Science Pathways

DRAFT 4

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Introduction & Request Items:

This report was developed in response to a research request submitted by a Science Professional Learning Council. Data were available for consortium middle schools and high schools spanning the 2000 through 2005 academic years. Data for the local community college was available for the summer 1996 semester through the spring 2005 semester. The questions in this research request revolve around the general theme of intersegmental transitions of science students. This report is divided into four major sections; a list of the sections with the corresponding original questions follows:

SECTION 1: Success in Allied Health Biology vs. UC Transfer Biology at the Local Community College

1. What is the success rate for students who enroll in Transfer-level Biology before Allied Health Biology as compared with those who enroll in Allied Health Biology before Transfer-level Biology?

2. What is the success rate in Transfer-level Biology compared to grade in highest Math course in community college and/or high school?

3. What is the success rate in Transfer-level Biology compared to grade in highest English course in community college and/or high school?

4. Track student success in Transfer-level Biology for years before and after a new Math course was set as a prerequisite.

5. What are the science pathways above the Community College Level?

SECTION 2: Middle School Grades Correlated to High School Biology and Chemistry Grades

6. Compare middle school grades in English, math, and science with success in high school Biology and Chemistry.

SECTION 3: California Standards Test (CST) Comparison to High School Biology, Chemistry, and Physics Grades

7, 8, 9. Biology, Chemistry, and Physics California Standards Test (CST) scores correlations

SECTION 4: High School Biology and Chemistry Grades Compared to Community College Biology and Chemistry Grades

10a. Compare high school Biology grades with community college Biology grades.

10b. Compare high school Chemistry grades with community college Chemistry grades.

Summary:

SECTION 1: Success in Allied Health Biology vs. UC Transfer Biology at the Local Community College

- Success rates were highest for local community college students who took Allied Health Biology (Human Anatomy) after successfully completing Transfer-level Biology (General Zoology)
- Success rates in the Biology courses of interest are higher when students enroll in more than one Biology course
- Math level at both the high school and community college level has a positive effect on success in Biology courses at the community college level
- Higher level high school English courses have a positive effect on Biology success at the community college level
- Higher level College English composition prior to completing Biology has a positive effect on Biology success at the community college level

SECTION 2: Middle School Grades Correlated to High School Biology and Chemistry Grades

- Students who were successful in their high school Biology or Chemistry courses, respectively, had higher grade point averages in their middle school science, English, and math courses, respectively
- The largest difference in GPA between successful and not successful high school Biology students was found in eighth grade science courses

SECTION 3: California Standards Test (CST) Comparison to High School Biology, Chemistry, and Physics Grades

- Most science courses appear to have a moderately strong correlation between grades and CST science scores in the same subject

SECTION 4: High School Biology and Chemistry Grades Compared to Community College Biology and Chemistry Grades

- High school Biology and Chemistry course success rates were higher for students who went on to take a Biology or Chemistry course at the local community college

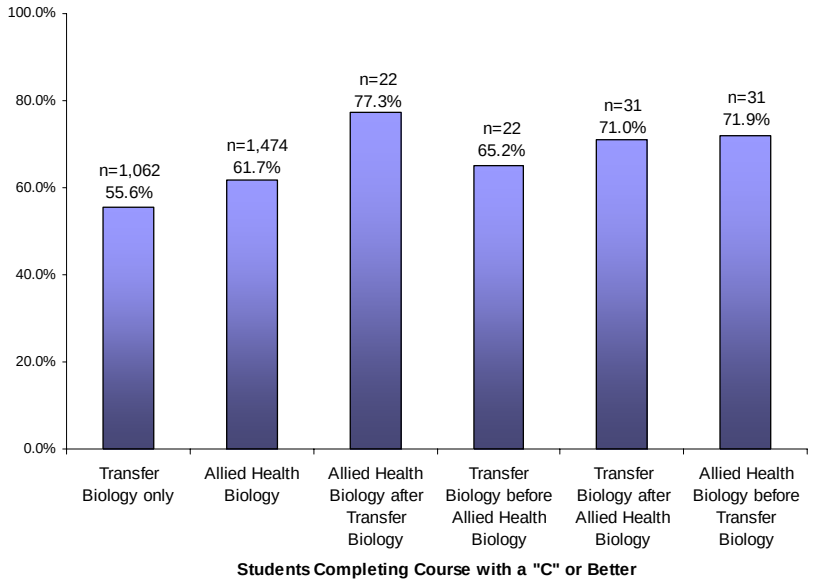
- Successful completion of courses remained consistent for students enrolled in the local community college 1996 and 2000 Biology course cohort and the 2000 and 2005 Biology course cohort
- The grade point average for high school Biology and Chemistry courses were higher for students who subsequently successfully completed Biology or Chemistry courses, respectively, at the local community college
- Females and males had nearly equal success rates in overall Biology and Chemistry enrollments, respectively, at the local community college
- Asian, Hispanic, and students with unknown ethnicities from the local high school cohort out-performed the general local community college student population in Chemistry courses; no ethnicities from the high school cohort out-performed the general student population in Biology courses

SECTION 1:
Success in Allied Health Biology vs. UC Transfer Biology at the Local Community College

Item 1. What is the success rate for students who enroll in Transfer-level Biology before Allied Health Biology as compared with those who enroll in Allied Health Biology before Transfer-level?

Between Spring 2001 and Spring 2005, Transfer-level Biology received 1,062 enrollments and Allied Health Biology received 1,474 enrollments at the local community college. During this time period, the success rate for students who only took Allied Health Biology (61.7 percent) was higher than the success rate for students who only took Transfer-level Biology (55.6 percent) (Chart 1). A limited number of these Biology students took both Transfer-level Biology and Allied Health biology. For this group, the success rates were highest (77.3 percent) for students who took Allied Health Biology after successfully completing Transfer-level Biology. Students who completed Transfer-level Biology before completing Allied Health Biology succeeded at a rate of 71.9 percent. Regardless of the local community college Biology course sequence, students who took more than one Biology course had higher success rates than students who took only one Biology course.

Chart 1. Success Rates for Students Enrolled in Transfer-level Biology and/or Allied Health Biology



Item 2. What is the success rate in Transfer-level Biology compared to grade in highest Math course in community college and/or high school?

Both high school and college last math course completed seem to have an effect on success rates in Transfer-level Biology. Generally, the higher the math level, the higher the success rate for Transfer-level Biology. Previous completion of Statistics shows the highest success rate in Transfer-level Biology, while Basic Math shows the lowest success rate (Tables 1 and 2). Pre-Algebra, Beginning Algebra, and Geometry data were combined for purposes of analysis since the sample sizes for each group were relatively small.

Table 1. Success in Transfer-level Biology by Highest High School Math Completed with a Grade of C or Better

Highest Math Course Completed in High School	Successful	Not Successful	n
Pre-Algebra, Beg. Algebra, or Geometry	29.8%	60.2%	67*
Intermediate Algebra	42.3%	57.7%	130
Advanced Algebra/Pre-Calculus	58.1%	41.9%	117
Calculus	64.2%	35.8%	67
Total	49.0%	51.0%	381

*Due to a small sample size Pre-Algebra, Beginning Algebra, and Geometry courses were combined for purposes of analysis.

Table 2. Success in Transfer-level Biology by Last Community College Math Completed with a Grade of C or Better

Last Community College Math Course Completed	Successful	Not Successful	n
Basic Math	11.1%	88.9%	9
Pre-Algebra	19.2%	80.8%	26
Begin Algebra	33.3%	66.7%	51
Intermediate Algebra	50.7%	49.3%	136
Statistics	78.1%	21.9%	32
Advanced Algebra/Pre-Calculus	62.5%	37.5%	16
Calculus	62.6%	37.4%	99
Total	50.5%	49.5%	369

Item 3. What is the success rate in Transfer-level Biology compared to grade in highest English course in community college and/or high school?

As with Math, completion of a higher-level English course seems to increase success in Transfer-level Biology (Charts 2 and 3). High School students completing AP English have the highest success rates, while students completing Intermediate Composition have the highest success rates for community college students.

Chart 2. Success in Transfer-level Biology by Highest High School English Completed with a Grade of C or Better

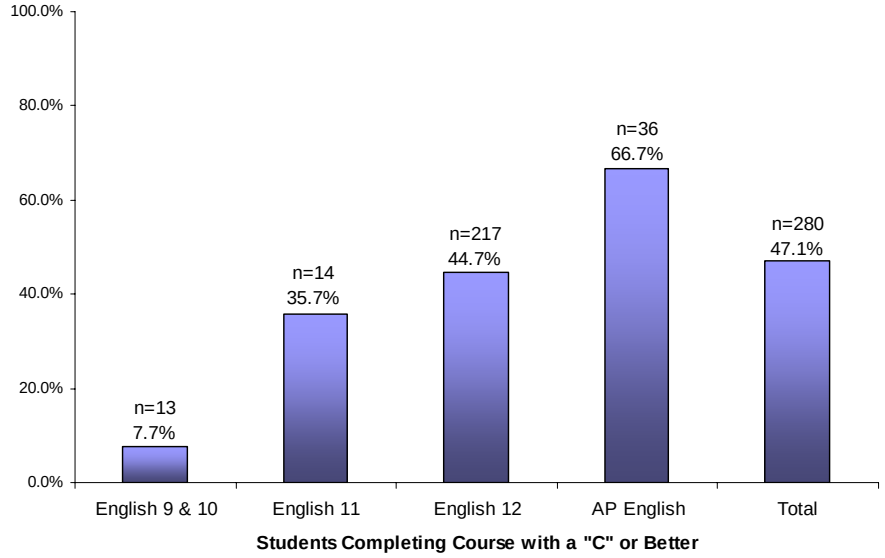
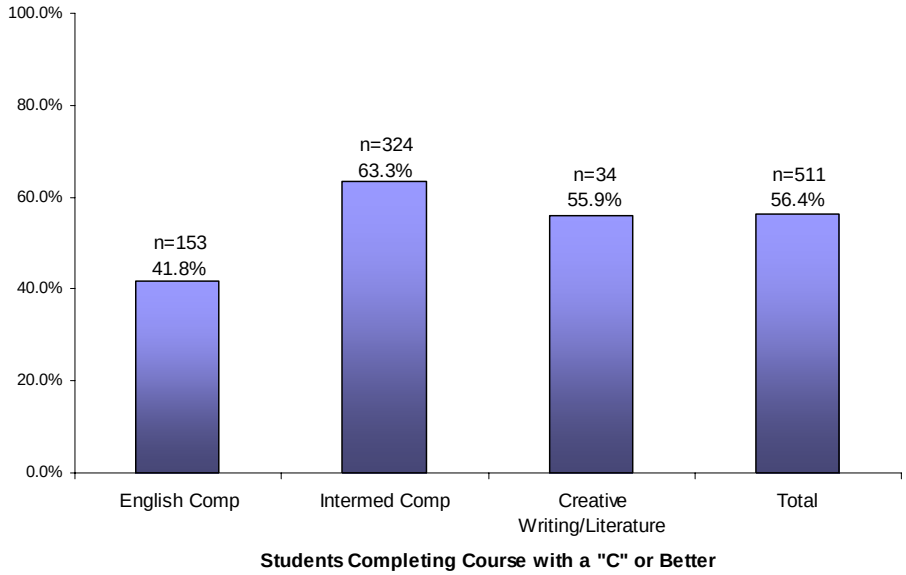


Chart 3: Success in Transfer-level Biology by Last Community College English Course Completed with a Grade of C or Better



Item 4. Track student success in Transfer-level Biology for years before and after a new Math course was set as a prerequisite.

These data are not included in this report, as they do not involve an inter-segmental analysis of data. The local community college Research Office should be able to provide this information.

Item 5. What are the science pathways above the Community College Level?

Data were not available for the universities in this consortium.

SECTION 2:
Middle School Grades Correlated to High School Biology and Chemistry Grades

Item 6: Compare middle school grades in English, math, and science with success in high school Biology and Chemistry.

Students who were successful in their high school Biology and Chemistry courses had higher grade point averages in their middle school science, English, and math courses. The largest difference in GPA between successful and not successful high school Biology students was found in eighth grade science courses (Table 3). Students who were successful in their high school Biology courses had an average GPA of 3.23 in their middle school science courses, compared to a middle school science GPA of 2.23 for students who were not successful in high school Biology. Students with higher middle school English grades tended to do better in their high school Biology and Chemistry courses (Table 4). The largest difference in GPA between successful and not successful high school Chemistry students was found in sixth grade math courses (Table 5). Successful and not successful Chemistry students had a 1.05 difference (3.54 vs. 2.49) in sixth grade math GPA's, however, a small sample size (n=31) of sixth grade students could skew these results.

Table 3. GPA of All Science Courses a Student Took in Middle School Compared to High School Biology and Chemistry Grades

	High School Biology				High School Chemistry			
	Successful	Not Successful	GPA Diff.	n	Successful	Not Successful	GPA Diff.	n
6th Grade Science GPA	3.52	2.78	.74	272	3.46	2.74	0.72	31
7th Grade Science GPA	3.21	2.31	.90	11,121	2.88	2.33	0.55	8,009
8th Grade Science GPA	3.23	2.23	1.00	14,687	2.91	2.31	0.60	10,992
9th Grade* Science GPA	2.92	2.17	.75	844	2.86	2.46	0.40	991

*One or more of the middle/junior high schools in the consortium submitted data that included 9th grade records.

Table 4. English GPA's in Middle School Compared to High School Biology and Chemistry Grades

	High School Biology				High School Chemistry			
	Successful	Not Successful	GPA Diff.	n	Successful	Not Successful	GPA Diff.	n
6th Grade English GPA	**	**	**	5	***	***	***	0
7th Grade English GPA	3.14	2.26	.88	10,782	2.84	2.30	.54	8,252
8th Grade English GPA	3.16	2.19	.97	14,479	2.87	2.33	.54	11,368
9th Grade* English GPA	2.87	2.14	.73	1,206	2.70	2.30	.40	1,248

*One or more of the middle/junior high schools in the consortium submitted data that included 9th grade records.
** Data excluded due to small sample size (n<=5).
******* There were 21 sixth grade enrollments in a course called 'English' at one middle school, but none of these students went on to take Chemistry in high school. English data were pulled based on course titles including the characters 'ENG' or 'ESL', so sixth grade "English" courses that do not use this nomenclature were excluded from the query. Note that less than .0001% of enrollments in this sample were ESL enrollments.

Table 5. Math GPA's in Middle School Compared to High School Biology and Chemistry Grades

	High School Biology				High School Chemistry			
	Successful	Not Successful	GPA Diff.	n	Successful	Not Successful	GPA Diff.	n
6th Grade Math GPA	3.45	2.70	.75	273	3.54	2.49	1.05	31
7th Grade Math GPA	3.04	2.15	.89	11,997	2.76	2.21	.55	8,915
8th Grade Math GPA	2.92	2.07	.85	15,948	2.70	2.17	.53	12,210
9th Grade* Math GPA	2.77	2.11	.66	1,271	2.64	2.25	.39	1,305

*One or more of the middle/junior high schools in the consortium submitted data that included 9th grade records.

SECTION 3:
California Standards Test (CST) Comparison to High School Biology, Chemistry, and Physics Grades

Items 7, 8, 9: Biology, Chemistry, and Physics California Standards Test (CST) scores correlations

All three disciplines (Biology, Chemistry, and Physics) showed significant, moderately strong correlations between grades and California Standards Test (CST) scores. Test scores were taken from the same year and in the same subject area as the indicated class. Not included were scores from the "Earth Science" or "Integrated I" CST subjects, which accounted for 1.3% of all test scores available. Course grades were converted to numeric grade points for this analysis. Among the three disciplines, Biology had the strongest correlation and Chemistry had the lowest, although it should be emphasized that the differences between disciplines are not large. The strength of this correlation may be influenced by many factors including alignment between course and CST content, similarity between assessments used for grading and CST items, and variability between students, schools, and classes over time. Correlation coefficients are available upon request.

SECTION 4:
High School Biology and Chemistry Grades Compared to Community College Biology and Chemistry Grades

Item 10a: Compare high school Biology grades with community college Biology grades.

Between 1999 and 2005, 66,589 Biology enrollments were tracked in the high schools of the local consortium (Table 6). Enrollment counts include all students who took any Biology course at a consortium high school in one or more of their high school years. Enrollment counts also include enrollments in courses that have unique titles in the same academic discipline (e.g., Biology 1, Biology 2). Of the 66,589 students in the high school Biology cohort for the local consortium, 3,725 enrollments were tracked to local community college Biology courses (Table 9). The high school Biology course success rate was higher for students who went on to take a Biology course at the local community college (72.5 percent) than students who did not go on to take a local community college Biology course (61.5 percent).

Table 6. All High School Biology Course Outcomes

	All Consortium High School Biology Course Enrollments		Cohort of Consortium High School Biology Enrollments for Students who Subsequently Took a Biology Course at the Local Community College	
CBEDS Category (Code)	**Successful***	**n**	**Successful***	**n**
IB Biology (2660)	83.8%	1,499	81.9%	72
AP Biology (2670)	88.5%	2,134	72.8%**	158
Other Biology (2698)	76.4%	1,202	92.5%	67
All Biology Courses	61.5%	66,589	72.5%	3,725

*Successful course completion is defined as a student earning the equivalent grade point of 2.0 (a C grade) or better.
**AP Biology students from consortium high schools did not do as well as expected in their local CC Biology courses. These results were double checked and confirmed to be an accurate account of student outcomes. It is not clear from the available data why AP students would have a lower than expected success rate in local CC Biology courses.

Between summer semester 1996 and spring semester 2005, over 46,000 Biology enrollments were tracked to the local community college (Table 7). There was a 40 percent increase in enrollment in Biology courses between the two cohorts included in Table 10, however, the successful completion of courses remained consistent for the cohorts, with 67.8 percent of course enrollments being successful between 1996 and

2000 and 66.5 percent of course enrollments being successful between 2000 and 2005. The differences in success rates between Cohort 1 and Cohort 2 are statistically significant for Animal Biology/Zoology and General Biology.

Table 7. All Local Community College Biology Course Outcomes

	Cohort 1: Summer 1996 to Spring 2000		Cohort 2: Summer 2000 to Spring 2005	
	Successful*	**n**	**Successful***	**n**
Anatomy/Physiology	63.6%	2,134	61.7%	3,709
Animal Biology/Zoology****	66.9%	1,211	58.4%	2,086
Biology Lab**	74.1%	5,083	73.8%	9,266
Ecology/Environmental. Science	80.3%	295	78.4%	463
General Biology****	64.4%	6,480	62.8%	10,698
Marine Biology/Oceanography	55.2%	924	58.6%	850
Microbiology	81.4%	488	83.4%	855
Molecular Biology	61.6%	172	58.3%	520
Other***	71.5%	590	65.7%	959
All Biology Courses	67.8%	17,377	66.5%	29,406

*Successful course completion is defined as a student earning an A, B, C, or CR in the course.
**Biology Lab included Principles of Biology lab only. Other specialty labs are included with their specialty discipline (e.g., Marine Biology Lab is included in the Marine Biology/Oceanography row count).
***"Other" Biology courses included those with small sample sizes and/or could not be easily classified into a main Biology category. Courses in the "Other" category include: Natural History of Plants, Human Heredity/Evolution, Biology of Alcohol, Unifying Concepts of Biology, Biology of Plants, DNA Science I, DNA Science II, Biology of Plants, Introduction to Research/Lab, Introduction to Biology Research, Introduction to Biology Research, and Independent Study.
****Percent difference in success is statistically significant.

Of the 46,783 students in the local community college Biology cohort for the consortium, 3,601 Biology enrollments were tracked to the consortium's high schools. The high school cohort includes all students enrolled in consortium high schools from the 2000 to 2005 academic years. Data for the previous five years were not available. Table 8 displays data on whether the K12 Cohort succeeded or not in their local community college Biology courses. Consortium high school students overall were slightly less successful than the general local community college population who took Biology courses between 2000 and 2005.

Table 8. High School Biology Cohort Who Took Biology Courses at the Local Community College by Course Success

Local CC Course	Successful	Not Successful	n
Anatomy/Physiology	46.9%	53.1%	196
Animal Biology/Zoology	51.0%	49.0%	361
Biology Lab	73.3%	26.7%	1,314
Ecology/Environmental Science	73.3%	26.7%	45
General Biology	59.3%	40.7%	1,392
Marine Biology/Oceanography	50.0%	50.0%	120
Microbiology	73.3%	26.7%	30
Molecular Biology	65.2%	34.8%	46
Other	67.0%	33.0%	97
All Biology Courses	63.2%	36.8%	3,601

The grade point average for high school Biology courses was higher for students who successfully completed the local community college's Biology courses (Table 9). The exception to this trend is the local community college's Microbiology and Molecular Biology students; unsuccessful Microbiology and Molecular Biology students had a higher Biology GPA's than successful students. Note that the sample sizes for these courses are relatively small, which could help account for this anomaly.

Table 9. Biology Course GPA's of High School Biology Cohort Who Took Biology Courses at the local community college

	Successful in Local CC Biology Course			Not Successful in Local CC Biology Course		
	GPA	Std. Dev.	n	GPA	Std. Dev.	n
Anatomy/Physiology	2.65	0.93	92	2.11	1.17	104
Animal Biology/Zoology	2.70	0.87	184	2.08	0.99	177
Biology Lab	2.50	0.95	963	1.94	0.98	351
Ecology/Environmental Science	2.48	0.99	33	1.65	1.01	12
General Biology	2.56	0.94	826	1.98	0.95	566
Marine Biology/Oceanography	2.62	0.85	60	2.03	0.92	60
Microbiology	2.55	1.13	22	2.83	0.39	8
Molecular Biology	3.02	0.89	30	3.33	0.59	16
Other	2.69	0.85	65	2.11	1.15	32
All Biology Courses	2.56	0.94	2,275	2.01	0.99	1,326

Females and males had nearly equal success rates in overall Biology enrollments at the local community college (Table 10). This is true for the entire student body taking Biology courses at the community college and the local high school cohort taking Biology courses there. There were minor differences in success rates of the local community college Biology course enrollments when compared to just local community college students who attended local consortium schools.

Table 10. Gender Distribution of Successful Biology Students in All Biology Courses Enrolled in at the Local Community College

Gender	All Local CC Bio. Enrollments	n	Local HS Cohort in CC Bio. Enrollments	n	Percent Diff. in Success
Female	67.3%	29,946	62.8%	2,282	4.4%
Male	66.5%	16,837	63.8%	1,319	2.8%
Total	67.1%	46,783	63.2%	3,601	3.9%

Success rates in Biology courses at the local community college vary among student ethnic groups. The most significant differences in success rates between all local community college Biology students and the local cohort taking Biology courses at the local community college is found in the Other (29.5% difference), followed by the Pacific Islander category (13.9%), the Asian category (11.6%), and the African American category (8.4%) (Table 11).

Table 11. Ethnic Distribution of Successful Biology Students in All Biology Courses Enrolled in at the Local Community College

Ethnicity	All Local CC Bio. Enrollments Success	n	Local HS Cohort in CC Bio. Enrollments Success	n	Percent Diff. in Success
Asian	73.9%	1,173	62.3%	106	11.6%
African American	61.0%	2,347	52.5%	99	8.4%
Filipino	70.0%	10,001	67.6%	630	2.4%
Hispanic	63.3%	23,897	61.1%	2,172	2.2%
Native American	65.6%	276	61.5%	13	4.0%
Other	75.0%	132	45.5%	11	29.5%
Pacific Islander	69.1%	369	55.2%	29	13.9%
White Non-Hispanic	76.5%	6,684	71.6%	377	4.8%
Unknown/Non-Respondent	66.6%	1,904	63.4%	164	3.2%
Total	67.0%	46,783	63.2%	3,601	3.8%

Item 10b: Compare high school Chemistry grades with community college Chemistry grades.

Between 1999 and 2005, 41,067 Chemistry enrollments were tracked in the high schools of the local consortium (Table 12). Enrollment counts include all students who took any Chemistry course at a consortium high school in one or more of their high school years. Enrollment counts also include enrollments in courses that have unique titles in the same academic discipline (e.g., Chemistry 1, Chemistry 2). Of the 41,067 students in the high school Chemistry cohort for the local consortium, 323 enrollments were tracked to the local community college Preparation for General Chemistry, General Chemistry I, and/or Organic Chemistry courses (Table 12). The high school Chemistry course success rate was higher for students who went on to take a Chemistry course at the local community college (83.3 percent) than students who did not go on to take a selected local community college Chemistry course (63.9 percent).

Table 12. Chemistry Success Rates for Consortium High School Students by Enrollment at the Local Community College

	All Consortium High School Enrollments		Enrollments by Students who Subsequently Took Preparation for General Chem., General Chem. I, or Organic Chem. at the Local CC	
CBEDS Category (Code)	**Successful***	**n**	**Successful***	**n**
Chemistry (2607)	64.5%	25,227	84.3%	268
IB Chemistry (2661)	81.2%	1,330	76.9%	26
AP Chemistry (2671)	81.5%	902	87.5%	8
Other Chemistry (6098/2698)	60.0%	11,910	**	4
All Chemistry Courses	63.9%	41,067	83.3%	323

*Successful course completion is defined as a student earning the equivalent grade point of 2.0 (C grade) or better.
** Data excluded due to small sample size (n<=5) in order to maintain confidentiality of student record.

Between summer semester 1996 and spring semester 2005, over 4,000 General Chemistry, Preparation for General Chemistry, and Organic Chemistry enrollments were tracked to the local community college (Table 13). Of these courses, success rates in Organic Chemistry were the highest for both cohorts. There was a 17 percent increase in enrollment in Chemistry courses between the two cohorts included in Table 16, however, the overall successful completion of courses remained consistent for the cohorts, with 54.1 percent of course enrollments being successful between 1996 and 2000 and 54.7 percent of course enrollments being successful between 2000 and 2005. The differences in percent successful between Cohort 1 and Cohort 2 are statistically significant for Organic Chemistry.

Table 13. All Local Community College Chemistry Course Outcomes

	Cohort 1: Summer 1996 to Spring 2000		Cohort 2: Summer 2000 to Spring 2005	
	Successful*	**n**	**Successful***	**n**
Preparation for General Chemistry	55.2%	1,232	53.5%	1,550
General Chemistry I	51.0%	657	54.6%	720
Organic Chemistry**	64.3%	70	78.3%	83
Total	54.1%	1,959	54.7%	2,353

*Successful course completion is defined as a student earning an A, B, C, or CR in the course.
**Percent difference in success is statistically significant.

Of the 4,312 students in the local community college Chemistry cohort for the consortium, 246 Chemistry enrollments were tracked to the consortium's high schools. The high school cohort includes all students enrolled in consortium high schools from the 2000 to 2005 academic years. Data for the previous five years were not available. Table 14 displays data on whether the K12 Cohort succeeded or not in their local community college Chemistry courses. Consortium high school students overall were slightly less successful than the general local community college population who took Chemistry courses between 2000 and 2005, though consortium high school students had higher success rates in General Chemistry than their non-consortium high school counterparts.

Table 14. High School Chemistry Cohort Who Took Selected Chemistry Courses at the Local Community College by Course Success

Local CC Course	Successful	Not Successful	n
Preparation for General Chemistry	50.8%	49.2%	185
General Chemistry I	61.0%	39.0%	59
Organic Chemistry	*	*	2
Total	53.3%	46.7%	246

* Data excluded due to small sample size (n<=5) in order to maintain confidentiality of student records.

The grade point average for high school Chemistry courses was higher for students who successfully completed the local community college's Chemistry courses (Table 15).

Table 15. Chemistry Course GPA's of High School Chemistry Cohort Who Took Chemistry Courses at the Local Community College

	Successful in Local CC Chemistry Course			Not Successful in Local CC Chemistry Course		
	GPA	Std. Dev.	n	GPA	Std. Dev.	n
Preparation for General Chemistry	2.70	0.84	94	2.37	0.76	91
General Chemistry I	2.83	0.79	36	2.82	0.79	23
Organic Chemistry	*	*	1	*	*	1
Total	2.75	.80	131	2.47	0.78	115

* Data excluded due to small sample size (n<=5) in order to maintain confidentiality of student records.

For the general local community college population taking Chemistry classes, female students had a higher success rate in these courses (Table 16). This is not true

for the local high school cohort taking Chemistry courses at the local community college; the success rate for female students was slightly lower than their male counterparts. Male students in the local high school cohort succeeded at a slightly higher rate than the general student population taking Chemistry courses at the local community college.

Table 16. Gender Distribution of Successful Local Community College Chemistry Students

Gender	All Local CC Chem. Enrollments	n	Local HS Cohort in CC Chem. Enrollments	n	Percent Diff. in Success
Female	56.3%	1,937	52.9%	123	3.4%
Male	53.0%	2,375	53.7%	123	-0.7
Total	54.5%	4,312	53.3%	246	1.2%

Success rates in Chemistry courses at the local community college varies among the different student ethnic groups. The most significant differences in success rates between all local community college Chemistry students and the local high school cohort taking Chemistry courses at the local community college is found in the Asian ethnic category (-15.5% difference), followed by the Filipino category (14.0%), and the White Non-Hispanic category (13.2%) (Table 17). Negative values in the "Percent Diff. in Success" column indicate that students in the local high school cohort had higher success rates that the general local community student population taking the same Chemistry courses.

Table 17. Ethnic Distribution of Successful Local Community College Chemistry Students

Ethnicity	All Local CC Chem. Enrollments	n	Local HS Cohort in CC Chem. Enrollments	n	Percent Diff. in Success
Asian	63.4%	186	78.9%	19	-15.5%
African American	37.0%	162	*	4	*
Filipino	56.0%	1,058	42.0%	50	14.0%
Hispanic	51.2%	1,982	55.7%	115	-4.5%
Native American	53.8%	52	*	0	*
Other	76.9%	13	*	0	*
Pacific Islander	69.6%	46	*	0	*
White Non-Hispanic	63.2%	627	50.0%	40	13.2%
Unknown/Non-Respondent	52.7%	186	61.1%	18	-8.4%
Total	54.5%	4,312	53.3%	246	1.2%

* Data excluded due to small sample size (n<=5) in order to maintain confidentiality of student record.

Conclusion:

Regardless of the sequence of courses taken, local community college students who took more than one Biology course had higher success rates than students who took only one Biology course. Success rates were highest for local community college students who took Allied Health Biology after successfully completing Transfer-level Biology. A related question to be answered about success in Transfer-level Biology is does the recent implementation of Intermediate Algebra as a prerequisite for this class affect student outcomes. Since these data do not involve intersegmental transitions, this report does not address this question. The local community college research office should be able to answer this question, plus map the science pathways for community college science courses (Items 4 & 5).

Success in higher level math courses also has an impact on success in college Biology courses. Generally, the higher the math level successfully completed in high school or in community college, the higher the success rate in college Biology courses. A similar tendency is seen in the area of high school English; completion of a higher-level high school English course seems to increase success in college Biology courses. These data can be monitored in the future to see if these trends persist.

An analysis of middle school to high school transitions revealed a related trend. Students who were successful in their high school Biology and Chemistry courses had higher grade point averages in their middle school science, English, and math courses. Success in eighth grade science courses appears to be the most influential in high school Biology and Chemistry course outcomes. Further analysis would determine which middle school Science courses have the most influence on success in high school Biology and Chemistry courses.

With regard to the high school to college transition, students who are more successful in their high school Biology and Chemistry classes tended to do better in their college-level Biology and Chemistry courses, respectively. Regression analysis of these data could help to determine which variables best explain why this relationship exists. Demographics, success in other high school courses, highest level of math or

English completed in high school could possibly impact the success outcomes in college Biology or Chemistry courses.

In looking at the California Standards Tests data, most science courses appear to have at least a moderate correlation between grades and CST science scores in the same subject. Courses with stronger correlations may have content that more closely matches the skills tested by the science CST.