Fullerton College Program Review and Planning

Self-Study for Instructional Programs

Fall 2021

COMPUTER SCIENCE

Statement of collaboration

The program faculty members listed below collaborated in an open and forthright dialogue to prepare this Self Study. Statements included herein accurately reflect the conclusions and opinions by consensus of the program faculty involved in the comprehensive self-study.

Participants in the self-study

Scott Edwards
Andrew Clifton
Luciano Rodriguez

Authorization

After the document is complete, it must be signed by the Principal Author, the Department Coordinator, and the Dean prior to submission to the Program Review and Planning Committee.

Andrew Verne Clifton Printed name of principal author	Signature	11-12-2021 Date
Andrew Verne Clifton Printed name of department coordinator	Signature	11-11-2021 Date
Mark Greenhalgh Printed name of Dean	Mark Greenhalgh Signature	11/19/2021 Date

A Note on terminology

"Program review" is the blanket term for all parts of this process. This document is a comprehensive "self-study." Fullerton College defines "program" as a course of study leading to a degree or certificate. A department may contain more than one program. With consultation with the Program Review and Planning Committee, a department may decide to write a separate self-study for each program within its department.

1.0 Executive Summary (Please write this section last, but include it here at the front of the self-study, on a page all by itself.)

> "Writing computer programs is one of the purest creative activities in the history of the human race. Programmers aren't bound by practical limitations such as the laws of physics; we can create exciting virtual worlds with behaviors that could never exist in the real world. Programming doesn't require great physical skill or coordination, like ballet or basketball. All programming requires is a creative mind and the ability to organize your thoughts."
>
> John Ousterhout, *A Philosophy of Software Design*

Since the last program review cycle in 2017, the Computer Science department has seen successes and challenges. Our enrollment growth continued, almost unabated, until the COVID-19 pandemic and our rapid transition to remote learning. This growth gave us the opportunity to hire an additional full-time faculty member, Dr. Luciano Rodriguez, and expand the numbers of sections offered, as well as adding summer sections for the first time.

Of course, the major challenge to our department was COVID-19, the rapid move to remote learning, and our subsequent embrace of online teaching, both synchronous and asynchronous. In some ways, the Computer Science department was uniquely prepared for this transition; we were able to bring our existing knowledge of remote technology systems and industry tools for remote collaboration into our virtual classrooms. Prior to COVID-19, no Computer Science courses were offered online. Like many departments with little to no experience in online teaching, our traditional attitude toward online versions of our courses was a mixture of mild curiosity and skepticism: it *might* work, but how could Canvas, discussion boards, and video snippets replace the rich interaction and deep learning of an in-person classroom? The transition forced us to understand and embrace these new modalities; online learning was not just a temporary measure during the pandemic, but is now a permanent part of the Computer Science department. All of our faculty are now trained in online teaching, and three of our four courses offer at least one online section.

While many departments experienced a dramatic drop in enrollment, enrollment in Computer Science has held steady, with only a small drop in the previous year necessitating the cancellation of two sections. Students beyond the Fullerton College community are also discovering our program, and how our courses can serve as a lower-cost alternative to the equivalent courses at their own colleges. We have had students, with no prior relationship with Fullerton College, enroll in our courses from UC Berkeley, Colorado School of Mines, and universities in Korea and Vietnam. At the same time, our own students continued to excel in spite of the challenges of the pandemic, transferring to or pursuing post-baccalaureate degrees at UC Berkeley, Stanford University, UC San Diego, and USC.

Our completion and success rates were on a slow upward climb, until Spring of 2020 and our transition to remote learning. They have, unfortunately, dipped over the last year; we hope they will resume their

previous trend once we return to in-person instruction.

We have rewritten our Program Student Learning Outcomes to better match the goals of our program and our students, and to align with the college's new Institutional SLOs. We are in the process of exploring new methods for assessing them and analyzing the results of those assessments, so as to ensure continual improvement into the future.

Not all the challenges facing our department can be attributed to COVID-19: achievement gaps for Latinx and low-income students remain stubbornly in place. We explore these in detail, along with several ideas for addressing them, in section 3.2.4, below.

Looking forward, we are excited to bring some of the innovations developed for our remote classes into in-person teaching in Spring 2022. At the same time, we are working to develop new course offerings for students with no prior Computer Science experience, and leveraging the skills and specialties of our faculty. The return to in-person teaching will bring our department physically together again, enabling a higher level of faculty interaction and collaboration. Although there will be new challenges in the coming Spring and beyond, the past two years have demonstrated that the Computer Science department is prepared and able to rise to meet those challenges.

2.0 Mission

Please explain briefly how your program contributes to the College's mission, vision, core values, and goals. Highlight any new contributions since your most recent self-study. If your department has a mission statement, please share it. If not then please consider discussing one with your colleagues.

The Fullerton College Computer Science department strives to embody the College's Mission. With the addition of Summer and online sections, students have increased flexibility in how they approach our courses. With tutoring available in both the Academic Support Center and the Math/CSci Lab, our students have a supportive and inclusive network they can turn to.

Computer Science is a fundamentally collaborative field; students have opportunities to work together formally, through assigned group work, and informally, in the CSci Lab and beyond. Our courses emphasize the communal nature of computer programming: a computer program is not just instructions for a computer, but a document to be read *by other people* and should be written with that in mind.

While we always strive to give students a supportive learning environment, where they can learn and grow, we also expect them to hold themselves to high standards. The artifacts of computer science sustain every level of the modern world; flawed computer programs are responsible for endless frustration, lost productivity, stolen identities, and in extreme cases, loss of life.

All the faculty in the Computer Science department are driven by both a deep love of teaching, and of computer programming. The experience of solving a tricky problem, or seeing a student have an "Aha!"-moment when a difficult concept suddenly clicks into place, or the seemingly-magical ability of a computer program to "summon" new behaviors into existence, these are all experiences which motivate and inspire us as teachers and learners ourselves.

The skills that our students learn involve understanding the importance of language syntax and semantics; interpreting word problems, breaking down complex problems into sub-problems which they solve and then incorporate into a total solution, and learning to evaluate and edit their computer code to be the most efficient solution possible. All of these abilities contribute to problem-solving skills which translate over many disciplines and life experiences. Our students gain the ability to approach problems, both on the computer and in the "real world", in a careful and methodical way, and they learn how to communicate both their solutions, and the processes by which they arrived at them.

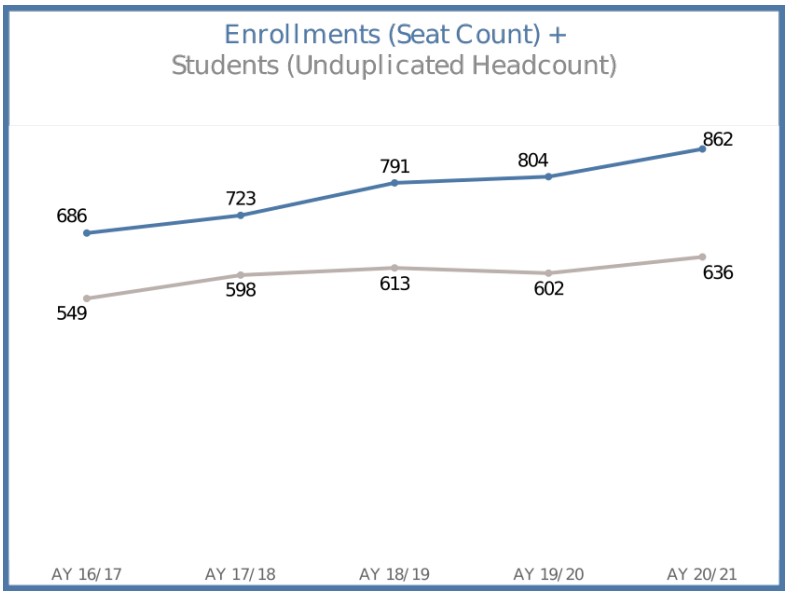
3.0 Students

Because there is a nearly infinite amount of student data that can be studied, please focus your analysis on the trends that stand out. The Office of Institutional Effectiveness (OIE) is providing data that will help you zero in on bottlenecks, gateways, and student equity issues. As per accreditation standards, OIE data will be broken down by race, ethnicity, gender, and other demographic categories. One of the purposes of this section is to identify inequities and make plans to remedy them.

3.1 Enrollment demographics

1. Using the data provided by the OIE, briefly describe the enrollment trends in the program over the past five years.

   Enrollment has increased steadily over the last five years. This trend was slowed, but not halted or revered, by the COVID-19 pandemic; our department continues to have a fill-rate at or above 95%.



2. Using the data provided by the OIE, describe the student population the department serves. Do you have a way of determining which students are majors, for example through a gateway course? Please explain.

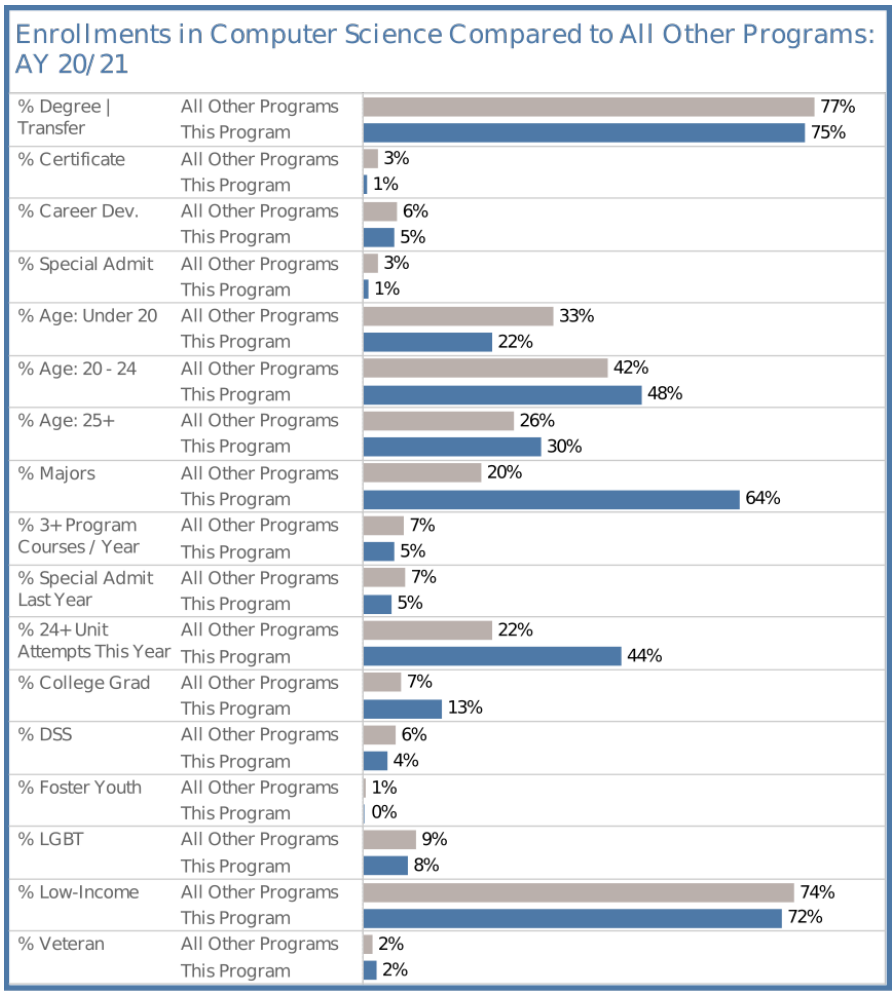
   In 2021, 72% of our students were low-income, 33% were Latinx, and 20% were female. This compares to 74%, 58%, and 53%, respectively, for other programs. (There were no significant demographic differences between major and non-major students.)

   Our students skew slightly older, with a larger percentage falling into the 20-24 age bracket than other programs.

   64% of our students are declared Computer Science majors, according to OIE data. While CSCI 123 is required by a number of different majors, CSCI 133 is almost exclusively enrolled in by Computer Science majors, and could be used as another method to identify Computer Science majors.

   A larger percentage of our students already have a college degree of some kind.

   A significant percentage — 44% — of our students are full-time (greater-than 24 units/academic year).



Computer Science Enrollments by Race | Ethnicity | Ancestry

	All Other Prog..	This Program
Amer. Indian | Alaska N..	0.2%	0.2%
Asian	11.1%	35.3%
Black | African Amer.	2.9%	1.6%
Filipino	2.7%	4.8%
Latinx	57.8%	32.6%
Native Hawaiian | Pacifi..	0.2%	0.2%
Two or More	3.4%	5.6%
Unknown	5.7%	4.9%
White	16.1%	14.8%

Computer Science Enrollments by Gender

	All Other Programs	This Program
Female	53.2%	20.3%
Male	42.3%	73.4%
Different Ident..	4.6%	6.3%

3. Which classes have the highest demand and why? Are they offered regularly — at different times of the day and week, in different formats (in-person, on-line, hybrid)? Please explain.

123 is our most in-demand course: it is a required course for Computer Science, Math, and Engineering. In the future, we intend to continue offering online sections of 123, 133, and 223, and we hope to add one or more hybrid sections. We have also historically offered a Saturday section of 123; this was suspended during the pandemic, but will resume in Spring 2022.

5 Courses with Most Enrollments
(5 Year Totals)

Course	Enrollments	Sections	% Online	% Evening
CSCI 123 F	2,288	93	0%	27%
CSCI 133 F	992	41	0%	38%
CSCI 241 F	324	13	0%	89%
CSCI 223 F	262	11	0%	100%

4. Please describe how course offerings match students' preparation and goals.

We offer courses on almost all days (M-Th, Sat.) and at all times from morning until evening. Prior to our switch to remote learning, no courses were offered online, but the exposure and positive has prompted us to offer a number of sections online (five sections in Spring 2022, or roughly 1/5th of our section offerings).

Students are often unprepared for the rigor of computer science; unlike, for example, Chemistry or Mathematics, students often have no real exposure to computer science in high school. Other colleges have made significant progress with improving success and retention rates of introductory computer science courses, and reducing equity gaps, by adding a, optional "pre-introductory" course for students entering the program with no prior experience. We have researched a number of these courses and are talking with our colleagues at other colleges to work through the design of a "CSCI 0" that would be appropriate for our student population. See SAP #3 below for further details.

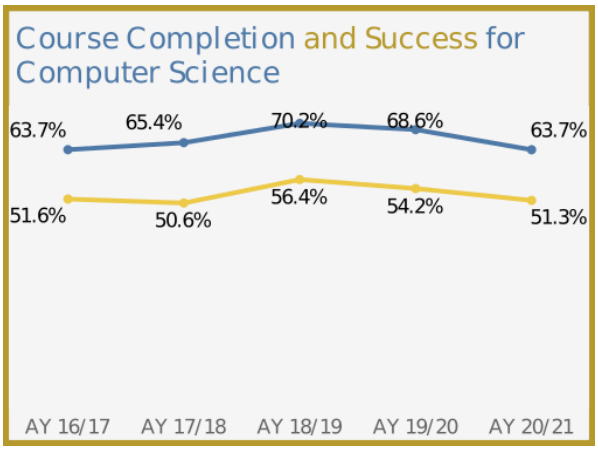
77% of our major-students transfer to a four-year school; all of our courses transfer either directly or as electives, and thus provide our students with a solid foundation when they transfer. Anecdotally, all of our instructors have had former students contact us to let us know how *well-prepared* they were for their upper-division courses by our program.

5. Does enrollment vary by semester? Please describe how course offerings are adjusted to meet student demand and help students reach their academic goals.

Enrollment does not vary by semester; we offer the same number of sections in Spring and Fall. We have recently added Summer sections of CSCI 123 and 133 to offer students additional flexibility; these sections consistently fill. Prior to the COVID-19 pandemic, we regularly added additional sections in the weeks prior to the beginning of the semester when it became apparent that our planned schedule was not sufficient to meet student demand.

3.2 Student Achievement and Equity (and student demographic profile)?

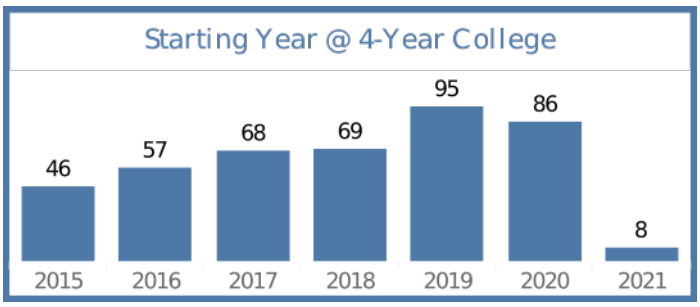
1. Using the data provided by the OIE, briefly describe student achievement rates in your program over the past five years: completion, success, degrees/certificates, transfer, licensing, job placement, wage improvements (not all of these measures apply to every program).



Completion and success were both on a mild upward trend until the COVID-19 pandemic and the switch to remote learning, after which completion and success both drop. Compared to other programs, where completion/success have remained flat throughout the pandemic period, this drop can partly be explained by noting that enrollment in Computer Science has remained steady throughout the pandemic, while other programs have experienced a (sometimes significant) drop in enrollment. Note also that the ready availability of the "EW" withdrawal option over the last two years may explain part of the decrease in course completion/success.

Student degrees have risen steadily over the last 5 years, with low points alternating every other year, as would be expected from a primarily two-year program.

77% of our major-students transfer; most transfer to CSU Fullerton (142 students) or UC Irvine (48 students). The remainder transfer primarily to other CSUs/UCs. Note that during the COVID-19 pandemic we had a small number of students from UC Berkeley with *no* prior relationship to Fullerton College enroll in our CSCI 133 course, as a low-cost alternative to UCB's CS 61B course. We hope that by offering at least one online section of CSCI 133 every semester, we can continue to take advantage of this opportunity.



Transfers to four-year colleges were on a steady climb, until the onset of the COVID-19 pandemic. The huge drop in transfers in 2021 may be explained by students delaying the beginning of their upper-division work until their respective transfer schools have returned to in-person learning. As noted above, student degrees did *not* see a similar drop in 2021.

2. Please pay special attention to equity issues — where a group of students has an achievement rate that is below average. What factors can explain this?

by Race | Ethnicity | Ancestry

	Enrollments	Course Co..	Gap
Amer. Indian | Alaska Native			
Asian	1,302	69.4%	
Black | African Amer.	62	56.5%	
Filipino	178	66.9%	
Latinx	1,289	58.5%	-152
Native Hawaiian | Pacific Island..			
Two or More	163	70.6%	
Unknown	143	67.1%	
White	718	74.6%	

by Low Income

	Enrollments	Course Completion	Gap
Not Low Income	940	74.7%	
Low Income	2,926	63.7%	-322

by Military Status

	Enrollments	Course Completion	Gap
Not Military	3,744	66.0%	-445
Military	122	78.5%	

There are achievement gaps for Latinx and low income students. We suspect that high-schools in low-income areas are less likely to offer quality computer science courses, or any computer science coursework at all. The largest factor in determining a student's success in our program appears to be prior exposure to computer programming in some form; those without this exposure are at a significant disadvantage.

After the switch to remote learning in March 2020, low-income students faced further challenges: a lack of reliable technology to participate in coursework and lecture, a paucity of quiet spaces in which to study, and the transition of our support systems in the Academic Support Center and the Computer Science Lab to "virtual" operation.

Note for readers: the value in the Gap column represents the deficit number of students which would need to successfully complete a course in order to close the equity gap for that demographic group. Not all groups with numeric gaps qualify as equity gaps, as groups with too-few students are eliminated from consideration for reasons of statistical validity.

The inverse of this situation occurs in the category of military/non-military students: although the data shows an achievement gap for non-military students, the number of military students is small enough that the higher achievement rate for military students should probably not be regarded as having statistical confidence.

3. Does the department have regular discussions about equitable grading, attendance, late-work, and extra credit policies, or about other strategies for helping students succeed? Could reforming classroom policies help more students succeed? Please explain.

   Pedagogy, grading, and equity issues are discussed formally at regular department meetings, as well as informally through discussion and collaboration. One advantage of the COVID-19 shutdown has been an increase in sharing of pedagogical techniques and ideas within our department (and within the larger faculty community); our faculty have shared knowledge of new and more equitable grading systems, methods for assessing students remotely while minimizing the impact of cheating, and new tools for communicating with students and encouraging student-to-student interaction.

4. Please write a brief Equity Action Plan. What strategies can you implement to close this gap in student achievement within the next five years? What professional learning, curriculum development, or other forms of support does your department need?

   We believe that the equity gaps described above in 3.2.2 can best be addressed by focusing on student support.

   - While the Academic Support center currently offers one-on-one tutoring, this is a recent addition and many students are unaware of it.
   - Similarly, although student support has been available via the Computer Science Lab for many years (and continued to be available, via Zoom, during the COVID-19 pandemic), not all students are aware of this opportunity. Currently, all full-time instructors offer lab support time, in addition to regular office hours, however, during the COVID-19 pandemic, lab support was available to students *only* during those times when an instructor was scheduled. When the lab is operating in-person, students can come to the lab at any time, and perhaps work with other students, or with a student tutor. In Spring 2022, the lab will be available for *both* in-person and remote (Zoom) tutoring.
   - Prior to the COVID-19 pandemic, we were beginning the process of adding supplemental instruction to CSCI 123.
   - Although not directly a support system, there has been some interest among students in creating/reviving the Computer Science Club, which could serve as an informal environment for students to receive support from each other.

- We have experimented with adding "boot camps" for incoming students, particularly those without any prior programming experience, to help soften the transition into CSCI 123.

In addition to the above points, faculty members have researched and instituted evidence-based equitable grading practices, revised syllabi to be more equity-minded, and attempted to make course materials more inclusive and culturally relevant.

Some research[1] has found that the addition of one or more pre-introductory "CSCI 0" courses can have a significant effect in increasing success rates of later courses, while also increasing the diversity of students who pursue a major in Computer Science. We will be asking the college to support the development of such a course in Strategic Action Plan #3, below.

3.3 Student Achievement and Pathways

1. Using the data provided by the OIE, briefly describe how students have moved through the program over the past five years: unit accumulation, prerequisites, corequisites, substitutions, gateway courses, and bottleneck courses. (Not all of these measures apply to every program.)

   CSCI 123 is the biggest bottleneck in our program, for reasons described above. 20% of students in CSCI 123 are repeating. CSCI 133 is similar, although with lower numbers. As students progress through the program, success rates increase and withdrawal rates decrease, and students are less likely to repeat, as would be expected.

Within the last 5 years, courses by course success rate (ascending 5 courses).

CSCI 123 F	46.7%
CSCI 133 F	58.6%
CSCI 241 F	63.3%
CSCI 223 F	72.5%

Within the last 5 years, the 5 courses with highest % of students repeating the course (NOTE: Some courses may allow for repeat enrollment)

CSCI 123 F	19.2%
CSCI 133 F	16.5%
CSCI 241 F	11.9%
CSCI 223 F	6.6%

Within the last 5 years, the 5 courses with the highest # of withdrawals

CSCI 123 F	873
CSCI 133 F	290
CSCI 241 F	92
CSCI 223 F	45

Within the last 5 years, the 5 courses with the highest % of withdrawals

CSCI 123 F	38.2%
CSCI 133 F	29.2%
CSCI 241 F	28.4%
CSCI 223 F	17.2%

2. For transfer degree programs: Are your current requirements in line with the Transfer Model Curriculum, or have you added extra steps, such as prerequisites? If you added extra steps, please explain.

1 Guzdial, Mark. "Learner-Centered Design of Computing Education: Research on Computing for Everyone." Synthesis Lectures on Human-Centered Informatics (2015).

The first course in the Computer Science sequence, CSCI 123, has a prerequisite, Math 141(H) (College Algebra), 142 (Trigonometry) or 143 (Enhanced College Algebra) which is not reflected in the transfer model curriculum or in the corresponding C-ID, however, the colleges to which a majority of our students transfer require this prerequisite in order for the course to articulate.

3. Please provide an update on the curriculum mapping you have done, perhaps in collaboration with Counseling. Are all programs (degrees and certificates) mapped? Based on course offerings for the last two to three years, could a student complete the map(s) you have created? If so, please demonstrate this with some facts from your schedules. If not, how will you address these discrepancies?

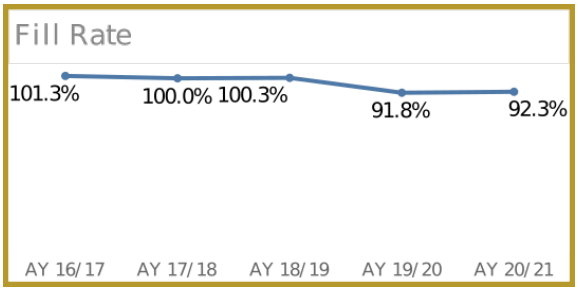
   We have started the mapping process in coordination with Counseling. We have created a three-year mapping; this includes the possibility of repeating one CSci course, and does not require any Summer courses, which could shorten the duration. (The addition of our in-planning "CSCI 0" course, described in SAP #3 below, would not affect the duration of this mapping.)

4. Do the data reveal differences among your AA, ADT, or certificate programs (in enrollment, completion, or success, for example)? Please explain.

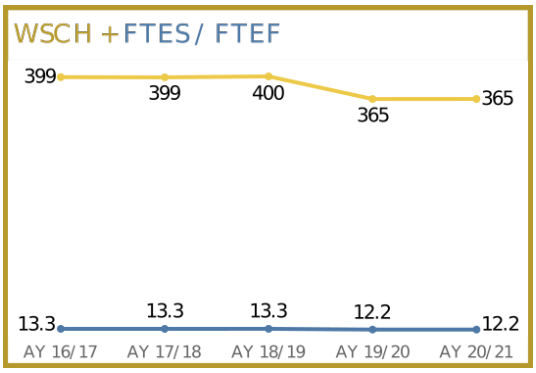
   We only offer a single degree program, and no certificate programs, so there are no differences to examine.

3.4 Faculty

1. Using the data provided by the OIE, briefly describe the faculty workload over the past five years: FTF (full-time faculty), PTF (part-time, or "adjunct" faculty), FTEF (full-time equivalent faculty), WSCH per FTEF (weekly student contact hours). (Not all of these measures apply to every program.)



   Until COVID, our fill rate was consistently at or above 100%, and only in the last two years have we had to cancel sections. Even so, our fill rate remains above 90%.



Faculty workload (both FT and PT) has remained relatively flat over the review period.

2. If your department plans to request hiring a full-time faculty member, this is the place to make the argument. Please discuss hiring needs in reference to data analyzed in sections 3.1 to 3.4.

   We do not anticipate hiring additional full-time faculty; we are beginning the process of performing a hiring round for additional adjunct faculty, so as to be able to offer course sections during days/times when full-time faculty are otherwise unavailable.

3.5 Covid-19

Using the data provided by the OIE, briefly describe how the COVID-19 pandemic affected your department and how your department has adjusted. Did you make temporary changes? Or have you adopted new, long-lasting practices that enhance teaching?

Prior to the COVID-19 pandemic, no Computer Science courses were offered in any format other than in-person, on-campus. The COVID-19 pandemic of course forced us to reevaluate our course modalities; roughly half of our courses during the pandemic were offered synchronously, via Zoom, while the other half were offered as pure (asynchronous) online courses. The experience with teaching online was so positive that we intend to continue offering a number of sections in this modality going forward, something that would not have happened otherwise. Similarly, the switch to remote learning has forced our faculty to expand our toolkits of teaching technologies: we have become fluent in Zoom breakout rooms and polls, Canvas discussion boards, video recording, editing, and captioning, and moderating Discord chat servers.

Remote learning has also expanded the geographical reach of our program: we have seen students participating from the Bay Area, out-of-state in Arizona, Colorado, and out-of-country in Korea and Vietnam. We hope that our online course offerings in the future will continue this pattern.

3.6 What has not been asked?

Please tell us about other ways your department has been successful, ways that the previous questions might have missed.

As mentioned above, the COVID-19 pandemic has allowed our department to reach students outside the traditional Fullerton College community. Somehow, students are discovering that our courses will articulate to their colleges, but often for significantly lower costs.

4.0 Outcomes

4.1 Program Student Learning Outcomes (PSLOs)

Since the last self-studies, the College adopted new Institutional Student Learning Outcomes (ISLOs) and new design principles for PSLOs. Please describe your department's PSLO revisions to date, and your PSLO plans.

> We have submitted our revised PSLOs, and are awaiting approval. Our new PSLOs emphasize the skills students can expect to gain, and the goals to which those skills are applicable. We are considering adding an additional PSLO emphasizing the collaborative and communicational elements of Computer Science.

4.2 PSLO Assessment

The new PSLO design principles encourage departments to use PSLOs as a way of gaging student learning once they have completed a degree or certificate, not just when they have completed a single course. Please describe how PSLOs are assessed or will be assessed in your department.

> PSLOs are currently assessed based on CSLO data; we intend to explore alternate assessment methods to target the PSLOs directly, perhaps incorporating student portfolios or specifically-designed assignments from particular courses.

4.3 CSLO Assessment

Briefly describe the timeline your department uses to assess CSLOs on a regular basis and how you use the results to make improvements. This discussion should be based on SLO data, which is available on eLumen. (Your division's SLO reps can help with this.) Please include relevant CSLO charts or graphs in an Appendix. Since the last self-study, you should have assessed the CSLOs of every course that you have taught, at least once. If that is not the case, please describe how you will accomplish this as soon as possible.

> CSLOs are assessed every three years, rotating through the four courses. Assessment results are presented at department meetings and discussed with faculty. These discussions have led to revised CSLO assessments, modified grading criteria, and changes to how assignments are assessed.

4.4 SLO Equity Analysis

1. Looking at CSLO attainment data, do you find significant differences by race, ethnicity, gender, and other categories? Please include some illustrations of this data in the Appendix. Describe here what the data shows. What strategies will you use to close the attainment gaps among groups of students? What kinds of professional learning would help?

   > There are some minor significant differences in the Ethnicity category with African American and American Indian/Alaskan Native students with 63.64% and 66.67%, respectively. These group of students have the lowest "Meets expectation," however, there is a small sample size to make a concise evaluation on their performance. In

retrospect, we have a large sample size to say that the student population consisting of Asian, Hispanic, and White Non-Hispanic are meeting the course expectations with 83.54%, 72.41%, and 77.27%, respectively. Overall, the average expectation met among all ethnicities is 75.01%.

Overall by Demographic Element for Demographic Category: Ethnicity

	Greatly exceeds expectations.		Exceeds expectations		Meets expectations		Does not meet expectations but developing		Does not meet expectations	
African American	0	0.00%	0	0.00%	7	63.64%	0	0.00%	4	36.36%
American Indian/Alaskan Native	0	0.00%	0	0.00%	2	66.67%	0	0.00%	1	33.33%
Asian	0	0.00%	0	0.00%	132	83.54%	0	0.00%	26	16.46%
Filipino	0	0.00%	0	0.00%	15	68.18%	0	0.00%	7	31.82%
Hispanic	0	0.00%	0	0.00%	84	72.41%	0	0.00%	32	27.59%
Pacific Islander	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	14	93.33%	0	0.00%	1	6.67%
Unspecified	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
White Non-Hispanic	0	0.00%	0	0.00%	68	77.27%	0	0.00%	20	22.73%

In the category of Gender, we see all cases meeting expectations with females at 78.79%, males at 77.97%, and Non-Binary at 83.33% (small sample size). There are no differences within each group division to make any improvements.

Overall by Demographic Element for Demographic Category: Gender

	Greatly exceeds expectations.		Exceeds expectations		Meets expectations		Does not meet expectations but developing		Does not meet expectations	
F	0	0.00%	0	0.00%	52	78.79%	0	0.00%	14	21.21%
M	0	0.00%	0	0.00%	269	77.97%	0	0.00%	76	22.03%
N	0	0.00%	0	0.00%	5	83.33%	0	0.00%	1	16.67%
X	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%

In the category of Economically Disadvantage Status, we see all cases meeting expectations with Unknown at 77.68% and those who are at 80.82%. There are no differences within each group division to make any improvements.

Overall by Demographic Element for Demographic Category: Economically Disadvantaged Status

	Greatly exceeds expectations.		Exceeds expectations		Meets expectations		Does not meet expectations but developing		Does not meet expectations	
UNKNOWN	0	0.00%	0	0.00%	268	77.68%	0	0.00%	77	22.32%
Y	0	0.00%	0	0.00%	59	80.82%	0	0.00%	14	19.18%

In the category of Veteran Status, we have a low “Meet expectations” level of 53.85%. However, this statistic is not reliable due to the low sample size.

Overall by Demographic Element for Demographic Category: Veteran Status

	Greatly exceeds expectations.		Exceeds expectations		Meets expectations		Does not meet expectations but developing		Does not meet expectations	
Y	0	0.00%	0	0.00%	7	53.85%	0	0.00%	6	46.15%

The last category is Age Range and for the majority we have a high "Meets expectations" percentage for all groups. The age groups of "30-34" and "Unknown" have the lowest percentage with 50% and 55.56%, respectively. Again, we cannot make any suggestions due to the low sample size.

Overall by Demographic Element for Demographic Category: Age Range

	Greatly exceeds expectations.		Exceeds expectations		Meets expectations		Does not meet expectations but developing		Does not meet expectations	
17 and Younger	0	0.00%	0	0.00%	10	83.33%	0	0.00%	2	16.67%
18-19	0	0.00%	0	0.00%	79	81.44%	0	0.00%	18	18.56%
20-24	0	0.00%	0	0.00%	155	76.73%	0	0.00%	47	23.27%
25-29	0	0.00%	0	0.00%	45	77.59%	0	0.00%	13	22.41%
30-34	0	0.00%	0	0.00%	4	50.00%	0	0.00%	4	50.00%
35-39	0	0.00%	0	0.00%	7	87.50%	0	0.00%	1	12.50%
40-49	0	0.00%	0	0.00%	2	100.00%	0	0.00%	0	0.00%
50+	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	5	55.56%	0	0.00%	4	44.44%

Overall, the CSLOs data look great and no improvement is needed at this time.

2. Compare the equity analysis in this section to the equity analysis in Section 3.2. Are there some groups who have lower completion and success rates AND lower SLO attainment rates than other groups? Can new departmental strategies close both gaps? Please explain. [For example, many departments found that their SLO attainment gaps are quite a bit smaller than their success gaps (or the gaps don't exist). This might mean that many students who get a D or lower in a course are actually learning the material (i.e. attaining the SLOs) but they are winding up with a failing grade for other reasons: absences, tardies, missed assignments, missed exams, poor performance on high-stakes assignments.]

In the Ethnicity group, both course completion and course success highlight only the Latinx student population with a gap of greater than 150 (smaller than 58.5%). However, in SLO attainment rates, Hispanic students met expectations at 72.41%. In the Gender group, no gaps were highlighted. There is a gap of greater than 322 (smaller than 63.7%) in the Low-Income category for course completion and course success. Like the Latinx group, the SLO attainment rates show that students do meet expectations with 80.82%. The Military Status group only has a gap of 445 (66.0%) for the "Not Military" student population in course completion. However, the SLO attainment shows that 53.85% of Veterans meet expectations. This indicates that our military students (even though it is a small sample size) are doing well.

Overall, the comparison between the course completion and success rates with SLO attainment rates show that Latinx and Low-Income students are the lowest-performing. As stated in the prompt, these students understand the material based on the SLO data but have trouble completing their assignments for a passing grade. By increasing the support opportunities for students: ASC one-on-one tutoring, CSci lab student tutors, possibly adding SI to 123, boot camps for incoming students, and addition of a "CSCI 0" course, this can minimize, if not, close the gap.

5.0 Other Areas of Program Effectiveness

5.1 Your Department and General Education

1. Using the data provided by the OIE, please look at students who take your courses for GE credit.

   N/A

2. What role does your department play in helping students complete the GE pathway?

   N/A

3. Do you offer GE courses at a variety of time slots and at a frequency that allows students to fulfill GE requirements?

   N/A

4. Please take into account daytime, evening, weekend, and online classes to provide a brief sketch of your GE course availability.

   N/A

5.2 Outside Influences on Your Department

1. Describe any laws, regulations, trends, policies, procedures, or other influences that have an impact on your program. Please include any other data that may be relevant to student achievement, learning, and trends within your Basic Skills, CTE, or Transfer Education programs. Make sure you are including all degree and certificate programs, including the College's GE program.

   N/A

2. Please also consider not only your courses, but also prerequisite and corequisite courses that might be offered by a different department.

   As stated above, CSCI 123 has a prerequisite of Math 141, 142, or 143. With AB 705 and the removal of lower-level math courses, we expect that more students will be able to complete this prerequisite within their first semester, thus accelerating their enrollment into CSCI 123.

3. If AB 705 applies to the program then how are you meeting its mandates?

   N/A

5.3 Your Program's Active and Applied Learning and High-Impact Practices

1. The College wants to create an inventory of faculty efforts to make learning active and applied. Please briefly describe opportunities your students have to apply and deepen knowledge and skills through projects, internships, co-ops, clinical placements, group projects outside of class, service learning, study abroad, and other experiential learning activities that you intentionally embed in coursework, or elsewhere in your program.

   We had planned to encourage student to participate in DataFest, hosted by Chapman University, however this was canceled due to COVID-19. We intend to encourage participation in the future.

   Computer Science students often participate in Math Department activities such as the Math Colloquium course, the AMATYC, and the Putnam exam. These were largely placed on hold during the pandemic.

2. Are there institutional barriers hindering your department's ability to offer or enhance these learning experiences for students? Please explain.

   None that we have encountered.

6.0 Planning

6.1 Progress on Previous Strategic Action Plans

1. Please briefly describe the goals (Strategic Action Plans, SAPs) from your last self-study. How much progress have you made on them? If you have reached a goal, explain how it allows ongoing improvement, especially if you received additional funding.
2. If additional funds were NOT allocated to you in the last review cycle, how did the LACK of funds have an impact on your program?

   - SAP #1: Increase retention and success rates. (No funds requested)
     In 2019, our success rate actually increased by 9.3%, but over the last two years it has settled back to 2017 levels. Also in 2019, our retention rate increased by 10.2% but settled back to 2017 levels in 2021. There doesn't appear to be any obvious explanation for this, except perhaps that the pandemic may have had an unforeseen and unintended impact due to the significant disruption in teaching (e.g., the sudden shift to strictly online instruction).
   - SAP #2: Increase number of sections offered. (No funds requested)
     We increased sections by hiring an additional full-time faculty, and also added summer sections of CSCI 123 and CSCI 133, along with additional sections of CSCI 241 and CSCI 223 to meet demand.

- SAP #3: Offer a preliminary course in CSci for students with no prior experience. (No funds requested)
  This SAP is still in the research phase.
- SAP #4: Update classroom technology.
  Addition of more memory was added to the computer science server to accommodate additional student load. Also, the projector in room 616 (the primary CS classroom) has been upgraded to a higher-resolution model to enhance presentation of lecture material and live demonstrations.

We received all funds requested in the previous cycle.

6.2 New Strategic Action Plans

Please write brief, concrete plans that you will accomplish over the next four years. Your plans might include requests for additional funds. The Program Review Committee will read these and either endorse the request or ask for more information. Please keep in mind that the Committee's endorsement does not guarantee additional funding. The President's Advisory Council and Faulty Allocation Committee play major roles in allocating funds and prioritizing new faculty hires.

Please number each of your plans. This will help keep to track of them. Also, make sure that each funding request includes the following elements:

1. It is supported by the data and analysis in previous sections of this self-study.
2. It fulfills a part of the College mission, vision, goals, or objectives.
3. It explains how the request helps the College attain student equity.
4. There is a measurable way to tell if the extra funding will be effective.
5. It considers whether you can reach this goal (or parts of it) without additional funding.
6. Please give a dollar amount, or best estimate. If you can identify a funding source, then please name it. If you can put the request into one of the following categories, please do so: Personnel, Facilities, Equipment, Supplies, Computer Hardware, Computer Software, Training, Other.

Please fill out this table for each of your Strategic Action Plans.

Strategic Action Plan (SAP) #_1_, department (or program) name: _Computer Science_____

Describe Strategic Action Plan.	Increase retention and success rates.
List College goal/objective the plan meets.	College Goal #: 1,2 Objective #: 1,2; 2,3,4
Explain how the request helps the College attain student equity.	While there is no explicit funding request for this SAP, an increase in success and retention implies providing broader opportunity for more students, which is likely to result in greater equity among the student population.
What measurable outcome do you anticipate for this SAP?	We expect our success and retention numbers to go up from their 2021 levels and return to 2017 numbers.
What specific aspects of this SAP can you accomplish without additional financial resources?	We can continue to keep CSci students abreast of current events and activities that occur in the mathematics colloquium so they can observe and learn about areas of study where the two disciplines overlap. Also, with the campus opening again to in-person instruction, students who may have been adversely affected by the abrupt shift to online instruction will have the opportunity to resume their studies in a format that may better suit them, which may increase their chances of success.

If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.

No funding is requested for this SAP.

Strategic Action Plan (SAP) #_2_, department (or program) name: _Computer Science_____

Describe Strategic Action Plan.	Offer intersession preparatory seminars to help incoming students become better oriented.
List College goal/objective the plan meets.	College Goal #: 1,2 Objective #: 1,2,3,4,5; 2,3,4
Explain how the request helps the College attain student equity.	Having a preparatory "boot camp" available before the semester begins can help students become acquainted with some of the complex tools and concepts that will be required of them in the forthcoming semester. This should have a positive impact in reducing achievement gaps, especially outreach is extended to students in disadvantaged or underrepresented groups.
What measurable outcome do you anticipate for this SAP?	Reduce achievement gaps by 2%
What specific aspects of this SAP can you accomplish without additional financial resources?	The CS faculty can identify which tools and/or skills would be practical to present in this context.

If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.

No funding is requested for this SAP.

Strategic Action Plan (SAP) #_3_, department (or program) name: _Computer Science_____

Describe Strategic Action Plan.	Continue development of a preliminary “CSCI Zero” course.
List College goal/objective the plan meets.	College Goal #: 1, 2 Objective #: 2,3,4,5; 1,2,3
Explain how the request helps the College attain student equity.	It isn't uncommon for new students entering the CS curriculum with no prior programming experience to encounter significant challenges with the first course in the sequence (CSCI 123). Offering students a preliminary "CSCI Zero' course can help them to become better oriented and prepared to meet the challenges that await them in CSCI 123. This is supported by substantial research to suggest that such a course can have a significant impact on the success and retention of students, notably among underrepresented groups.
What measurable outcome do you anticipate for this SAP?	An increase in student success and retention, particularly among underrepresented groups. A secondary benefit would be an increase in enrollment.
What specific aspects of this SAP can you accomplish without additional financial resources?	The CS faculty can collectively continue the investigation of comparable courses at other community colleges without increased funding.

If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.

No funding is requested for this SAP.

Strategic Action Plan (SAP) #_4_, department (or program) name: _Computer Science_____

Describe Strategic Action Plan.	Explore the feasibility of developing a data science course as an elective.
List College goal/objective the plan meets.	College Goal #: 1, 2 Objective #: 2,3,4,5; 1,2,3
Explain how the request helps the College attain student equity.	Data science is an emerging field that merges computer science with mathematics and statistics, and universities are increasingly offering degrees in this specialty. Providing an introductory course with this focus can help open another avenue of potential study for students in a relatively new field that is bound to be very valuable and in great demand. This also provides greater opportunity for the underrepresented segments in the student population to enter the field.
What measurable outcome do you anticipate for this SAP?	At this point, the effort would be exploratory and involve preliminary research to help understand the scope and resources required to determine if it is even feasible and/or practical.
What specific aspects of this SAP can you accomplish without additional financial resources?	The CS faculty can begin looking into the possibility by investigating if there are similar courses at other community colleges, as well as any defined programs in place at transfer universities.

If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.

No funding is requested for this SAP.

Strategic Action Plan (SAP) #_5_, department (or program) name: _Computer Science_____

Describe Strategic Action Plan.	Update classroom and lab technology.
List College goal/objective the plan meets.	College Goal #: 1, 2 Objective #: 3,4,5; 1,2,3,4
Explain how the request helps the College attain student equity.	Technological improvements in the CS classrooms and lab can improve the effectiveness of presentation and delivery of lecture material, which can increase comprehension and accessibility for students, boosting scores overall. Improvements under consideration include providing wireless connection to the projectors, adding more auxiliary power outlets in the CS lab, and replacing the projector in the CS lab with an ultra-short throw projector to make it easier for those in the back of the room to see the display.
What measurable outcome do you anticipate for this SAP?	An increase in success and retention, decrease in achievement gaps.
What specific aspects of this SAP can you accomplish without additional financial resources?	Research options in hardware configuration and the cost of each option.

If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.

Type of resource	**Requested dollar amount**	**Potential funding source**
Personnel		
Facilities	Additional auxiliary power outlets in CS lab – unknown cost	
Equipment	Ultra-short throw projector for CS lab – $2,000	
Supplies		
Computer hardware	Wireless video for classroom projectors – $500 per classroom	
Computer software		
Training		
Other		
TOTAL requested amount	$3,000 (plus installation) for lab and 2 classrooms	Instructional Equipment funds

6.3 Optional: Long-Term Plans

Your department might have more plans than just immediate requests for funding. If so, please describe them here.

N/A

7.0 Executive Summary

Please provide the reader with a brief overview of the highlights, themes, and key elements of this self-study. Please don't include new information you did not discuss earlier. Although you will likely write this section last, please remember to put this summary at the front of your report.

See executive summary beginning in page 3.

8.0 Publication Review

The College wants to maintain integrity in all representations of its mission, programs, and services. Please help this effort by reviewing your publications: professional social media profiles, websites, brochures, pamphlets, etc. Please tell us the date they were last reviewed and if you found them to be accurate in all representations of the College and program missions and services. Information on the college's graphic standards is available here.

1. For each of your program's publications, please provide the URL where the publication can be viewed. If the publication cannot be accessed via the Internet, please contact Lisa McPheron, Director of Campus Communications at lmcpheron@fullcoll.edu.

   Website: https://math.fullcoll.edu/computer-science/; Last reviewed: Fall 2021

2. If you find an inaccurate publication, please explain how you will make corrections.

   Although no longer available, we intend to update and publish a department brochure.

3. If your department maintains a social media presence then please describe it here. What do you use it for? How do you monitor it? Who is in charge of it? In what ways is it benefiting the College and your program? Does it follow the District's social media guidelines?

   Our department does not maintain a social media presence.

4. If your program regularly communicates with the wider community, please describe how. What feedback do you get from the community?

   N/A