

# Demonstrated Excellence

*College Practices that Support Student Success and Make California Stronger*



## Access and Success in Computer Science at California State University, Dominguez Hills

June 2016



Photo by: Jeff Farsai/CSUDH

In the 1960s, the California State University (CSU) system was set to open a new campus in Palos Verdes—an affluent part of the South Bay within the Los Angeles metropolitan area. However, in August of 1965, the city of Watts experienced an uprising, which spawned from the predominantly Black Watts citizens’ outrage over the racist practices of police in their community. California leaders recognized the challenges facing the region and understood that college opportunity could improve the quality of life and social mobility of an entire community reeling from the effects of racial discrimination and lack of opportunity. Subsequently, the decision was made to create a university close by in the emerging city of Carson instead of Palos Verdes.<sup>1</sup>

Today, the effects of that decision are seen in the student body of CSU Dominguez Hills, which is among the most diverse of all the 23 CSU campuses in California, with Latinos representing 64 percent and Blacks representing 14 percent of all undergraduate students compared to the CSU systemwide average of around 40 percent and 4 percent, respectively.<sup>2</sup> Additionally, over 70 percent of students who earn a bachelor’s degree at CSU Dominguez Hills are low-income Pell grant recipients, compared to about 50 percent of CSU students systemwide.<sup>3</sup>

The history of the institution is central to its identity. Ultimately, the faculty and staff at CSU Dominguez Hills

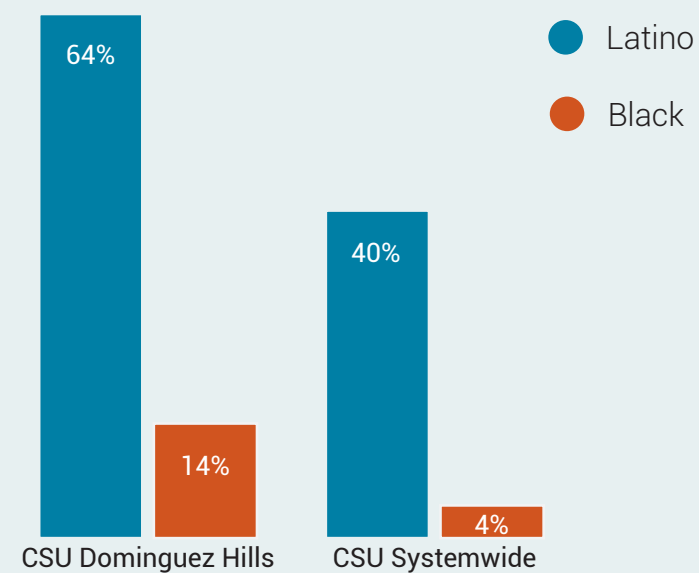
know that for many of their students, CSU Dominguez Hills may have been the only public university that believed in their students enough to open its doors and support them in pursuing their dreams of earning a bachelor’s degree. Instead of seeing that as a challenge, the faculty and staff at CSU Dominguez Hills see it as an opportunity—an opportunity to empower and change the lives of people who are thirsty for knowledge and hungry for a better future for themselves and their families.

The dedication of CSU Dominguez Hills to its mission of providing an accessible and transformative education to the local community and the state of California is demonstrated through its more than 90,000 alumni—over 65 percent of which live in the immediate area and contribute to the economic and social advancement of their local community.<sup>6</sup>

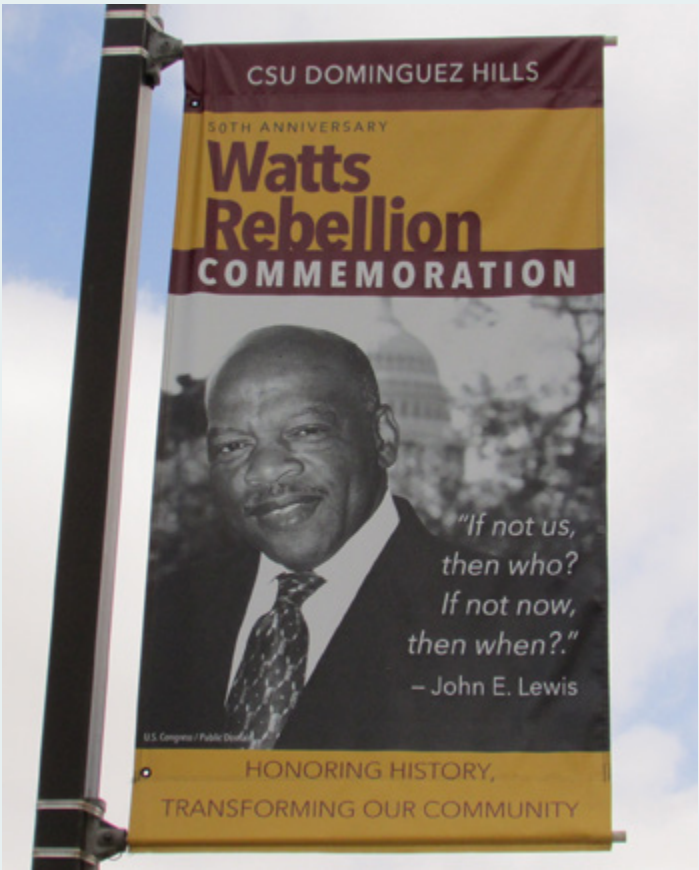
For this profile in the Demonstrated Excellence series, we are highlighting one aspect of the CSU Dominguez Hills campus, the Computer Science Department, that not only exemplifies a commitment to providing greater access, but also demonstrates a commitment to student success. We hope that this profile may inspire campus wide efforts that move beyond the department level to take innovative approaches to curriculum design more broadly and provide the holistic support necessary to improve outcomes for students across entire campuses regardless of their background.

Almost 80 Percent of CSU Dominguez Hills Undergraduates are Latino or Black

Fall 2015 Undergraduate Enrollment



Source: CSU Dominguez Hills Institutional Research<sup>4</sup> and CSU Analytics Studies<sup>5</sup>



This quote is placed prominently on banners spanning the California State University, Dominguez Hills campus, and truly captures the culture of the institution and its history.



## Computer Science at CSU Dominguez Hills

In a contemporary economy where technology is embedded in nearly every aspect of our lives, Science, Technology, Engineering, and Mathematics (STEM) jobs are a critical component of the 21st century workforce.<sup>7</sup> This is especially true for a state like California, where over one million jobs will be in STEM fields within the next five years.<sup>8</sup>

Among the various fields that make up STEM, computer science is one of the most popular and in-demand sectors. In fact, nearly half of all STEM jobs in California are in computer science related fields.<sup>9</sup> Of those computer science jobs, many require a college degree to gain entry into the profession.<sup>10</sup> As a result, computer science degree programs in California's colleges and universities play an important role in preparing the next generation of STEM workers.


Given the need for more STEM workers in California and given the lack of diversity in tech hubs like Silicon Valley where it has been reported that only around two or three percent of the workers for several companies are Black or Latino,<sup>11</sup> CSU Dominguez Hills is uniquely positioned to contribute to the

educated and diverse computer science workforce needed to meet the industry's needs.

Over a decade ago, Dr. Mohsen Beheshti, chair of the CSU Dominguez Hills Computer Science Department, and his colleagues recognized that despite the rich diversity and talent represented on campus, the department was encountering challenges retaining students pursuing computer science degrees.

Through analyzing department data, Dr. Beheshti and his colleagues realized that there were a significant number of students who initially declared computer science as their major, but after taking only a few classes had quickly switched to another major. This is when they asked an important question: ***What was causing so many students to leave the Computer Science Department and how could the Department be proactive in reducing the barriers to access and success for these students?***

What they learned in analyzing information was that faculty members in the department had not interacted with most of those students before these students made the decision to transfer out of the computer science major. When



Dominique Dalanni took the road less traveled to a university, overcoming a range of personal challenges and attending three community colleges in 10 years before applying to CSU Dominguez Hills, which she called "the best decision I ever made." She said the Computer Science Department has played an important role in her current academic success by providing her with the courses and resources that helped her gain the knowledge and confidence she needed to be successful. "The moment I arrived, everyone at CSU Dominguez Hills was extremely welcoming and made it clear that they were here to support me regardless of my background. To go from where I came from to now pursuing my dreams of getting my bachelor's degree in computer science and going on to attend graduate school is an amazing feeling, and I hope it gives hope to other people. CSU Dominguez Hills and the Computer Science Department have given me every opportunity to succeed. This school has changed my life."

digging deeper, they realized that the relatively low level of math proficiency for first-time freshmen (see table below) was creating barriers for many students who had declared computer science as their major but were not prepared for the required prerequisite course sequence of pre-calculus and calculus. Ultimately, after not being able to pass one or both of the prerequisite math courses, students were switching to other majors before even taking a computer science course.

This was a problem that the Computer Science department was intent on fixing.

**Less than half of first-time freshmen at CSU Dominguez Hills are proficient in math**

	CSUDH Percent Proficient in Math	CSU Systemwide Percent Proficient in Math
Fall of 2006	17%	63%
Fall of 2015	44%	73%

Source: CSU Analytics Studies<sup>12 13 14 15</sup>

**(Re)Designing Computer Science**

The efforts of the Computer Science Department are grounded in their belief that students at CSU Dominguez Hills are fully capable of achieving at the highest levels, even when others might have counted these students out for various reasons. The faculty and staff in the Computer Science Department operated in the spirit of Congressman John Lewis who asked, “If not us, then who? If not now, then when?” They knew that without their intentional and urgent response, many talented and capable students with much to offer the computer science field would never get there.

And in order to overcome the challenges to improving access to and success in the computer science field, Dr. Beheshti and his colleagues knew that business as usual would not work. The needs of their students were evolving, and it was necessary for the Computer Science Department to do the same. Through a series of innovative steps, the Computer Science Department redesigned the student experience and created new avenues for students to be engaged with computer science at CSU Dominguez Hills.



**Dr. Mohsen Beheshti**

“Making sure that the students are academically supported is one thing, but making them feel like they belong in the computer science field is a priority. Having a sense of belonging is critical to student success, so as faculty we make sure that we maintain close advising relationships and encourage students to be involved in the variety of student leadership opportunities that are available to them. We know that preparing students for difficult academic concepts will be nearly impossible if students don’t see themselves as connected to their major or feel like they are part of a supportive community.”



CS-0: The Gateway to Computer Science

The student interest in computer science was there, but often the confidence was not. Maybe just as importantly, Dr. Beheshti asserts that as a result of many of the CSU Dominguez Hills students coming from low-income backgrounds and ill-resourced high schools, their previous exposure to computer science was limited or absent entirely, making them unaware of what a computer science degree may have to offer them. These circumstances made it that much more important for the Computer Science Department to find ways to address the challenges their students were facing when it came to computer science.

In order to expand student interest in computer science and reach students earlier in their academic career before they take challenging math courses that could potentially discourage or disqualify them (if they do not pass the required course) from continuing to pursue a degree in computer science, Dr. Beheshti and his colleagues developed an introductory course called Computer Science Zero (CS-0). In CS-0, students are exposed to basic computer programming concepts and important problem-solving strategies that do not require previous knowledge of advanced mathematical concepts, such as algorithms commonly used in computer science.<sup>16</sup>

The Computing Alliance of Hispanic Serving Institutions (CAHSI), of which the Computer Science Department at CSU Dominguez Hills is a member, found that enrollment in courses similar to CS-0 were more diverse than other

computer science courses because of its ability to serve as a recruitment tool for underrepresented students who may not have ever considered computer science otherwise.<sup>17</sup> As such, CS-0 has the ability to introduce diverse student populations to the field of computing. Evidence from pre- and post-CS-0 enrollment surveys indicate that CS-0 is effective in boosting confidence in one’s programming abilities among women and underrepresented minority groups.<sup>18</sup>

New Majors Creating More Access to Computer Science

Recognizing that knowledge of advanced mathematical concepts and/or a B.S. in Computer Science was not the only path to careers in computer science, the Computer Science Department created new majors to better respond to industry and student needs to increase enrollment within the Computer Science department. Dr. Beheshti and his colleagues met with industry leaders to understand what knowledge and skills employers needed in potential candidates to meet their workforce needs. The outcome of those conversations was the development of two new majors: 1) Bachelor of Arts in Computer Technology (offered Fall 2009) and 2) Bachelor of Science in Information Technology (offered Spring 2016). As seen in the table below describing the different majors, the Computer Science Department has created new avenues for accessing computer science degrees which allow for varying levels of math proficiency/ preparation and ultimately prepare students for the diversity of career options in the computer science field.

CSU Dominguez Hills Computer Science Undergraduate Majors

Description	B.S. in Computer Science	B.A. in Computer Technology (offered Fall 2009)	B.S. in Information Technology (offered Spring 2016)
Career Preparation	Prepares students for careers in fields such as systems programming, data engineering, software engineering and graduate school	Prepares students for careers in such fields as domain expert, lab technician, repair/ troubleshooting and homeland security	Prepares students for both graduate school and careers in information technology settings
Math Course Requirements	Students must pass two calculus courses, discrete mathematics, and two upper level mathematics courses	Students must pass statistics and college algebra	Students must pass statistics and discrete mathematics

## Holistic Support for Computer Science Students

A major focus of the Computer Science Department has been on curricular change. However, Dr. Beheshti and the Computer Science Department at CSU Dominguez Hills understood that creating a sense of belonging for students happens both within and outside of the classroom. Students must feel they belong both academically and socially.

In an effort to address the co-curricular needs of computer science students and support their holistic development, the Computer Science Department has a system of services and opportunities that allow students to engage with computer science in a variety of ways. Included in this support system:

**Peer mentoring.** Along with other institutions across the country that are members of the Computing Alliance of Hispanic Serving Institutions (CAHSI), CSU Dominguez Hills has instituted Peer-Led Team Learning (PLTL). Guided by a peer leader, the PLTL approach engages teams of students in learning gateway course material and creates support structures and role models that are essential for retention and advancement.<sup>19</sup>

**Internships.** The Computer Science Department collaborated with industry leaders to align curriculum to workforce demands, but also to identify opportunities for students to get hands-on experience with computer science in the field. From those efforts, the department has worked with organizations like STEM Advantage and businesses like Toyota, Honda, and Disney to secure internship opportunities for over 20 computer science students each year.

**Advising.** In addition to the personal connections Dr. Beheshti makes with all computer science students, students get one-on-one, focused advising from the faculty and staff of the Computer Science Department. Enrollment holds are placed on students every semester and they must meet with advisors before being allowed to enroll in courses. This approach ensures that students are receiving good information about their academic progress and gives faculty and staff the opportunity to identify any intervention that may better support students in their pursuit of bachelor's degree in the Computer Science Department.



# The Benefits of (Re)Designing Computer Science

Employing strategies that support both the academic and social well-being of students has paid off for the Computer Science Department. Since implementing new approaches to computer science education at CSU Dominguez Hills, the Computer Science Department has achieved three important outcomes:

- 1. The number of students in the B.S. in Computer Science program more than doubled from 120 in the fall of 2006 to 260 in the fall of 2015.
- 2. The creation of the B.A. in Computer Technology expanded accessibility to the field of computer science for students with varying levels of academic preparation and has contributed to an additional 250 undergraduate students in the Computer Science Department.
- 3. The number of degrees conferred in computer and information sciences has jumped from just four in 2010-11 to almost 50 in 2014-15.

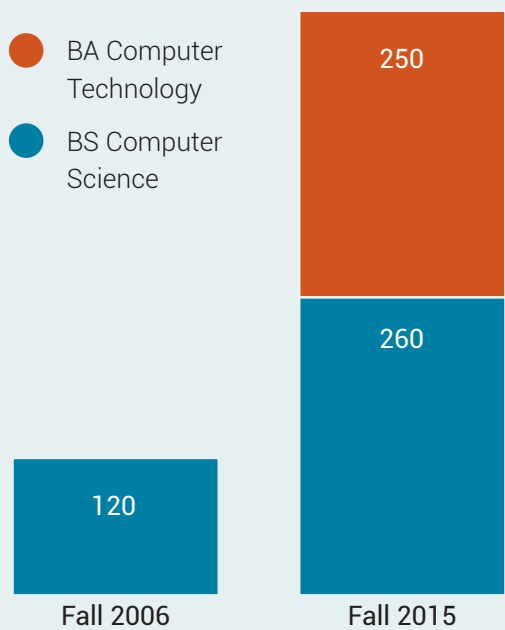
More importantly, CSU Dominguez Hills has provided a model approach to supporting students in a field that is critical to the success of the state's STEM workforce.

We commend the Computer Science Department at CSU Dominguez Hills for exemplary leadership that:

- a. Evaluates and acts on data;
- b. Resists old paradigms of degree programs and creates new opportunities that match industry and student demand;
- c. Understands the important role of faculty in advising and providing guidance early and often in a student's career;
- d. Understands the importance of social networks in a student's field of interest; and
- e. Understands the unique responsibility of the public institution to the students it serves regardless of level of preparation.

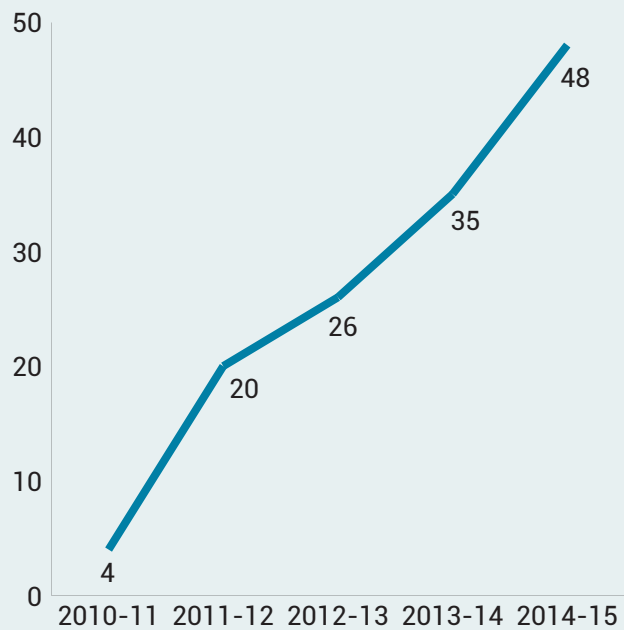
It is exactly these qualities and leadership practices that can ensure more Californians can call themselves college graduates and strengthen our workforce and economy.

The number of students in the Computer Science Department has increased by 325 percent over the past decade



Source: CSU Dominguez Hills Computer Science Department

The number of degrees conferred in Computer and Information Sciences has increased every year since 2010



Source: Integrated Postsecondary Education Data System (IPEDS)

# Endnotes

- <sup>1</sup> California State University, Dominguez Hills. (2016). 50th Anniversary Watts Rebellion Commemoration. Retrieved from <http://www4.csudh.edu/watts/> on May 17, 2016.
- <sup>2</sup> CSU Analytics Studies. (2016). Table 1 CSU Systemwide Enrollment by Ethnic Group, Number and Percent of Total, from Fall 2015 Residents Only. Retrieved from [http://www.calstate.edu/AS/stat\\_reports/2015-2016/rfeth01.htm](http://www.calstate.edu/AS/stat_reports/2015-2016/rfeth01.htm) on May 20, 2016.
- <sup>3</sup> California State University. (2016). Contributions to the Public Good. Retrieved from <http://www.calstate.edu/value/public-good/dominguezhills.shtml> on May 23, 2016.
- <sup>4</sup> CSU Dominguez Hills Institutional Research. (2016). Undergraduate Ethnic Distributions. Retrieved from <http://www4.csudh.edu/Assets/CSUDH-Sites/IRAP/docs/Enrollment/Major/Ethnicity/EthnicTrendUGgraph.pdf> on May 20, 2016.
- <sup>5</sup> CSU Analytics Studies. (2016). Table 1 CSU Systemwide Enrollment by Ethnic Group, Number and Percent of Total, from Fall 2015 Residents Only. Retrieved from [http://www.calstate.edu/AS/stat\\_reports/2015-2016/rfeth01.htm](http://www.calstate.edu/AS/stat_reports/2015-2016/rfeth01.htm) on May 20, 2016.
- <sup>6</sup> California State University, Dominguez Hills. (2016). 50th Anniversary Watts Rebellion Commemoration. Retrieved from <http://www4.csudh.edu/watts/> on May 17, 2016.
- <sup>7</sup> U.S. Department of Education. (2016). Science, Technology, Engineering and Math: Education for Global Leadership. Retrieved from <http://www.ed.gov/stem> on May 20, 2016.
- <sup>8</sup> Carnveale, A.P., Smith, N. & Melton, M. (2011). STEM State-Level Analysis. Retrieved from <https://cew.georgetown.edu/wp-content/uploads/2014/11/stem-states-complete-update2.pdf> on May 17, 2016.
- <sup>9</sup> Carnveale, A.P., Smith, N. & Melton, M. (2011). STEM State-Level Analysis. Retrieved from <https://cew.georgetown.edu/wp-content/uploads/2014/11/stem-states-complete-update2.pdf> on May 17, 2016.
- <sup>10</sup> Bureau of Labor Statistics. (2016). Occupational Outlook Handbook: Computer and Information Technology. Retrieved from <http://www.bls.gov/ooh/computer-and-information-technology/home.htm> on May 17, 2016.
- <sup>11</sup> Weise, E. & Guynn, J. (2014). Tech jobs: Minorities have degrees, but don't get hired. USA Today. Retrieved from <http://www.usatoday.com/story/tech/2014/10/12/silicon-valley-diversity-tech-hiring-computer-science-graduates-african-american-hispanic/14684211/> on May 17, 2016.
- <sup>12</sup> CSU Analytics Studies. (2016). Fall 2015 Final Regularly Admitted First-time Freshmen Proficiency Rates. Retrieved from [http://asd.calstate.edu/performance/proficiency/2015/Prof\\_Sys\\_Final\\_Fall2015.htm](http://asd.calstate.edu/performance/proficiency/2015/Prof_Sys_Final_Fall2015.htm) on May 17, 2016.
- <sup>13</sup> CSU Analytics Studies. (2016). Fall 2015 Final Regularly Admitted First-time Freshmen Proficiency Rates: CSU Dominguez Hills. Retrieved from [http://asd.calstate.edu/performance/proficiency/2015/Prof\\_DH\\_Fall2015.htm](http://asd.calstate.edu/performance/proficiency/2015/Prof_DH_Fall2015.htm) on May 17, 2016.
- <sup>14</sup> CSU Analytics Studies. (2016). Fall 2006 Final Regularly Admitted First-time Freshmen Proficiency Rates: CSU Dominguez Hills. Retrieved from [http://asd.calstate.edu/performance/proficiency/2006/Prof\\_DH\\_fall2006.htm](http://asd.calstate.edu/performance/proficiency/2006/Prof_DH_fall2006.htm) on May 18, 2016.
- <sup>15</sup> CSU Analytics Studies. (2016). Fall 2006 Final Regularly Admitted First-time Freshmen Proficiency Rates: CSU Dominguez Hills. Retrieved from [http://asd.calstate.edu/performance/proficiency/2006/Prof\\_Sys\\_fall2006.htm](http://asd.calstate.edu/performance/proficiency/2006/Prof_Sys_fall2006.htm) on May 18, 2016.
- <sup>16</sup> Beheshti, M., Alo, R.A., Fernandez, J., Gates, A.Q., Ranjan, D., Boadi, A., Villaverde, K. (2008). Work in Progress CS0 Course Implementation in Computer Science. *38th ASEE/IEEE Frontiers in Education Conference*.
- <sup>17</sup> Beheshti, M., Alo, R.A., Fernandez, J., Gates, A.Q., Ranjan, D., Boadi, A., Villaverde, K. (2008). Work in Progress CS0 Course Implementation in Computer Science. *38th ASEE/IEEE Frontiers in Education Conference*.
- <sup>18</sup> Beheshti, M., Alo, R.A., Fernandez, J., Gates, A.Q., Ranjan, D., Boadi, A., Villaverde, K. (2008). Work in Progress CS0 Course Implementation in Computer Science. *38th ASEE/IEEE Frontiers in Education Conference*.
- <sup>19</sup> Gates, A. Q., Hug, S., Thiry, H., Al'o, R., Beheshti, M., Fernandez, J., Rodriguez, N., and Adjouadi, M. (2011). The Computing Alliance of Hispanic-Serving Institutions: Supporting Hispanics at critical transition points. *ACM Transactions on Computing Education*, 11(3), 16:1-16:21.



# ABOUT THE CAMPAIGN

The Campaign for College Opportunity is a broad-based, bipartisan coalition, including business, education and civil rights leaders that is dedicated to ensuring that all Californians have an equal opportunity to attend and succeed in college in order to build a vibrant workforce, economy and democracy. The Campaign works to create an environment of change and lead the state toward effective policy solutions. It is focused upon substantially increasing the number of students attending two- and four-year colleges in California so that we can produce the 2.3 million additional college graduates that our state needs.

For more information, visit: [www.collegecampaign.org](http://www.collegecampaign.org).

## Los Angeles Office

714 W. Olympic Boulevard, Ste. 745  
Los Angeles, CA 90015  
Tel: 213.744.9434  
Fax: 800.207.3560

## Sacramento Office

1512 14th Street  
Sacramento, CA 95814  
Tel: 916.443.1681  
Fax: 916.443.1682

## Oakland Office

300 Frank Ogawa Plaza, Ste. 420  
Oakland, CA 94612  
Tel: 510-292-8921  
Fax: 877-207-3560

[www.collegecampaign.org](http://www.collegecampaign.org)



[www.facebook.com/collegecampaign](http://www.facebook.com/collegecampaign)



[www.twitter.com/CollegeOpp](http://www.twitter.com/CollegeOpp)

# BOARD OF DIRECTORS

## Thomas A. Saenz (Chair)

President & General Counsel, Mexican American Legal  
Defense and Educational Fund (MALDEF)

## Gary K. Hart (Vice Chair)

Former California Secretary of Education & State  
Senator

## Marcus A. Allen (Treasurer)

Partner, Englander Knabe & Allen

## Lisa A. Smith (Secretary)

Managing Director/Head of the Pacific Region, Siebert  
Brandford Shank & Co., L.L.C.

## George Boggs

Superintendent-President Emeritus, Palomar College;  
President & CEO Emeritus, American Association of  
Community Colleges

## Camila Chavez

Executive Director, Dolores Huerta Foundation

## Connie Conway

Member, California Community Colleges Board of  
Governors; Former Member of the California State  
Assembly

## Pamela H. David

Executive Director, Walter & Elise Haas Fund

## Robert Lapsley

President, California Business Roundtable

## William G. McGinnis

Trustee, Butte-Glenn Community College District

## Rory O'Sullivan

Deputy Director, Young Invincibles

## Darline Robles

Professor of Clinical Education  
USC Rossier School of Education

## Frederick R. Ruiz

Co-Founder & Chairman Emeritus  
Ruiz Food Products

## David Wolf

Co-Founder, Campaign for College Opportunity