

Make AP CS Count Toward Core Requirements for University of California Admission

California is known as a world leader in driving the digital age through our information technology sector. Yet, few students have access to high-quality K-12 computer science education in the state. A key issue is that rigorous computer science courses typically do not satisfy a core mathematics or science graduation requirement for entrance to the UC system. **We are seeking program status (statewide recognition) for AP Computer Science (CS) Principles and AP Computer Science A to be allowed to satisfy a mathematics “c” or science “d” credit for University of California admissions.**

Although Mountain View-Los Altos Union High School District is in the heart of the Silicon Valley – home to many high-tech companies including Google, Intuit, AOL, Adobe, Microsoft, NASA Ames, Silicon Graphics, and Oracle – as recently as 2012 there was no college preparatory computer science course offered at the district’s two comprehensive public high schools. And this lack of access is widespread across California. Just under 4,000 students took the *AP Computer Science A* exam in 2012, compared to more than 31,000 for AP Biology and almost 60,000 for AP Calculus. Limited access also creates serious gender and equity issues for underserved minorities. In 2012, only 45 African Americans and 306 Latinos took the AP CS A exam.

Computer science is a foundational science for the Digital Age

Computer science is increasingly driving discovery in all areas of science. Many scientists and engineers agree that the scientific process of the twenty-first century requires a coordinated, simultaneous, and synergistic effort involving theory, experiments, and serious simulations. The last of these – simulations – is dependent upon advancements in computer algorithms, data mining, machine learning, pattern recognition, optimization, distributed computing and many other sub-areas of computer science.

As computing research has advanced, we have witnessed a paradigm shift in how we do science and engineering. Scientists used to invest extensive time and resources into conducting experiments (i.e., “benchtop” or “wet-lab” research) to generate data that would in turn be used to construct computational models. Today we are seeing these very models being perturbed in different ways to run “in silico” experiments relatively quickly and inexpensively and yield new hypotheses that must, in turn, be tested at the bench. Existing areas of science, engineering, and mathematics are being radically transformed, and whole new fields of study have or are emerging, such as bioinformatics, systems biology, and astroinformatics.

“Whether you want to uncover the secrets of the universe, or you just want to pursue a career in the 21st century, basic computer programming is an essential skill to learn.”

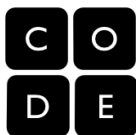
Stephen Hawking

Theoretical Physicist,
Cosmologist, and Author

“Computers are an increasingly essential part of understanding cancer and developing new therapies. Knowledge of computer programming is almost as important as knowledge of anatomy when it comes to medical research or clinical care.”

Larry Corey

President, Fred Hutchinson
Cancer Research Center



Research and innovation in all fields depend upon the ability to deal with the growing data deluge as it is simply impossible for humans to analyze the incredible volume of data being produced; instead, it must be filtered by software employing machine learning and other techniques to look for anomalies or confirming “observations.” This intense data mining is leading to huge breakthroughs in areas as diverse as cancer research and astrophysics and it requires computer science.

But it is more than just existing STEM fields that have been transformed by computer science. There is an unmistakable link between success, innovation, and computer science. Movies like *Avatar* and *Lord of the Rings* exemplify the creative use of new computing techniques. In fact, it is hard to imagine any field that has not been impacted by computer science. Computing professionals are solving challenges in the sciences, business, art, and the humanities and creating new career opportunities in all of these fields. The College Board states that AP Computer Science can open the pathway to 130 career areas and 48 college majors.

AP CS Principles and AP CS A Are Rigorous and College Ready

AP Computer Science A is a well-established college-preparatory course, with the first AP CS A exam offered in 1984. The course emphasizes object-oriented programming methodology with a concentration on problem solving and algorithm development, and includes the study of data structures, design, and abstraction. It is meant to be the equivalent of a first-semester college-level course for computer science majors.

AP Computer Science Principles is an engaging and rigorous new college-preparatory course intended to foster wider appeal for the computer science discipline and to better prepare a pipeline of STEM majors. The course is a deep, content rich class covering the fundamentals of computing, which complements the current AP CS A. It has been rigorously designed by the computing community and the College Board to focus on seven big ideas at the core of computer science —creativity, abstraction, data, algorithms, programming, Internet and impact — that are fundamental to computer science, but applicable to analysis in many disciplines.

The course is designed to give students a better understanding of computational thinking practices that are critical for the digital age in all disciplines. Computational thinking is a way of solving problems, designing systems, and understanding human behavior that draws on concepts fundamental to computer science. To flourish in today's world, computational thinking has to be a fundamental part of the way people think and understand the world. It is meant to be the equivalent of a college-level course for non-computing majors.

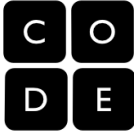
Curriculum Frameworks

AP CS Principles:

- Overview and computational thinking practices: <http://bit.ly/17ubtNR>

AP CS A:

- Course overview: <http://bit.ly/15Ezn5j>
- Course description: <http://bit.ly/13dUFox>



This course has seen enormous support from the computing community, K-12 educators and higher education. It is being taught across the state with NSF and College Board support at:

- UC Berkeley
- UC San Diego
- Hoover High School – San Diego Unified School District
- Newbury Park High School – Conejo Valley Unified School District
- Oakland Technical High School Computer Academy – Oakland Unified School District
- Otay Ranch High School - Sweetwater Union High School District
- Sweetwater High School - Sweetwater Union High School District

CS Principles is also being taught at a number of other schools in California with professional development support from UC Berkeley and UC San Diego, as indicated in the appendix. The first AP Computer Science Principles Exam will be offered in May 2017.

As part of the development process for AP CS Principles, institutions of higher education had to attest whether they would grant credit and/or advanced placement for scores on the AP Computer Science: Principles Exam. More than 80 schools from around the country did so including:

- Cal Poly State University, San Luis Obispo
- Harvey Mudd College
- Stanford University
- University of California, Berkeley
- University of California, Irvine
- University of California, Los Angeles
- University of California, San Diego
- University of California, Santa Cruz

Conclusion

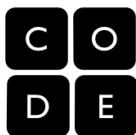
California's IT sector leads the nation; it now has the opportunity to lead in computer science education as well. This simple policy change is clearly supported by academic principle, not only by computer scientists, but by the world's leading academics and researchers across many fields of science. And it is resoundingly supported by the business community because of its workforce implications in hundreds of career paths that impact every sector of our industry. There's a movement sweeping the nation to grow computer science education to prepare *all* our children for the 21st century. Almost 700,000 people signed the [Code.org](http://code.org) petition on this topic – over 20,000 of them in California. California has a chance to get ahead of this movement and lead it.

See code.org or computinginthecore.org for partners and more information on computer science education.

Contact: cameron@code.org or della.cronin@computinginthecore.org

See access-ca.org for additional information about computer science education in California.

Contact: jflapan@uci.edu or debra.richardson@uci.edu



Appendix: Additional Schools offering AP CS Principles

High school 2012-13 offerings supported by **UC Berkeley** teacher professional development:

- Gunn High School - Palo Alto Unified School District
- Albany High School - Albany Unified School District
- Piedmont High School - Piedmont Unified School District

High schools with teacher professional development offered by **UC Berkeley** in summer 2013 (expected to be teaching CS Principles in 2013-2014):

- Oakland Technical High School - Oakland Unified School District
- Synergy Quantum Academy – Los Angeles Charter high school

The UC Berkeley project also has cohorts in other states including MA, NC, WA and PR

High school offerings supported by **SDSC/UCSD/SDSU** teacher professional development

2011-12 pilot schools (continued in Cohort 1):

- Lincoln High School - San Diego Unified School District
- Grossmont High School - Grossmont Union High School District
- Oceanside High School - Oceanside Unified School District
- Valhala High School - Grossmont Union High School District

2012-2013 Cohort 1 CompPASS (Computing Principles for All Students' Success) Project:

- National City High School - Sweetwater Union High School District
- O'Farrell Middle School - San Diego Unified School District
- Sweetwater High School - Sweetwater Union High School District
- Hoover High School - San Diego Unified School District
- Castle Park High School - Sweetwater Union High School District
- Otay Ranch High School - Sweetwater Union High School District
- Mission Bay High School - San Diego Unified School District
- Foothills Christian High School - El Cajon Private High School

High schools with teacher professional development offered by **SDSC/UCSD/SDSU** in summer 2013 (expected to be teaching CS Principles in 2013-2014):

- San Diego High School - San Diego Unified School District
- Granger Jr. High School - Sweetwater Union High School District
- Diegueño Middle School - San Dieguito Union High School District
- Westview High School - Poway Unified School District
- Gladstone High School - Azusa Unified School District
- Preuss Charter School - San Diego Unified School District
- Clairemont High School - San Diego Unified School District
- Pacific Beach Middle School - San Diego Unified School District
- Chula Vista High School - Sweetwater Union High School District
- Hoover High School - San Diego Unified School District
- Arroyo Paseo Charter High School - San Diego Unified School District
- Bonita Vista High School - Sweetwater Union High School District
- Crawford High School - San Diego Unified School District
- Serra High School - San Diego Unified School District