**CAREER AND TECHNICAL EDUCATION (CTE)**
2-Year Review SUPPLEMENTAL QUESTIONS
Computer Science Department
Prepared by:
Dr. Victor Matos & Solomon Russell

1.   *How strong is the occupational demand for the program?*

The demand for computer science related jobs continues to be strong. According the USA Today, "New computer science graduates often have their pick of opportunities as recruiters struggle to fill positions in the industry." According to the US B Bureau of Labor Statistics employment in computer occupations is expected "to result in nearly half a million new jobs, far more than any other STEM group."
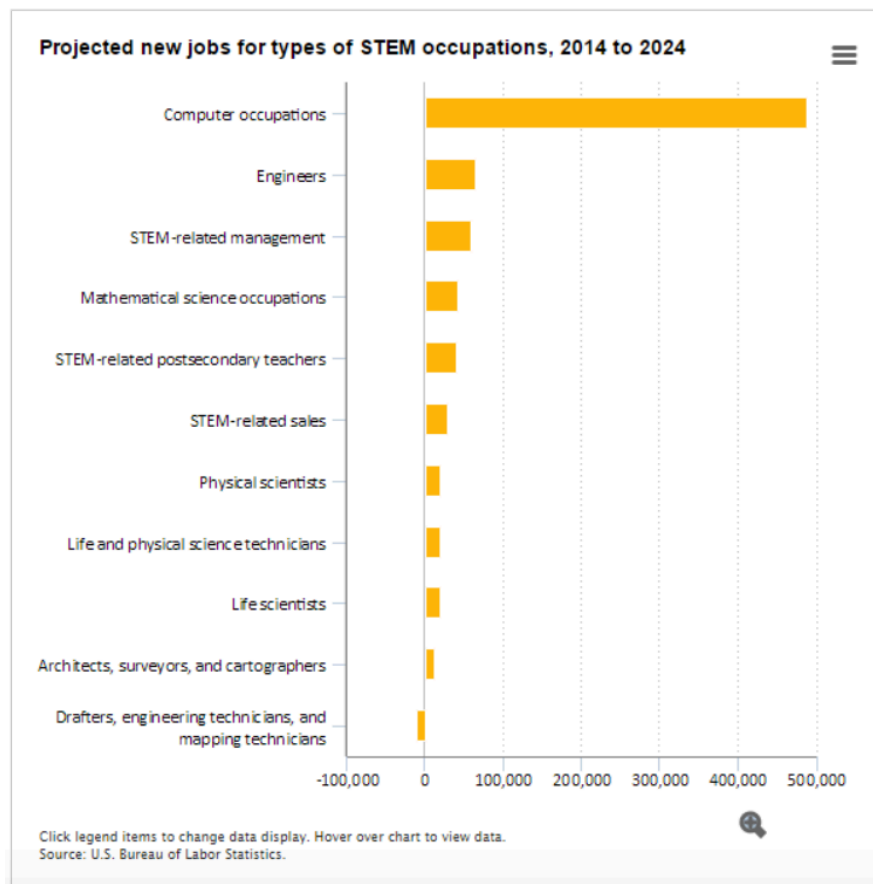
In the newest available data from the US Bureau of Labor Statistics, the projected percent change in employment for software developers from 2016 to 2026 is 24%. This is much faster than the average of 7% across all occupations tracked. In the state of California, the growth in software developers, over that same period, is projected to be 29%.

2.   How does the program address needs that are not met by similar programs in the region?

We offer rigorous courses that prepare our students to be successful in industry and at 4 year institutions. Most other community colleges in Los Angeles County do not provide students with dedicated lab time with their professors. They instead they offer 3-unit programming courses with no lab. Our 4-unit programming classes, with a lab, makes El Camino College Computer Science Department distinct and much more responsive to student needs. We are also the only community college in Los Angeles County to have an Association of Computing Machinery (ACM) Chapter.

In fall 2019 we welcomed our first Warrior-Toro CS Pathway cohort to the El Camino College Computer Science Department. We are in partnership with CSU Dominguez Hills (CSUDH) that would allow students to receive a Bachelor's degree in CS within four years. Students in the program would take courses at ECC and CSUDH they will take most of your classes together, study together, and receive significant additional support including cohort enrichment workshops, professional development, tutoring, priority registration, and guidance to apply for competitive internship experiences. This program is an NSF funded replication of a very successful CS Pathway program began at CSU Monterey Bay (CSUMB) and Hartnell College. There is no other program like this in Southern California.

We, as a department, are also active participants in our community. We host a one-week professional development workshop for high school computer science teachers in a partnership with UC Berkeley and NC State University. We have recently charted a Computer Science Teachers Association (CSTA) Chapter on campus. One of our notable graduates from the El Camino College mathematics division is David Patterson. He served as chair of the computer science department at UC Berkeley, was president of ACM from 2004 to 2006, served on the Information Technology Advisory Committee for the U.S. President (PITAC) during 2003–05, and was the recipient of the 2017 Turing Award in Computer Science for contributions "of lasting and major technical importance to the computer field."

3. *What are the completion, success, and employment rates for students in the program?*

The following table summarizes Course-Grade distribution for all CS courses in the 2014-1018 period.

COURSE	TERM	INST. METHOD	A	B	C	D	F	W	Total	Success Rate	Retention Rate	Global GPA
CSCI-1	2014-18	On Campus	525	366	228	90	177	513	1899	58.9%	73.0%	2.70
CSCI-2	2014-18	On Campus	219	151	65	18	38	227	718	60.6%	68.4%	3.01
CSCI-3	2014-18	On Campus	273	120	49	9	33	106	590	74.9%	82.0%	3.22
CSCI-12	2015-18	Online	39	1	0	3	10	15	68	58.8%	77.9%	3.06
CSCI-14	2017-18	On Campus	29	7	4	1	8	12	61	65.6%	80.3%	2.98
CSCI-16	2014-18	On Campus	20	17	9	5	4	26	81	56.8%	67.9%	2.80
CSCI-30	2015-18	On Campus	100	66	36	5	6	40	253	79.8%	84.2%	3.17
CSCI-40	2015-18	On Campus	34	20	13	4	3	13	87	77.0%	85.1%	3.05
		Total 2014-18	**1239**	**748**	**404**	**135**	**279**	**952**	**3757**	**63.6%**	**74.7%**	**2.90**
			33.0%	19.9%	10.8%	3.6%	7.4%	25.3%				

The following table summarizes the Success-Rate of each course in the Computer Science program for the period 2014-18.

COURSE	SUCCESS RATE
CSCI-1	58.9%
CSCI-2	60.6%
CSCI-3	74.9%
CSCI-12	58.8%
CSCI-14	65.6%
CSCI-16	56.8%
CSCI-30	79.8%
CSCI-40	77.0%
Total	**63.6%**

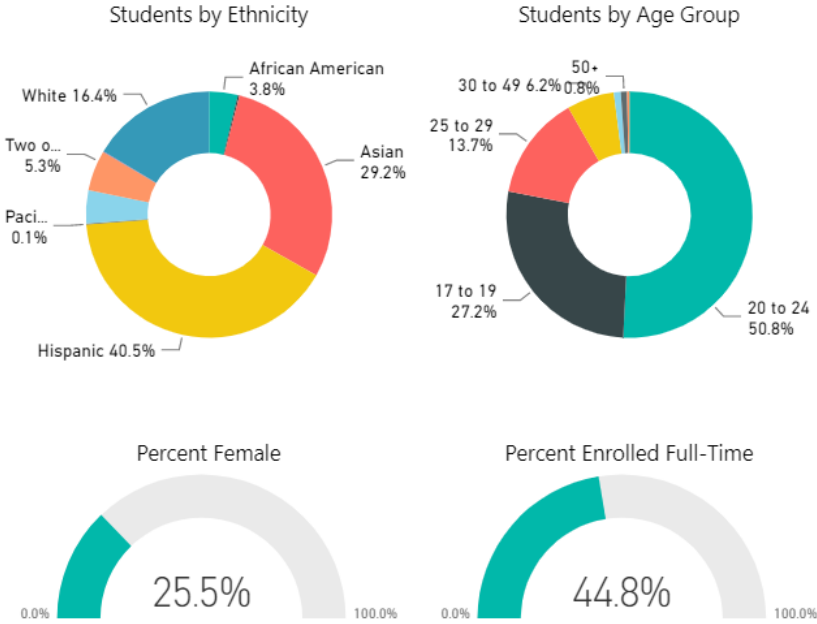Computer Science Program Success Rate by Course
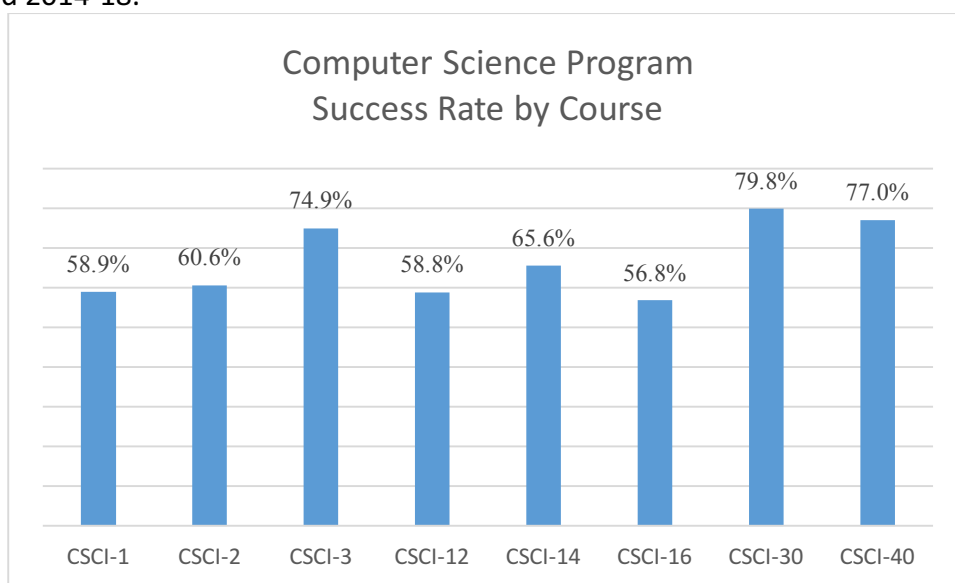
- The program's success score is **63.6%.** However, when you exclude the students who withdraw from courses, then the collective success rate raises to **85.2%**. One may argue, that this much higher level of attainment is indicative of the strong identification and engagement to the program experienced by the students who remain continue taking CS courses.

- Out of the eight courses in the program, three of them exhibit a success rate that exceeds the institutional success rate (**71.6%**).

- Female ECC students represent **25%** of the student body and have a **71.3%** rate of success. Their performance is significantly higher than that of the the male students which is **61.9%.** This figures are encouraging as the national percentage of female students is just in the **20%** range (Stephenson, C. et.al. 2018)

- The introductory courses CSCI-1 and CSCI-2 have the largest enrollment, but their success and retention rates are not as good as those of the more advanced courses CSCI-3, CSCI-30, and CSCI-40. Again, students who persevere do well in successive courses.

- The lowest GPA (**2.70**) and success rate (**58.9%**) occurs in **CSCI-1**, which is the first course in the program. Its goal is to initiate the student into the use of computing reasoning to solve problems and to code solutions in the C++ programming language. This class is opened to all students regardless of their intended field. We believe that many of those who plan to major disciplines other than CS realize during the semester that the course contents do not align well with their interest, and end by dropping or failing the course. Clearly, this attrition has a negative effect on the performance and perception of the course.

- The department has identified **CSCI-1** as a priority target for program improvement. Two strategies have been chosen to address the issue.

    o The first solution requires significant **improvements of the physical facilities**. More and better labs are required for students to succeed. Here we talk about *dedicated* and *open* labs. A dedicated lab is used for instruction and is closely tied to class scheduling. An open lab is one that is continuously available to its users as a place where they meet to discuss, experiment, work in groups, and learn at their individual paces. The CS program only has a single dedicated lab (**MBA113**) which is sadly obsolete. Its computers are old, slow, and unreliable. Furniture is out-of-date and inappropriate. Unfortunately, the current facility fails to provide a nurturing environment in which students are learning at ease. To aggravate the situation, Computer Science students do not have an open lab. This absence is detrimental in many ways. First, students need a place where there is equipment available for completing their assignments and projects. Consider that not all of them own a personal computer. Second, students lack a space 'of their own' that is actively shared by their peer. This lack of identifying space negatively impacts student engagement with the program and the school. Institutional intervention is needed to correct this situation.

    o The second solution is being managed at the **curricular level**. To that effect, the department has proposed a new course called **CSCI-7 The Beauty of Computer Science Principles**. This proposal is an adaptation of a very successful course developed at the University of California, Berkeley, intended for non-CS majors at Junior High-School and undergraduate freshman level. The intention is to offer an early opportunity for the
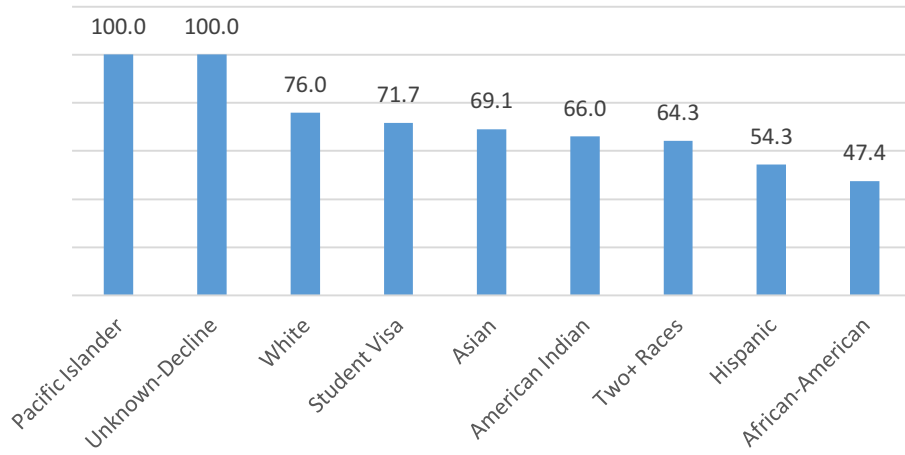
students to apply their problem-solving skills and identify their affinity (or lack of) to computing. The course offers a frustration-free environment in which students are invited to the computer science curriculum and uses a novel learning approach in which participants discover the pleasures of computing without excessive coding detail. We hope this addition to the CS program will help reduce the high drop rate of CSCI-1.

o **Better guidance**, suggest first taking CSCI-14 PYTHON (requires MTH170) instead of CS1 for those who do not intent a Computer Science major. Computing is an enabler of other fields….
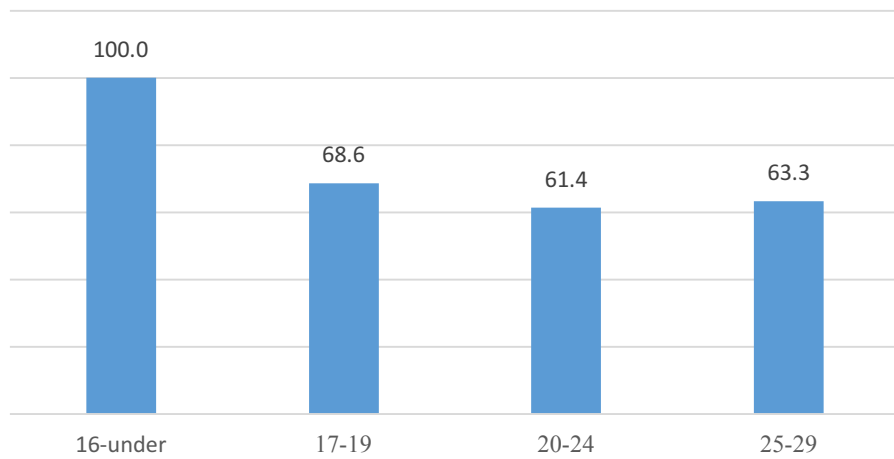
The following figure summarizes the distribution of students in the Computer Science program based on a breakdown categorized by ethnicity, age group, gender, and full-time enrollment. Keep in mind that the accounted population consists of **982** students.
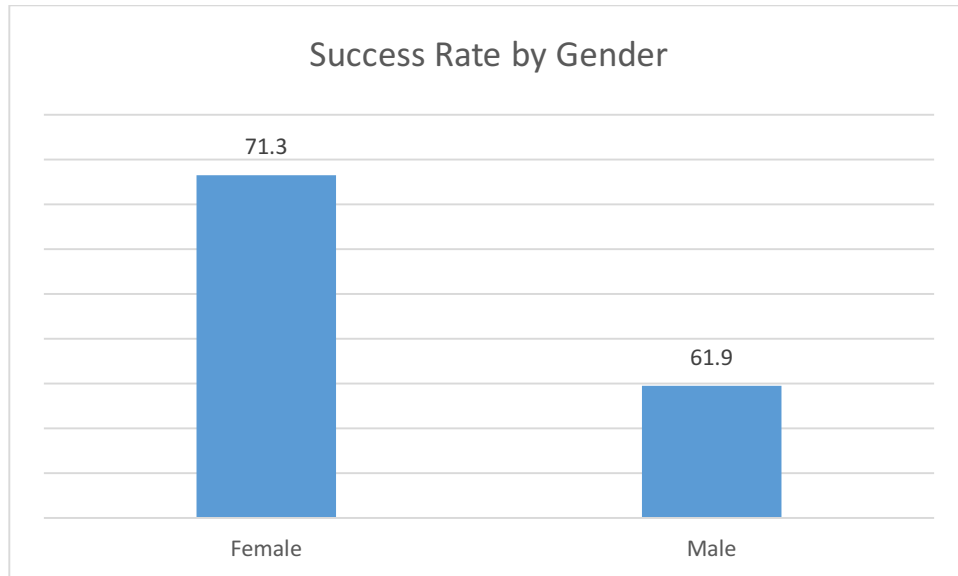
Success Rate by Ethnic Group

Ethnic Group	Success Rate
Pacific Islander	100.0
Unknown-Decline	100.0
White	76.0
Student Visa	71.7
Asian	69.1
American Indian	66.0
Two+ Races	64.3
Hispanic	54.3
African-American	47.4

Success Rate by Age Group

Age Group	Success Rate
16-under	100.0
17-19	68.6
20-24	61.4
25-29	63.3

Success Rate by Gender

Female	71.3
Male	61.9

Success Standard for the CS Program

Currently, the global success-rate of the program stands at **63.6%.** We believe the main reason for this low figure is the rather high drop rate of CSCI-1. Assuming the suggested corrections for improving the program are met, that is, we have better labs, and the CSCI-7 course begins to be offered, then it is reasonable to believe that the **CSCI-1 drop rate could be reduced by at least 10%.** Assuming those students are retained, and they score the minimum passing grade of 'C' then the overall success rate will grow to **65%.** This improvement may look like a small and conservative change; however, we believe that the suggested strategies for enhancing the program are going to set the stage for a continued improvement trend.

4.   List any licensure/certification exam(s) required for entry into the workforce in the field of study and report the most recent pass rate(s) among program graduates

There are no licensure/certification exams required for entry into the workforce for computer science.

5.   Are the students satisfied with their preparation for employment? Are the employers in the field satisfied with the level of preparation of program graduates?

Our students are very satisfied according to their response to our latest survey, 89.35% responded that they *Strong Agree* (56.97%) or *Agree* (32.38%) with the statement that "the courses in this program have helped me meet my academic goals." In the last 2 years we have had students transfer to top computer science universities like UCLA, UC Berkeley and UC Irvine. We have also had our graduates obtain internships and full-time programming positions at Amazon, Microsoft and Apple. El Camino College does not keep or collect employer surveys for computer science. Only those students already in a job and seeking to better their knowledge go directly into a job after their education at El Camino College. 98% of our students intend to go on to earn a bachelor's degree and put off getting a computer job until they have graduated from a 4-year college.

6.   Is the advisory committee satisfied with the level of preparation of program graduates? How has advisory committee input and feedback been used in the past two years to ensure employer needs are met by the program?

The advisory committee has been satisfied with the level of preparation of program graduates due to their comments. David Smallberg, senior lecturer from UCLA characterized our program as "very impressive" during an advisory board meeting, while noting our accomplishments. During the November 3rd, 2017 board meeting Professor Alvaro Monge, CSULB recommended the department focus on advanced Java as a new course. He also recommended cleaning up the verbiage so it is easier for the College Curriculum Committee to understand. We decided to focus on that advanced Java course and took his suggestions when making revisions to our proposals. That course is now being offered. The Advisory Board meets twice a year and has been invaluable as we have charted the direction of the program.

Provide the following information:
a.   Advisory committee membership list and credentials

Computer Science Advisory Board Members

Leslie Aaronson
Strategic Director for K-12 Initiatives at National Center for Women & Information Technology

Dr. Tahir Aziz
Professor, Computer & Office Studies (COS) at Long Beach City College

Dr. Mohsen Beheshti
Chair and Professor, California State University, Dominguez Hills

Datuki Bonner
Principal Database Technologist at Raytheon Systems

Julie Flapan
Executive Director, ACCESS and Director, Computer Science Project at UCLA X

Matt Gray
Vice President of Engineering at Honey

Ray Huffaker
Senior Software Engineer at Raytheon Systems

Kevin Judge

Senior Staff Engineer at John Deere

Winston Kwong
Supervisor of Software Engineering at John Deere ISG-Torrance

Dr. Alvaro Monge
Professor, California State University, Long Beach

Karlene Nguyen
Technical Director at MobilityWare

Thong Nguyen
Project Manager at Internet Brands

Kevin O'Connell
South Bay Web App Security Pen-Testers

Michael Perry
Student at El Camino College

Brad Rumery
Sampra Energy

David Smallberg
Senior Lecturer SOE at UCLA Computer Science Department

Dan Stanfill
Software Engineer and Video Gamer at DICE-LA

Jon Wada
Engineer at Raytheon

b. ***Meeting minutes or other documentation to demonstrate that the CTE program review process has met the above Education Code requirement.***

EL CAMINO COLLEGE MATHEMATICAL SCIENCES
COMPUTER SCIENCE ADVISORY BOARD MEETING MINUTES
November 2, 2018

Present: Leslie Aaronson (K-12 Initiatives at NCWIT), Dave Akins, Edwin Ambrosio, Mohsen Beheshti (CSUDH), Carl Broderick, Massoud Ghyam, Arturo Hernandez (MESA/STEM), Joe Hyman, Kevin Judge (John Deere), Marlow Lemons, Victor Matos, Alvaro Monge (CSULB), Thong Nguyen (Internet Brands), Solomon Russell, Greg Scott, Jacquelyn Sims, Satish Singhal, Dave Smallberg (UCLA), Jon Wada (Raytheon)

REVIEW OF MINUTES
The May 18, 2018 CS Advisory minutes were reviewed. M. Ghyam motioned to approve the minutes. Associate Dean M. Lemons seconded the motion. All were in favor to approve of the minutes.

CS DEGREE
Dean J. Sims discussed that the CS certificate is a work in progress. As new classes are developed, they will be embedded into the certificate.

A CS AS degree requires an ADT and compliance with CI-D. However, this would change our articulation.

The college is switching to a new curriculum software, so new curriculum is on hold until this switch is complete.

CAMPAIGN TO INCREASE FEMALE AND UNDERREPRESENTED STUDENTS IN COMPUTER SCIENCE
L. Aaronson discussed a program called Engage CS, which focuses on the three pillars of student engagement, building confidence and building a community. The more inclusive you can make things, the better.

S. Russell plans to increase on underrepresentation via his CS 7 class.

It is important that the classroom environment is inviting to female and underrepresented students.

NSF GRANT (MASSOUD GHYAM)
The NSF STEM Grant will assist a cohort of students every year and provide them with the help they need to graduate with a Bachelor's degree in CS.

The grant is $5 million over five years with the first cohort starting in fall 2019. Students will complete CS and Math prep during the summer before the cohort officially begins.

This will be a partnership with ECC and CSUDH. We will replicate the successful partnership between CSUMB and Hartnell's NSF cohort.

We are in the process of recruiting two coordinators, one at CSUDH and one at ECC. One coordinator will be in charge of the day-to-day logistics, while the other will focus on the education aspect.

M. Beheshti and M. Ghyam are the PI's on the grant.

The idea is not only for students to finish in four years, but to also get them employed after graduations.

The cohort size will be between 25-30 students. One cohort will be ECC students transferring to CSUDH, the other cohort will start and finish at CSUDH.

Student recruitment is underway. The plan is to focus on female and underrepresented student recruitment.

ACM CHAPTER REPORT (SATISH SINGHAL)
ACM is campaigning to increase the number of female and underrepresented students.

ACM plans to have a "Women in CS Week" and bring in female speakers.

ACM had a presentation on IPhone Programming, which was well attended. S. Singhal is taking students to Code Camp at USC and is planning an Algorithm Day. This is all so students can have more industry exposure.

CURRICULUM UPDATES AND CIS CHALLENGE
ECC's Institutional Research department looked at data to see if students that take CIS courses cross over to CS courses. The data showed that CS students are more likely to cross over and take CIS classes.

We will continue to vet our curriculum through the CIS department. However, this data allows us to negotiate during the curriculum challenge process with more ease than it has been in the past.

HIRING PRIORITIZATION
We are adding more classes and have a need for more faculty. We were ranked #24 on the campus wide hiring prioritization list, so we will not hire a FT CS position to start during the fall 2019 semester.

HS OFFERINGS
One section of CS 1 is currently being offered at North Torrance High School. We expect an increasing number of requests to offer CS 7 at high schools going forward.

CTEA FUNDING AWARD AND RECOMMENDATIONS FOR FUTURE REQUESTS
We have been able to add more sections due to the use of our CTEA funded laptop cart.
K. Judge recommended applying to receive a kit for an Embedded Systems course as experience in this area is beneficial. S. Russell recommended applying for robotics, manipulatives and physical items to use in the class. This will help students see code working.

rev 11 12 18