sections of BIOL 132. There are still some labs that include topics which students have not yet discussed in lecture (BIOL 130). It is impossible to align the labs with all sections of BIOL 132.

BIOL 225:

- A new lab using techniques of bioinformatics was incorporated into this majors class. While it does give students hands-on experience in finding and manipulating data from genomic and protein databases, if it were combined with some wet-lab aspect, the learning impact would be increased.

BIOL 230:

- For the last 4 years, students are more frequently required to develop their own questions/scientific inquiries in the Cell and Molecular Biology laboratory, and to plan and execute their own experiments. Progress has been made in the last 2-3 years as students are becoming more competent at this process faster. The formal laboratory reports now include a detailed reflection on the scientific process, and the entire assignment is submitted as part of their semesterly e-Portfolio. Since Fall 2013, students have weekly assignments (Pre-Laboratory writeups) writing their own hypotheses about scientific questions in the laboratory, and making predictions of outcomes. These weekly Pre-Labs and practice in developing hypotheses and thinking through predicted results have facilitated students' mindset of ownership of their own scientific investigations.
- Daily in-lecture Blue Book questions were begun in Fall 2014 to help more directly engage students in the classroom, encourage active participation and collaborative learning with classmates, and to help the instructor track student learning progress on a more consistent basis throughout the semester.

BIOL 250:

- One of the SLOs in BIOL 250 is that students will be able to relate an organ's structure to its function. Normally these are assessed through exam questions. However, in anticipation of using ePortfolios to assess PLOs (which share this learning outcome) Prof. Hirzel created three case study assignments that specifically address the structure/function learning outcome. In the first semester, students showed sequential improvement on these assignments over the course of the term. However, this result was not replicated during the subsequent semester. There are many factors that apparently affect the success of implementing such case studies. We continue to evaluate what strategy to employ to see improvement in this area.
- Overall success rates in this course are consistently suboptimal. Course success directly addresses the SLO in which students' identify and name anatomical structures. Among the factors that contribute to failure in the course are (a) students not mastering past material before beginning to learn new material, and (b) students not practicing identification drills frequently enough over the course of the week. In spring 2014, Prof. Hirzel created "gates" on his lecture quizzes that required students to pass the current quiz with a C or better before being allowed to begin a new unit of material. This strategy did not significantly impact course success rate. So in fall 2014, Prof. Hirzel moved from the aforementioned strategy which was more punitive in nature, to try an approach based on positive reinforcement and game theory. Modeling after how games create motivation to continuously practice to improve scores, he created three levels of quizzes, each with an increasing level of difficulty. Students were allowed to attempt each quiz until they reach mastery (or at least 70% score) and only then could they move to the next level of quiz. Although students did successfully complete all levels of quizzes, the impact of this strategy on overall course success was not significant.

HSCI 100:

- One of the SLOs for HSCI 100 is "Describe prevalent contemporary health concerns and problems, their characteristics and methods of care including (but not limited to) nutrition, mental health conditions, chronic illnesses and infectious diseases." This has been assessed by Prof. Behonick for multiple consecutive semesters using the Current Issue Project, in which students research a contemporary controversial health issue and present this during a class-wide poster session on the last day of lecture. This assessment has resulted in an ongoing refinement of this project and how it is scaffolded for/presented to the students in this course. This first involved creation of an explicit scaffolding process wherein students were forced to complete and submit sections of the project throughout the semester for feedback, and subsequently involved the incorporation of a library orientation/research skills lesson from the library staff into the course. The last assessment of this SLO occurred prior to the addition of library orientations to the course - this semester, this SLO will again be assessed to determine the impact of this on this SLO.
- The assessments for several SLOs in this course use embedded exam questions. It has been noted in several of these assessments that the ability of students in this course to correctly answer questions on the course material appears to be affected by the manner in which the question is asked. Several of the embedded questions required students to recall/understand the same course material, but were worded very differently. In

particular, questions that are phrased in the negative (e.g. "Which of the following is a reason why people don't have access to health care?") may lead to reduced student success due to reading comprehension issues rather than lack of informational recall. This will be taken into account when exam questions are composed for this course this semester.

10. PLO Assessment:
PLO Assessment link https://smccd.sharepoint.com/sites/can/prie/_layouts/15/start.aspx#/
Please see appended document (PLO1 SciMethod) for PLO assessment results.

A. Describe your program's Program Learning Outcomes assessment plans and results of direct and indirect assessments.

Faculty assessed student work posted in eportfolios of graduates of Allied Health and of Interdisciplinary Studies with Emphasis in Natural Science Programs. The PLO assessment rubric is attached to this document along with a summary of the results (pages 18-20). Only the first PLO, involving application of the scientific method of inquiry, was scored. The number of student portfolios was small (2 and 5, respectively for each program). Such a small sample size makes it very difficult to confidently draw any conclusion about program effectiveness, so our conclusions are limited to evaluation of the process.

Alignment of Course SLO results with PLOs is readily done with Tracdat reports. Not as easy is interpretation of these reports. Improvements in assessment of Course SLOs might be beneficial. These reports still would include a lot of students who are not majors nearing completion of their degrees here, and the latter group is the population of most interest for program evaluation.

B. Summarize the major findings of your program's PLO assessments. What are some improvements that have been, or can be, implemented as a result of PLO assessment?

The student portfolios provided a convenient way to conduct direct assessment of their work by multiple faculty. As was found in the Pilot Project conducted by CIETL, there was substantial variation among faculty in applying the rubric. We need to find a way to normalize our application of the rubric. In addition, students did not necessarily post their best or most appropriate work for the PLO to which it was linked. The process would work better if students regularly updated their portfolios each term with their best work and had more guidance about appropriate PLOs. Several students that assembled even a rudimentary portfolio commented that it was a useful exercise to do. One student posted outstanding work from a summer research internship. It would be nice to get permission to share these examples of portfolios with new students.

Alignment of Course SLO results to PLOs implies that most of our students are doing well on achieving the PLO expectations. The report that includes PLO alignment of SLO results from all courses required for a Biological Sciences degree (available at the link above) seems to indicate that our students need to do better in chemistry.

Looking Ahead

11. Strategic goal & action plans:
    How will you address the opportunities for improvement that you identified above in Articulation, Community & Labor Needs, Connection & Entry, Progress & Completion and PLO Assessment? Identify timelines for implementation, responsible party, and resource requirements.

Action Plan	Timeline	Responsible party	Resources required
Biology Professional development - FT and PT faculty involved in Reading Apprentice program, across disciplines of science and math.	Spring 2015 and summer 2015 training. course modified Fall 2015	Carol Rhodes and other PT with Denise Hum (Math)	time for training and discussions with colleagues on incorporation into classes
Renovate Bio 100 to attract and benefit more non-majors; develop honors addendum	When new FT gets hired	New FT faculty	New FT faculty
Health Science Strategy Meeting	Currently being planned for Spring 2015 semester. New strategy re: course offerings, SLO assessment, overall departmental organization to be implemented beginning Fall 2015.	Dani Behonick, Doug Hirzel, Janet Stringer	n/a
Anatomy & Kinesiology faculty strategy meeting to identify strategies to improve success of student athletes and kinesiology majors	Meeting will occur during spring 2015 and into summer 2015; pilot interventions in 2015-16 if resources are available	Doug Hirzel, Dani Behonick, Coaches	Resources not needed for meeting but resources will likely be needed for any interventions
Use Data Dashboard to disaggregate student achievement data into majors/allied health/non-majors to more clearly identify existing gaps	Summer 2015; discussion of significance and plan possible interventions during 2015-16	Doug Hirzel	possible assistance from PRIE

Complete the Resource Request form to request instructional equipment, IT equipment, facilities, professional development, research, or funding (if needed) and submit with this form to your Division Dean.
Link to resource request form http://www.canadacollege.edu/programreview/instruction-forms.php

Program Learning Outcome Rubrics
PLO I Assessment:
o Use the Scientific Method to investigate biological questions and critically evaluate and effectively communicate scientific data.

Primary Element	Below Basic-0	Basic-1	Proficient-2	Advanced-3
Identification of hypothesis	Hypothesis is unclear and untestable.	Hypothesis is testable, with some supporting rationale	States a clear, testable hypothesis with supporting rationale.	States a clear, testable hypothesis with supporting rationale. Identifies the role of relevant concepts and how they inform the hypothesis.
Experimental design	Design missing key components (essential variables not considered, variables not identified/classified, method not documented completely/accurately).	Design is logical; essential variables considered but are not classified as dependent and independent. Documentation of method is incomplete.	Design is logical, with all variables identified and classified as dependent and independent. Documentation of method is mostly complete.	Design is logical, with all variables identified and classified as dependent and independent. Method is documented completely and accurately, making experiment easy to repeat.
Data presentation and summary	Data is not presented appropriately: results do not directly address hypothesis, tables/graphs are inaccurate or are constructed incorrectly.	Most data is presented appropriately: most of data (quantitative and qualitative) is summarized accurately, results pertain to hypothesis, tables/graphs are accurate and/or are constructed correctly.	Data is presented appropriately: all data (quantitative and qualitative) is summarized accurately, results directly address hypothesis, tables/graphs are accurate and/or are constructed correctly.	Data is presented appropriately and with statistical analysis: all data (quantitative and qualitative) is summarized accurately and statistical analysis is provided, results directly address hypothesis, tables/graphs are accurate and/or are constructed correctly.
Conclusion	Interpretation of results is illogical, inaccurate and/or does not address hypothesis.	Interpretation of results uses reasonable logic, provides some explanation of how	Interpretation of results is clear and logical, explains directly how results	Interpretation of results displays sophisticated logic and integrated use of evidence to support conclusion. Identifies

		results support or disprove hypothesis.	support or disprove hypothesis.	weaker evidence; creates further questions.

***PLO 2 Assessment*:**
o Recognize and explain the evolutionary connections between biological structures and their function and between organisms and their environment.

Primary Element	Below Basic-0	Basic-1	Proficient-2	Advanced-3
Explain structure / function connection with cellular example	Explanation illogical, inaccurate and/or does not address question; example not suitable.	Explanation mostly logical and accurate with some minor errors; example suitable.	Explanation logical and accurate with no errors; example suitable.	Explanation logical, accurate and thorough with no errors; example suitable. Answer explicitly illustrates how example chosen is appropriate.
Explain structure / function connection with organismal example	Explanation illogical, inaccurate and/or does not address question; example not suitable.	Explanation mostly logical and accurate with some minor errors; example suitable.	Explanation logical and accurate with no errors; example suitable.	Explanation logical, accurate and thorough with no errors; example suitable. Answer explicitly illustrates how example chosen is appropriate.
Explain how evolutionary processes affect organisms and their environment	Explanation illogical, inaccurate and/or does not address question; example not suitable.	Explanation mostly logical and accurate with some minor errors; example suitable.	Explanation logical and accurate with no errors; example suitable.	Explanation logical, accurate and thorough with no errors; example suitable. Answer explicitly illustrates how example chosen is appropriate.

PLO 3 Assessment:

o Critically evaluate biological information and examine its significance and impact on society and the environment.

Primary Element	Below Basic-0	Basic-1	Proficient-2	Advanced-3
Evaluate biological information	Evaluation is incomplete: does not discern reliability of information source, its logic, and/or evaluate supporting evidence.	Evaluation is mostly complete: analyzes credibility and logic of information, is not thorough/rigorous in review of supporting evidence.	Evaluation is complete: critically analyzes scientific information for its credibility, logic, and sufficiency of supporting evidence.	Evaluation is complete and clear justification is provided: critically analyzes scientific information for its credibility, logic, and sufficiency of supporting evidence; thoroughly explains why information is/is not reliable.
Interpret scientific information	Interpretation is inaccurate (interpretation does not match evidence) and/or incomplete (concepts not identified).	Interpretation is mostly accurate (interpretation matches most of evidence) and complete (all key concepts identified).	Interpretation is accurate (accurately interprets scientific reports) and complete (all key concepts identified).	Interpretation is accurate (accurately interprets scientific reports), complete (all key concepts identified) and clearly justified (link between key concepts and interpretation explicitly illustrated).
Identify impact of scientific information on society and environment	Connection between information and described impact is illogical and/or inaccurate.	Connection between information and described impact is logical and accurate; description of impact incomplete.	Connection between information and described impact is logical and accurate; description of impact complete.	Connection between information and described impact logical, accurate and creative; description of impact complete.